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PREFACE

It is our great pleasure to welcome you to the "International Conference on Information Engineering Management and Security" (ICIEMS 2014). This year's International Conference continues its tradition of being the premier forum for presentation of research results and experience reports on leading edge issues of engineering, management, security models, systems, applications, and theory. The mission of the conference is to share novel access control solutions that fulfil the needs of heterogeneous applications and environments and identify new directions for future research and development. ICIEMS gives researchers and practitioners a unique opportunity to share their perspectives with others interested in the various aspects of engineering, management and security.

The call for papers attracted 400 submissions from Asia, Canada, Europe, Africa, and the United States. The program committee accepted 100 papers that cover a variety of topics, including next generation engineering models, engineering and analysis techniques for control, and security. We hope that these proceedings will serve as a valuable reference for researchers and developers.

We also encourage attendees to attend the keynote and invited talk presentations. These valuable and insightful talks can and will guide us to a better understanding of the future:

Putting together ICIEMS 2014 was a team effort. We first thank the authors for providing the content of the program. We are grateful to the program committee and the senior program

committee, who worked very hard in reviewing papers and providing feedback for authors. Finally, we thank the hosting organization Christu Jyoti Institute of Technology & Science(CJITS).

We hope that you will find this program interesting and thought-provoking and that the conference will provide you with a valuable opportunity to share ideas with other researchers and practitioners from institutions around the world.

We invite you to join us in this inspiring conversation.

Finally, I thank my family, friends, students and colleagues for their constant encouragement and support for making this type of conference.

-- **JBV Subrahmanyam**
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Asset Optimization and Economic Issues in the Smart Grid

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Abstract— Today's electrical grid is considered one of the greatest engineering accomplishments of all time. It was recognized in 2003 by the National Academy of Engineering as the preeminent engineering achievement of the twentieth century. Currently, the utility industry is facing a number of challenges that are bringing about the need to make major changes to the grid. These challenges include the need for greater energy security arising from increasing demand for energy worldwide and decreasing supply of fossil fuels to meet the demand, worldwide concern about global climate change, aging infrastructure and inefficiency in the existing grid. Additionally, consumers want to play a role in their own energy management and conservation. To address these challenges, the utility industry is in the early phases of migrating toward a "smart grid." The goal of the smart grid is to make the existing grid more efficient and less harmful to the environment, while continuing to provide safe, reliable, and affordable electricity to consumers. This paper discusses the current issues in regard to energy consumption, problems with the existing grid and the goals of the smart grid , information and communication technology (ICT) infrastructure, and communication technologies, standards, and protocols that are either already in use or are being considered for the smart grid , micro-grids, plug-in hybrid electric vehicles (PHEVs) and smart homes and the role they will play in the smart grid, existing smart grid deployments and pilot projects , the economic issues related to the smart grid and focuses on sensors for smart grid networks, and green networks.

Index Terms— smart grid, ICT , wireless Technologies, sensor, micro grid, smart home.

I. Introduction

The existing electricity grid is becoming less reliable as the infrastructure it is built upon continues to age, and because electricity and electronic devices now permeate every facet of our lives, the demands placed upon the grid are growing exponentially. American electricity consumption increased from about 118 kilowatt-hours a month in 1960 to nearly 1000 kilowatt-hours a month in 2010 [1] and world energy consumption is on track to increase by 44% from 2006 to 2030 [2].

The growth in worldwide energy consumption is due in large part to the availability of cheap energy that is provided by fossil fuels such as oil, coal, and natural gas, but these resources are becoming increasingly scarce. The supply of these fuels will not continue to meet the demand. Many oil and natural gas fields have peaked (or will in the near future) and their production will continue to decline, causing prices for this "peak-oil" to steadily increase. Estimates of when global oil production is likely to peak are between 0-20 years. The remaining oil and gas fields are either in politically unstable or environmentally sensitive areas [2]. Even if fossil fuels remain plentiful, a future based on fossil fuel consumption will threaten the environment by causing damaging climate change, the effects of which are still largely unknown. In order to reduce carbon emissions, the use of plug-in hybrid electric vehicles (PHEVs) and high-speed electric trains will need to replace gasoline and diesel powered vehicles, and homes and offices will need to be heated and cooled electrically rather than with coal, oil fired burners, or natural gas. This transition is expected to increase electricity demand globally by 76% by 2030[2].

This increased demand for electricity means the existing grid will need to be re-tooled and the utility industry's business model redesigned in order to continue to provide safe, secure, reliable, environmentally friendly, and affordable electricity service to consumers. The grid will have to transition from a mostly

unidirectional, centralized, and hierarchical organization to a distributed, networked, and automated energy value chain [1]. The existing grid topology is an hierarchical pyramid, with a few large power plants (burning fossil fuels) at the top that generate electricity and send it over a long distance through the transmission system to smaller utilities, who in turn provide electricity to end-users, on-demand, through the distribution system. Figure 1 is an illustration of the structure of the existing grid [4].

End users are typically located far from where the electricity is generated. Because of this hierarchical structure, failures in the system cause a domino affect, where one failure can affect thousands or even millions of users, and power outages today are much more detrimental than in the past given our dependency on electricity in order to function as a society. Inefficiencies in the existing generation system cause a loss of nearly 8% of its capacity in the transmission lines, and it reserves nearly 20% of its capacity to meet peak demand. In other words, 20% of generation capacity is only used 5% of the time [4]. The existing grid is also a unidirectional system both in terms of delivery and communication. Figure 2 [5] illustrates the current level of asset utilization in today's grid.

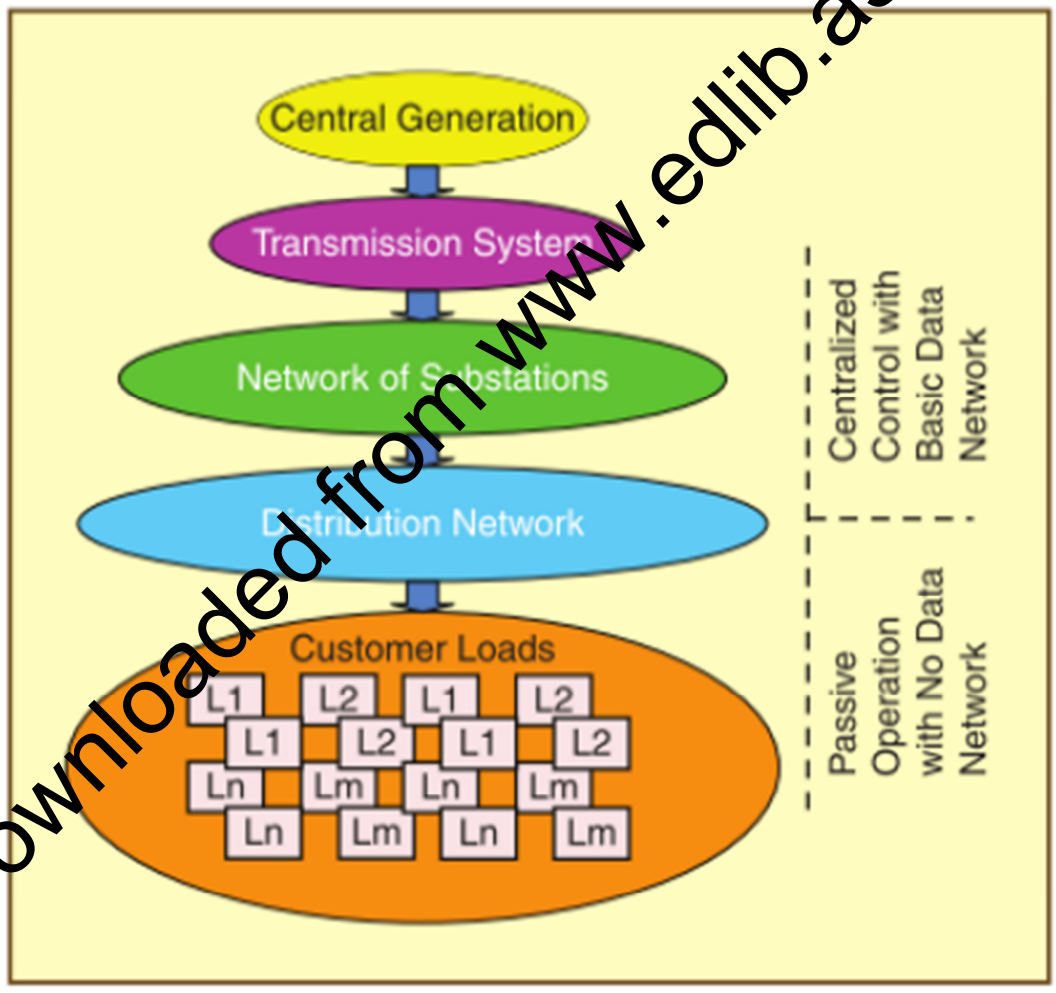

Figure 1: The Existing grid

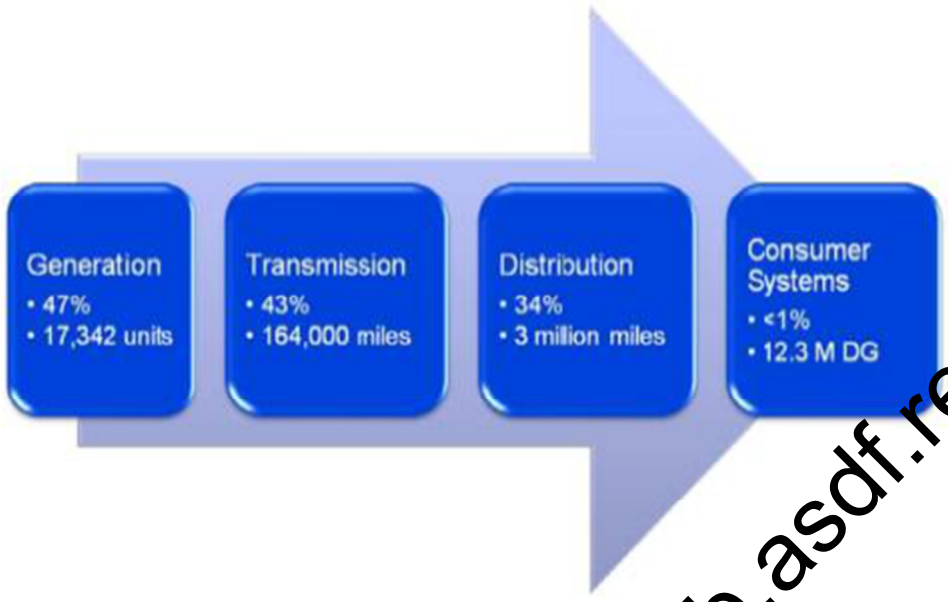

Figure 2. The current level of asset Utilization

The figures shown are the average utilization as a percentage of capacity. The figures indicate that there is room for improvement by increasing utilization of existing assets as opposed to building new ones. It should be noted that the most under-utilized area is the consumer systems asset class where millions of Distributed Generation (DG) resources are not connected to the grid [5].

The smart grid will require utilities to make more efficient use of assets in the generation, transmission and distribution systems, create a bi-directional flow of real-time information, and incorporate renewable generation resources such as wind, solar, and tidal sources, as well as plug-in hybrid electric vehicles (PHEVs) that will not only consume electricity, but also give back to the grid by acting as a distributed form of energy storage[3]. The supply of renewable sources of energy changes in response to changing conditions (wind speeds, cloud cover, PHEV battery capacity etc.), so a shift in the way electricity is provided to consumers will be necessary. Perhaps the most difficult transition that utilities will have to make is the transition from supplying electricity to consumers on-demand, to using demand-response (DR) to reduce peak demand. DR means the demand for electricity is managed in response to the available supply of resources. DR is needed in order to reduce peak demand, which is a major source of inefficiency in the existing grid, as mentioned earlier.

Reference [5] list three ways in which the smart grid differs from the existing grid:

a) Decentralized Supply and Control – Increased number of generation and storage resources from a few large, centralized power plants to many millions of decentralized resources, some of which will be owned by utilities, and others that won't.
b) Two-way Power Flow at the Distribution Level – Although the transmission system in the existing grid currently allows two-way flows, the distribution system does not. The smart-grid will allow consumers to sell energy back to the grid. Consumers who both consume and provide energy back to the grid are referred to as “prosumers.”
c) Two-way information flow – The transmission system uses SCADA to gather information, but SCADA has not been implemented in the distribution system, and no information is exchanged at all between consumers and grid operators [3].

Some of the principal characteristics of the smart grid are follows:

- Enable active participation by consumers;
- accommodate all generation and storage options;
- Enable new products, services, and markets;
- Provide power quality for a digital economy;
- Optimize asset utilization and operate efficiently
- Anticipate & respond to system disturbances (self-heal); and
- Operate resiliently against attack and natural disaster.

This paper discusses the current issues in regard to energy consumption, problems with the existing grid and the goals of the smart grid in section 1. The definition and general description of the smart grid as well as a description of the information and communication technology (ICT) infrastructure, and communication technologies, standards, and protocols that are either already in use or are being considered for the smart grid are discussed in section 2. Section 3 is a discussion of micro-grids, plug-in hybrid electric vehicles (PHEVs) and smart homes and the role they will play in the smart grid. In Section 4 a few of the existing smart grid deployments and pilot projects are covered Section 5 covers the economic issues related to the smart grid. In section six we discuss sensors applications for smart grid and the paper concludes in Section 7.

II. ICT Infrastructure, Standards, and Protocols

Smart-grid is defined as a system that uses two-way communication and information technologies, and computational intelligence in an integrated fashion across electricity generation, transmission, distribution, and consumption to achieve an electric system that is clean, secure, reliable, efficient, and sustainable[6]. The smart-grid will incorporate advanced information and communication technologies (ICT) along with automation, sensing, and metering technologies and energy management techniques in order to optimize the supply and demand of energy and improve asset utilization in the electrical system[7].

Communication of real-time data and the use of analytics and predictive modeling are crucial to the operation and management of the generation system within the smart-grid, therefore, IT will play a large role in the transition from the existing grid to a smart grid. System operators will need to use advanced system operation tools that provide real-time monitoring of all system components in order to optimize performance and avoid blackouts and integrate renewable energy sources that are variable in nature. Examples of these advanced tools include wide-area situational awareness (WASA), wide-area monitoring systems (WAMS), and wide-area adaptive protection, control and automation (WAAPCA)[8].

In the transmission system, smart-grid technologies include flexible AC transmission systems (FACTS) that enhanced the controllability of transmission networks and maximize power transfer capability. Dynamic line rating (DLR) are used to optimize existing transmission assets through the use of sensors that provide real-time information regarding the currant carrying capacity of a section of the network. Lastly, high voltage DC (HVCD) technologies assist in connecting wind and solar resources to the grid that are located large distances from load centers [8].

The distribution system has largely been the focus of smart-grid initiatives, since it is the least automated and provides the most opportunity for improvement. Advanced metering infrastructure (AMI) is used in the distribution system that enables the bi-directional flow of information and provides utilities and customers with real-time data on consumption and electricity pricing. AMI refers to smart meters and the technologies that are combined with them. Other technologies used in the distribution system include customer-side-systems, which include energy management systems, smart appliances, energy storage devices, in-home displays, building automation systems, energy dashboards, and energy applications for smart phones and tablets [8]. A three-layer smart grid conceptual model has been proposed by the Power

Engineering Society, as shown in figure 3 [7]. The layers include the energy and power systems layer, communications layer, and information technology layer. The ICT layers of this model account for approximately 70% of the smart grid infrastructure.

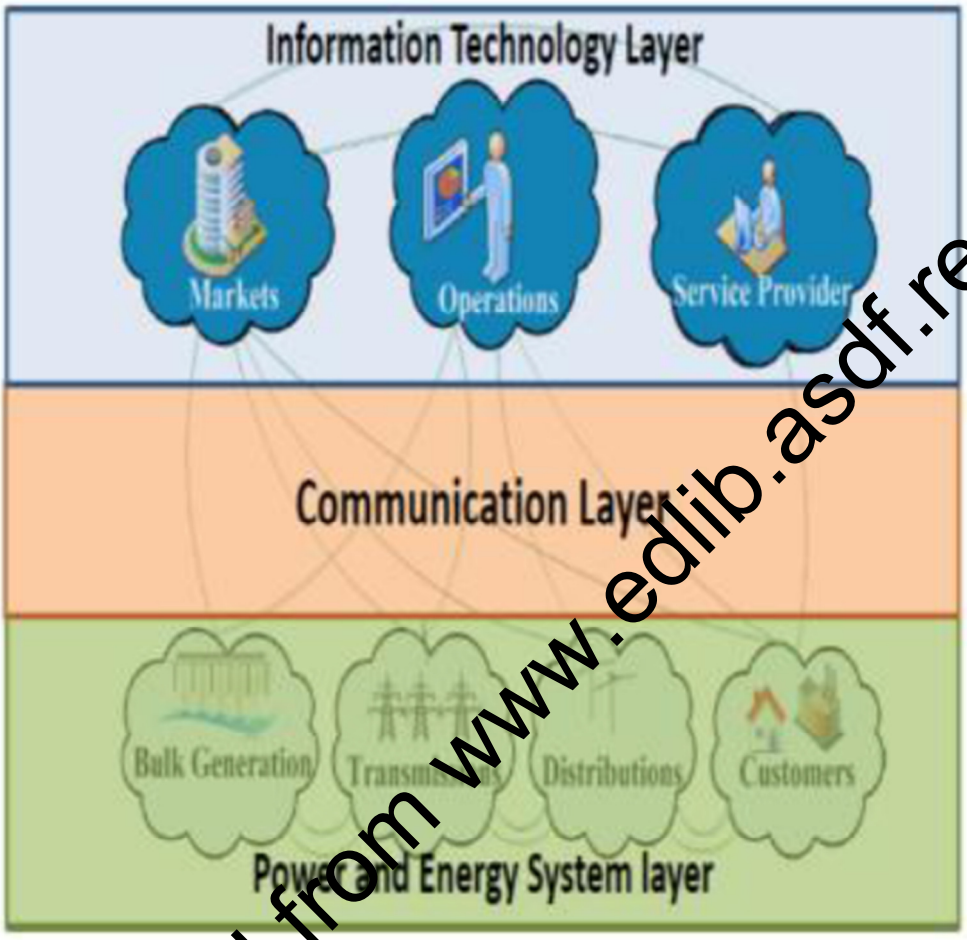

Figure 3. Smart Grid conceptual model

1) IT Layer

The IT layer of the smart grid is divided into two sub-layers; the Computing Platform and Operational Systems Layer (CPOS) and the Business Applications and Services (BAS) Layer. The CPOS layer consists of hardware in the form of servers that host all of the grid's operation systems. These systems include demand-side management and demand response, grid optimization, switching plans, outage and geographic information, transmission and distribution automation, communication networks analysis and management, self-healing and disturbance correction, dispatching and tracking, tagging power flow analysis, cyber-security protection, renewable energy integration, and protection and real-time Supervisory Control and Data Acquisition (SCADA) analysis[7].

The BAS layer consists of software packages that are responsible for the following:

1. Utilities customer care and billing, consumer interface and web interface.
2. Business and home energy management, distribution mobile workforce management
3. Third party service providers, their party access for marketing and financial applications.

2) Communications Layer

The smart grid communication layer connects all of the sub-systems (generation, transmission, distribution, and consumptions) within the smart grid to the IT and energy and power systems layers, allowing for the bi-directional exchange of information between grid and ecosystem operators and consumers. The communications sub layer is further divided into three sub-layers in addition to the existing SCADA. The communication layer sub-layers include; Automatic Meter Reading (AMR) networks layer, Advanced Metering Infrastructure (AMI) networks layer, and Advanced Metering Infrastructure Plus (AMI+) networks layer [7]. Each of these sub-layers serves certain types of networks within the grid. The network types are described in the following paragraphs. Figure 4 illustrates the functions of each of the sub layers.

Figure 4. Smart grid software layer

Consumer Premises Networks (CPNs) are located on the customer's premises and facilitate communication between appliances and smart-grid equipment. These networks are served by the AMR sub-layer. The CPNs are also subdivided based on the consumer's consumption profile into Home Area Networks (HAN), Business Area Networks (BAN), and Industrial Area Networks (IAN) [7]. These networks can serve devices like smart appliances, EV charging outlets, and in-home displays for HANs, load control devices, renewable energy integration, power measurements, and demand side management. Data in these networks can be exchanged though real-time measurement parameters (RTMP), or power consumption data. RTMP is used for demand-response and demand-side management. It measures current, frequencies, voltage and power. The smart meter power consumption data profile is defined by IEEE standard 6010-6011 [9]. The possible communication technologies for CPNs include both wired and wireless networks such as Zigbee, Xbee, Wi-Fi, BACnet, Home Plug, 6-lowPAN, and SAEJ6847[7].

Neighborhood Area Networks (NANs) are part of both the AMI and AMR sub-layers. The function of a NAN is to gather information from devices in the CPNs via smart meters and send the data to the data center at

the utility for processing. Devices served by NANs include concentrators, which collect data from meters in all neighborhoods, load control relays, and advanced smart meters. Communication technologies used by NANs include both wired and wireless networks such as Wi-Fi, WiMax, LTE, GPRS/EDGE, RF Mesh, FTTP/FTTH/Ethernet, and RF Radio point-to-multipoint [10].

Access Area Networks serve devices at the distribution level such as voltage regulators, renewable energy resources, re-closers, remotely operable switches, capacitors, line sag and maximum demand indicators, distance to fault relays, and line fault indicators. Access Area Networks use both wired and wireless communication technologies that include WiMax, GSM-CDMA, BPLC, 1G/LTE, and FTTP/FTTH/Ethernet.2 The Backhaul Network also serves devices at the distribution level. These include SCADA devices (RTU substations and IDE), Pressure, Temperature, and Oil level sensors, protection relays, and monitoring cameras. The communication technologies used by the Backhaul Network include WiMax, BPLC, LTE/LTE Public, FTTP/FTTH/Ethernet, Microwave, and Fiber[7].

Core and Office Networks are responsible for corporate communications in order to provide voice, data, planning, and Quality of Service. Network communication technologies used in these networks include GPRS, LTE, Leased Line Circuits, and FTTP/FTTH/Ethernet. External Access Networks use public access networks in order to provide access to the previously described networks to ecosystem operators. Figure 5 [7] provides a visual summary of the different networks and their associated communication technologies, as well as how they interface with one another.

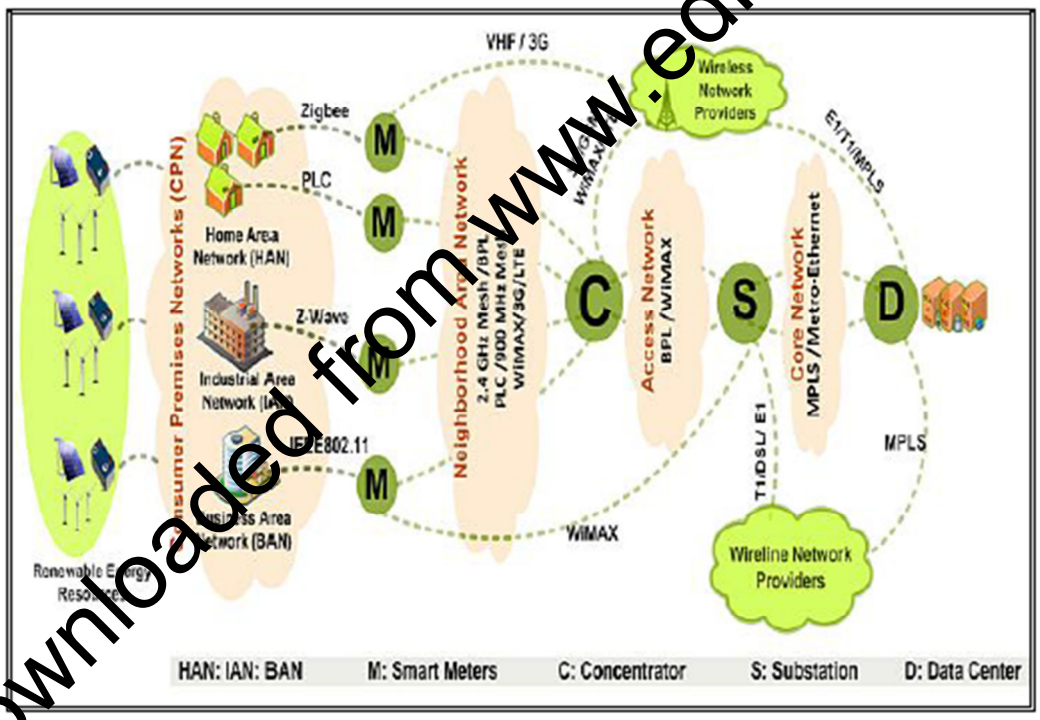

Figure 5. Available Networks options for smart grid

III. Micro-Grids, PHEVS, and Smart Homes

The transition to a smart-grid is expected to be an evolutionary process where utility companies slowly incorporate more and more smart-grid technologies into their existing infrastructure. Much like the evolution of the Internet, the smart-grid could become an interconnected network of smaller networks, called micro-grids. Micro-grids provide decentralized generation and storage that is more efficient and located closer to the customer's premises. Utility micro-grids, along with a Distribution Management

System (DMS) will enable large numbers of DG to contribute resources and assist in demand response to reduce peak load and improve reliability when the grid needs their support [5]. The Department of Energy describes micro-grids as:

"A micro grid, a local energy network, offers integration of distributed energy resources with local electric loads, which can operate in parallel with the grid or in an intentional island mode to provide a customized level of high reliability and resilience to grid disturbances. This advanced, integrated distribution system addresses the need for application in locations with electric supply and/or delivery constraints, in remote sites, and for protection of critical loads and economically sensitive development [5]."

In addition to utility micro-grids, community micro-grids are emerging whose purpose is to optimize local assets in order to best serve a community. They are self-contained power systems that operate in a small geographical area and are controlled locally [4]. They incorporate renewable resources along with traditional local generation. These micro-grids operate alongside the main grid most of the time, but can seamlessly move into "island mode" when necessary. The community micro-grid's intelligence can determine if conditions require the transition into island mode in order for the community to be best served.

Once the conditions return to normal, the community micro-grid will connect back to the main grid seamlessly. The military has relied on micro-grids for some time as a way to generate its own power, leaving it to rely on local utilities strictly for supplemental power and other services. Figure 6 illustrates a typical micro-grid design [11].

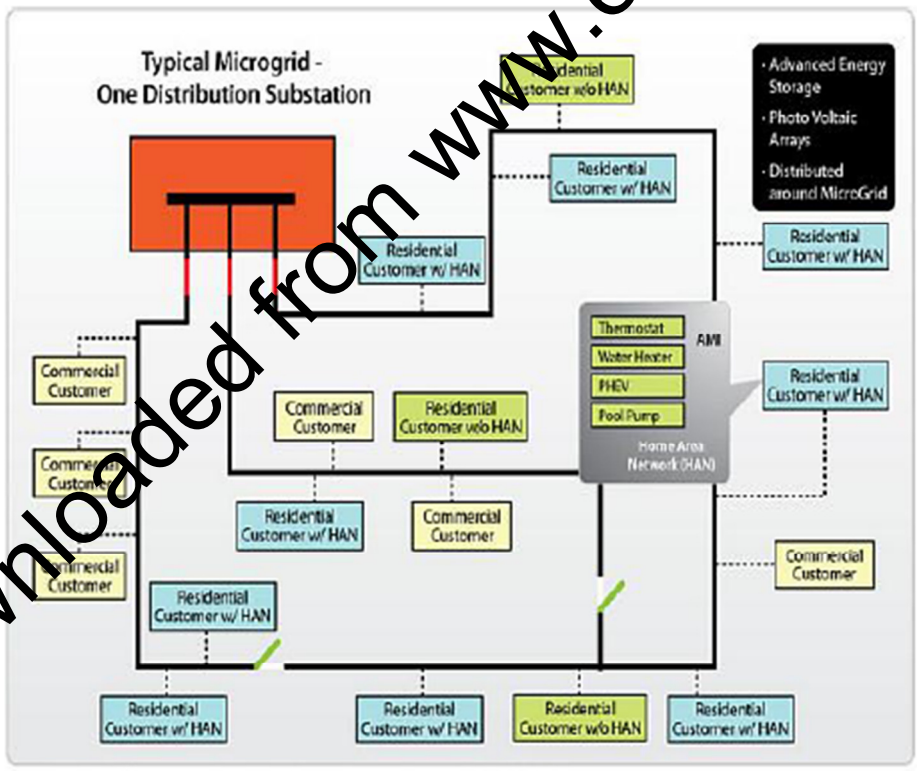

Figure 6. A typical Micro grid design

As the smart grid evolution progresses, micro-grids will begin to aggregate distributed generators into "virtual power plants," allowing distributed generation to be entered into the main grid and sold on the market by individuals. Micro-grids are still a contentious issue for some utilities who question their true

value. The research to date seems to discredit this notion. Micro-grids can assist in solving problems that on a large scale seem impossible, but become more manageable within smaller areas. Some of the suggested benefits of micro-grids are:

1. Easy renewable energy integration
2. Reduced losses in transmission
3. Lower carbon emissions
4. Local control and ownership
5. Use of island mode when blackouts occur
6. Cheaper and faster to build than large power plants.
7. Ability to incorporate storage from batteries or other devices
8. Micro-grids can contribute unused energy back to the main grid
9. Postponement of construction of new centralized power plants

Government regulation may be needed in order to require the use of micro-grids for the purpose of asset optimization in the smart grid. Further research is needed in this area to examine unintended consequences and to determine if the implementation of micro-grids will be cost effective for consumers.

Plug-in hybrid electric vehicles (PHEVs) will also play an important role in the smart-grid. PHEVs are part of the vehicle-to-grid (V2G) system, which is an auxiliary distributed storage system that exploits the capacity of vehicle batteries[12]. More and more of these vehicles will be used as the need to reduce carbon emissions and the price of gasoline increases. PHEVs will put an added burden on the grid as people will need to charge them. But PHEVs will also be able to store energy and assist with load shaving. Consumers will be able to sell the power stored in their vehicle's back to the grid if/when they choose. This will help grid operators deal with peak demand for energy. When electricity prices go up during times of peak demand, consumers, through smart-grid technologies, will be notified of rising prices and can profit from selling their PHEVs stored energy back to the main grid based on time-of-use pricing, which is discussed later. PHEVs already come equipped with Time–of–Use (TOU) recharching controllers. The electric vehicle charging infrastructure within the distribution system of the smart-grid handles billing and other needs related to smart charging PHEVs during periods of low energy demand [8].

Another important piece of the smart-grid puzzle is what's been called a “smart home.” Consumers who use smart homes are able to manage their energy demand by installing advanced devices. These devices include two-way communicating thermostats and meters as well as other automation devices including programmable outlet controllers and smart appliances. Smart homes will contribute to demand response by lowering peak demand in the smart-grid. Reference [13] states an analysis by the appliance industry estimates that virtually the entire projected growth in peak demand expected for 2030 in the U.S. Could be avoided with full implementation of smart appliances. The appliance industry points out that new energy efficiency measures will have little impact on reducing peak demand and they are already beginning to affect the performance of some appliances. The Pacific Northwest Laboratory and Whirlpool conducted a demonstration project (that is discussed in detail in the next section) using a smart clothes dryer that could detect variations in frequencies on the grid that indicated an impending power outage and respond by turning off the dryer's heating elements for up to ten minutes while the dryer continued to run. The resulting analysis led the appliance industry and the energy-efficiency advocacy community to jointly request that demand-response capable appliances by included in the new ENERGY STAR program. Grid-connected refrigerators also offer significant energy savings as they can be programmed to defrost at non-peak times of day. The savings of having 100 million homes with connected refrigerators is estimated at 50 billion Watt [13]. Likewise, a connected dishwasher can be programmed to run in the middle of the night, even if it was loaded in the early evening. Smart homes allow consumers to manage their consumption based on the dynamic pricing that is later. Lastly, smart homes can assist in the main grid in restoring power after an outage by waiting a sufficient amount of time before restarting. In many cases after a power

outage, all the devices restart simultaneously as soon as power is restored and cause another failure as a result.

IV. Smart Grid Projects

The Pacific Northwest project conducted by Clallum Public Utility District was one of the first to introduce an incentive program to encourage consumer's involvement in the plan for developing a smart-grid. Volunteer households were given free computers that received electricity rates every five minutes, along with thermostats, water heaters, and clothes dryers that were provided by Whirlpool. The devices could be programmed to inform households on current quantity of power they were using and at what cost, allowing the households to adjust their consumption accordingly. In addition, the computers allowed Clallum to remotely shut down the heating elements of the clothes dryers as described before in order to balance the load on the system. Each household was given a small amount of money at the beginning of the project and were allowed to keep whatever was left over at the end. The households were also given some instructional training on how to use the software. The 116 households that participated kept their demand below the utility's capacity at all times during the experiment, and saved an average of 10% on their power bills. This project was a good start, but replicating it on a large scale isn't likely as the participants were guaranteed that their bills wouldn't go up, and a single government laboratory ensured that the equipment was kept working during the entire duration of the project.

The Pecan Street Project is a research and development organization within the University of Texas at Austin that is carrying out a number of smart grid demonstration projects around the U.S. that emphasize customer participation. One of the projects in particular, the Mueller project, involves 1,000 homes that are equipped with energy management systems and incorporates most of the advanced smart-grid technologies. The project is analyzing new dynamic pricing models and studying the incorporation of DG, PHEVs, photovoltaic solar, and energy storage, as well as evaluating different smart-grid standards for interoperability. The expectation is that the results from this demonstration project can be extended to other smart-grid projects worldwide and under various conditions [14]. The Pecan Street Project rewards consumer participation by giving rebates for home efficiency measures and providing assistance financing efficient air conditioners as well as solar PV cells and solar water heaters. The Pecan Street Project is a model of the effectiveness of collaboration between utilities and policy makers as it also encourages green workforce development, promotes alternatives to automobile travel and the creation of energy business incubators [1].

V. Economic Issues

In order for the smart-grid to function effectively and efficiently, the electric utility industry's business model will require an overhaul. The electricity industry's business model was built on the notion that costs go down as supply goes up, therefore, the industry is largely responsible for consumer's lax attitudes toward energy consumption. The industry's strategy has historically been to sell more, and charge less.1 Now the utilities are faced with the need to change their business model to go from selling as much power as they can as cheaply as they can to both selling and conserving electricity. This paradigm shift will be extremely difficult since there are many different stakeholders involved with heterogeneous needs and goals and there are tremendous economic and regulatory issues to address. Reference [1] provides a very detailed discussion of the economic and regulatory issues surrounding the smart-grid in his book.

The first issue facing grid operators is the way in which they charge customers for power. It is widely known that the most costly elements of producing and delivering electricity are the costs of the fuel required to make it, and the costs of building power plants. In order to provide the continuous balance necessary in the existing grid, human operators make decisions as to which power plants will need to be turned on during the day as demand increases. Some power plants costs more than others to operate, therefore, the cost of producing and delivering electricity changes by the hour or even by the minute throughout the day. At

night, electricity is cheapest (2 to 3 cents/kWh) because the cheapest plants are running, but as people wake up and start turning on the lights, etc. additional plants are turned on and the costs increase (6 to 7 cents/kWh). During times of peak demand, when the most least efficient plants have to be turned on, costs are much higher (8 to 20 cents/kWh).1 Dumb meters don't account for this variation in costs, rather, they simply add up the number of kWh used by a customer over a month and charge a set rate for each kWh regardless of when it was used or how much cost the utility incurred to make it. Smart meters, on the other hand, track a customer's consumption hour-by-hour, allowing utilities to charge different prices for electricity used at different parts of the day. This is called time-based pricing. The use of smart meters and time-based pricing is beneficial for both the electric utilities and consumers. Utilities benefit in that they can set time-based prices and bill them and offer more pricing options. Also, smart meters allow appliances to be programmed to respond to price signals or user commands and adjust their use accordingly, as in the Pacific Northwest project described earlier. Lastly, smart meters "make it easier to integrate small-scale generators and storage on a customer's premises" in that they can keep track of self-generated power and decide when to store electricity to be used later.1 The smart meters, along with the systems that allow them to communicate price signals and record hourly use are collectively called Advanced Metering Infrastructure (AMI). AMI provides some core smart-grid functionality and is currently being used on a small scale, but it is just the beginning of the capability that fully enabled smart-grid technologies will provide in the form of sophisticated customer controls. Having large numbers of consumers who can adjust their demand when grid operators signal rising electricity prices is how peak loads are reduced via demand-response.

There are three types of time-based electricity pricing. First, real time prices (RTP) are set based on hourly wholesale prices with a mark-up. Real-time pricing can vary dramatically as much as 300% [1] so utilities tend to favor one of the other two pricing structures. TOU rates are calculated in a stair-step manner based on the daily patterns. For example, prices are highest in the middle of the day, lowest in the middle of the night, and mid-range during the morning and early evening. This pricing structure has been most commonly used by utilities since it doesn't require real-time communications with customers. TOU rates take into account consumption at different parts of the day, but they don't address the times when demand on one day is higher than another, as in when the temperatures are much higher or lower from one day to the next. Critical peak pricing (CPP) gives utilities the option of increasing rates substantially for just a few days during heat waves or extremely cold weather conditions when there is a spike in demand. Customers are notified in advance of the price increase so that they can plan to adjust their consumption. All of these pricing structures are designed to be profit neutral for utilities, but provide valuable benefits for customers and are very effective at reducing peak power demand. For example, TOU rates reduce peak demand by about 5% and CPP rates bring about a 20% reduction [1].

Pricing is one issue facing the utility industry, but implementing a smart-grid will require a complete overhaul of the industry's business model. It places the industry's current business models into two categories; the vertically integrated regulated utility and the disintegrated structure with retail choice. He then examines the likely path the two models will take within the constraints of three elements of a triad that include structure, regulation and competition, and business model, and describes two forces that have played a role in the triad. Structure refers to which parts of the industry a firm owns. Regulation and competition refers to how the industry is regulated, and business model deals with the business practices that meet regulatory requirements while maximizing profits. The two forces include vertical integration, which is "the savings that occur when a single utility owns all stages of the electric production and delivery process," and the benefits of competition within the electric utility industry.

The vertically integrated regulated utility owns the generation, transmission, and distribution and is regulated by the government. The idea behind vertical integration is that by interconnecting all power sources, costs are minimized and value is maximized because it is cheaper to serve the needs of a large group than to serve customers individually. Reference [1] believes vertically integrated regulated utilities will transition into "energy service utilities" Energy service utilities will keep their vertically integrated

regulated structure, while incorporating dynamic pricing and distributed generation resources, and smart-grid technologies.

The other scenario [1] describes is that the benefits of vertical integration become weaker and competition increases as a result of increasing implementation of smart-grid technologies. In this scenario, the utilities will stay out of the business of generating power and limit themselves to running a smart transmission and/or distribution system that integrates, sets prices for, and balances all types of generation, storage, and demand-response. These utilities are called "Smart Integrators[1]."

VI. Smart Grid and Sensors

Another critical component of the smart grid is the use of sensors that provide reliable communication of information within the grid. Wireless sensor networks (WSNs) are being introduced into the smart grid that will enhance the operation of all three sub-systems; generation, transmission, and distribution. The use of online sensing technologies provides the ability to monitor, diagnose, and protect the power system, which in turn reduces the impact of failures that result from natural disasters, equipment failure, etc. These sensors are the basis for maintaining safe, reliable, and efficient electrical service for consumers and businesses via the smart grid. Online sensing technologies will replace the wired communications systems that have been used in the existing grid for electrical system monitoring and diagnostics. These systems are expensive to install and maintain as they require extensive cabling infrastructure, so their implementation has been limited in the existing grid. In the existing grid, remote system monitoring and diagnostics are largely non-existent because of their high costs. Reference [15] states that at present, utilities have no monitoring whatsoever of most of their critical system equipment such as motors that are less than 200 hp[1]. But the costs of widespread power outages to consumers and businesses are too high for this situation to continue. In order to maintain safe and reliable service, utilities must improve on their ability to monitor their critical equipment and do a better job of coordinating protection devices. WSNs offer a low-cost solution and can provide monitoring of all system components, identifying faults and isolating them before they spread and cause widespread power system failures. Because of their low-cost, wireless sensors are the preferred tools for providing quicker reaction to changing conditions within a smart grid. . Reference [15] posits that the advantages of WSNs in the smart grid over traditional wired communication networks include rapid deployment, low cost, flexibility, and aggregated intelligence via parallel processing. Another application of WSNs are wireless automatic meter reading (WAMR). WAMR allows utilities to reduce costs by eliminating the need for human meter readers, and by deploying WSNs that provide two-way communication between utilities and consumers, utilities can offer the dynamic, time-based pricing schemes discussed earlier.

WSNs will only be successful if they are able to provide reliable and efficient communication, and there are challenges that have to be addressed. Interference exists within electrical environments that pose a threat to the ability of wireless sensors to operate effectively and reliably. Quality of service is also a concern given the many different applications that WSNs are expected to provide. Each application will have different QoS requirements, and because the bandwidth and latency of each wireless link will differ depending on conditions specific to its location, QoS requirements will be difficult to meet. Error rates are another issue in wireless communications. Link asymmetry, when one node can communicate to another, but not vice versa[], is also a problem with WSNs, especially at long distances or low power transmissions. A link quality metric is needed in order to predict the quality of wireless links under different conditions and maintain safety and reliability. But because of the harsh environments within electrical systems, link quality is constantly changing, making it difficult to determine the value of link quality at any given time. Reference [19] suggests two areas of research to consider when designing wireless networks for electrical systems which include wireless channel modeling and link quality characterization. Channel modeling allows designers to predict the performance of the communication network for a specific propagation environment, channel modulation, and frequency band.

Growing concern about global climate change and rising energy prices is producing much research and discussion about green networks and sustainability. The U.S. Environmental Protection Agency describes sustainability as being based on a single principle, "Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations[16]. The use of WSNs in the smart grid will add to the already large amount of traffic that exists in the Information and Communications Technology infrastructure, and will require an approach that maximizes energy efficiency within the wireless sensor networks in order to maintain a sustainable communications network within the smart grid. The amount of greenhouse gases caused by ICT is estimated to be 2% of the global greenhouse gas emissions and will continue to increase as more wireless technologies are added [17].

In order to minimize the carbon footprint associated with WSNs used in the smart grid, energy-efficiency measures must be taken at all layers of the ICT protocol stack, while maintaining acceptable error rates and Quality of Service. Assuming the WSNs will operate as WANs similar to the existing cellular telephone networks, there are several proposals for reducing energy consumption in mobile networks. One technique for reducing energy consumption in mobile networks is aimed at mobile base stations, which at present are very inefficient in their use of energy, since even when there is little or no traffic they still continue to consume 90% of their peak energy.17 Coordinated multipoint communication (CoMP) is a technique that allows dynamic coordination of base stations so that redundant base stations can be turned off when there is little or no traffic. CoMP extends the service area of BS while maintaining QoS levels and data rates[18].

Cell shaping is another technique that can increase efficiency in mobile wireless networks. Two cell shaping schemes are the basic switching off and cell breathing schemes. Figure (7) illustrates the use of cell shaping, which is a way of adapting the shape of a particular cell to traffic distribution so that the maximum number of BS are turned off without affecting network performance [17].

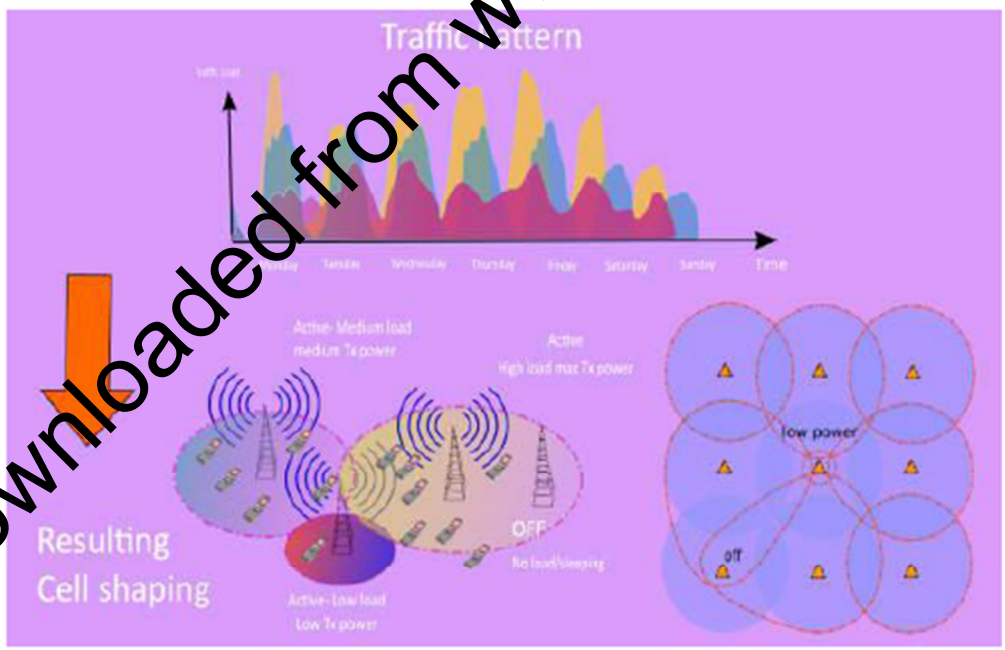

Figure 7. Cell shaping technique for traffic distribution

WSNs may also operate as WLANs. The main energy consumers in wireless LANs are the access points (APs), therefore the focus for reducing energy consumption is on increasing AP efficiency by reducing the number of idle APs in the network and providing network resources on-demand so that APs, network

switches, and controllers can be turned off when they aren't needed [19]. In [15], the SEAR (Survey, Evaluate, Adapt, Repeat) strategy is proposed as a resource on demand strategy for high density WLANs. This approach offers most efficiency gains in highly redundant, centralized WLANs with overlapping APs, but only provide modest, if any, advantages in single layer wireless networks. SEAR operates from a centralized WLANs central controller, and is policy based, allowing administrators to set policies that maximize efficiency while maintaining specific network performance requirements.

VII. Conclusion

The issues and challenges surrounding the implementation of a smart-grid are many, although advancements are rapidly being made. There are technology issues regarding interoperability between various parts of the grid and the devices connected to it as well as competing standards and protocols. There are privacy concerns regarding the use of smart-meters that gather large amounts of information about individual households and businesses. The utility industry's business model must change its focus from encouraging mass consumption to energy efficiency. Regulatory policies will have to be put in places that ensure privacy and fair access. But one thing is certain; the smart-grid is a necessity in the face of shrinking supplies of fossil fuels and increased climate change. The smart-grid benefits will far outweigh its costs. Work must continue and collaboration between utilities, policy makers, and the IT community will be needed.

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Real Face of Android Permission Modal

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Abstract---Android Operating System works on a permission based model. This permission based model is used to protect user's data and system resources. Every Android app we install request certain permission from the user. Without the user acceptance of the permission, the app cannot be installed in our device. Asking permission from the user is meant to prevent spreading of the malicious apps among the Android devices. But there are some hidden meanings of the permissions which need to be understood before they are granted to the app.

In this paper, we help the Android user to better understand the Android App Permission model and their hidden meaning, so that the user's can protect their devices from unwanted attacks from the cybercriminal activities. It is useful to understand what each Android app permission mean and what all information the app would be using before granting permission to the app's to access your device.

Index Terms---Android permission, Mobile application, Understanding permission, smartphone privacy.

I. Introduction

The growing sales of Android-based Smartphone's has made Android platform as the dominant mobile Operating System. The reason for the increasing popularity of Android operating system is that everyone looks for a smartphone that has got technologically advanced capabilities than just basic communication and messaging features. Everyone's want to have today more than just a basic phone used for messaging and calling, they want to do as many things as possible with their phones.

The most interesting feature offered by the Android OS to the developers is the ability to build their own apps which are rich and innovative. The freedom provided to the user to personalize their smartphone devices according to their needs, is an attractive feature offered by the Android OS. It helps user to personalize their smartphones and make them as unique as possible by downloading a variety of apps available on the Google Play Store.

This consumer-market allows developers to easily create applications and users to easily install them. The apps available on Google Play are both free and paid. Most of the free apps are downloaded from the Google Play. These free apps are the most dangerous thing to be afraid of. As there could be a motive of the developer of posting the app free of cost on the Play Store.

This consumer-market allows developers to easily create applications and users to easily install them. The apps available on Google Play are both free and paid. Most of the free apps are downloaded from the Google Play. These free apps are the most dangerous thing to be afraid of. As there could be a motive of the developer of posting the app free of cost on the Play Store.

Every app available on the Google Play requires some permission before they can be installed on our devices. The Android security system allows the user to see what all permissions are required by the app but doesn't provide choice to the user to select some of the permissions and granting permission to them and rejecting rest of the permissions. The Android security system doesn't provide access to modify the permissions according to the user of the app. The user has no other option but to permit all the permissions of the apps, if he wants that app to be installed to his system. These permissions are certain set of resources which is required by the developer to access user information. This user information resource could be anything like device IMEI number, user's location, user's contact details, user's messages etc. The user of

the app is not even aware of the fact that his personal information is being accessed by someone else [4]. Lack of information about the Android permissions let the user to put their secure information on stake.

An uneducated user is not able to understand the permissions being asked by the developer through the app and therefore just simply grants the permissions tasked by the developer through the app. Sometimes even an educated person could not make out what harm or what all consequences could be by granting permissions to the developers through the app. The consequences and the hidden meaning of the permissions asked by the developers needs to be understand before granting them.

II. Google Policies

Google defines several developer program policies to maintain a positive experience for everyone using Google play [3]. These policies are defined to maintain a strict restriction on to the content displayed by the apps and the information accessed by the applications. The policies defined by the Google are like rules for the developers which they ought to follow in all the circumstances. Following are some of the policies listed by the Google.

A. Deceptive Behaviour

Content, title, icon, description, or screenshots of any product must not contain false or misleading information. The product or the apps available on Google play should not explicit deceptive behaviour and all the content and information it contains should be true.

B. Personal & Confidential Information

Unauthorized publishing or disclosure of private and confidential information of peoples is not permitted. Google doesn't allow the developers to share the private and confidential data of the users with someone else.

C. Dangerous Products

Content that harm, interferes with the operations of, or accesses in an unauthorized manner are not allowed.

Example like

- Transmission of viruses, Trojan horse, worms, defects, malware that may be vulnerable for the security or harm user device, app, or personal data.
- Apps collecting user's information without their knowledge are prohibited.
- Apps with malicious scripts that capture the password entered are prohibited.
- Apps that lead users to download or install apps from developers which are not registered with Google play are not allowed.
- A Google Play app must only use Google Play update mechanism to modify, replace, or update its own APK binary code. Any other method other than this is not allowed.

D. System Interference

- Home screen shortcut, browser bookmarks, or icons of apps and their ads could not be added on the user's device as a service to third parties of for advertising purposes.
- Sending of email, SMS, or other messages on the behalf of the user without providing the user with the ability to confirm the content and intended recipient.

Besides all these and many of the other policies defined by the Google, hardly few of them are followed properly. Google policies are not being followed by the developers accordingly as they are mentioned. Not following the Google policies by the developers is a crime done by them. Abandoning the policies by the developers indicates vulnerability to the user's private data and it could lead in security breaching by the developer of the app. It indicates about the cybercriminal activities and unwanted attacks which could be done to the user's device.

III. How Android Permission Works

Android app permissions are certain set of resources which are required by the developer to access user's information. Only limited system resources could be accessed by the app. If the app wants to access sensitive API's, the apps needs to declare it in the AndroidManifest.XML file [9]. Sensitive API's include location data, camera function, Bluetooth, phone call, SMS/MMS and network communication. Android Manifest file is an XML file which is stored in every app's root directory. All the permissions required for an Android app need to describe in the Manifest file of the app. whenever a user tries to install an app the App Installer of the Android operation system shows all the permissions declared in the manifest file to user to either accept or reject them. This is shown in fig 1.

The permissions accepted by the user are applied to the app as long as it is installed in the device and the system would not show any notification when sensitive API's are being accessed by the app. If an app attempts to access a protected resource which is not mentioned in the manifest file then system will raise a security exception and would terminate the app to avoid the app from accessing the private data.

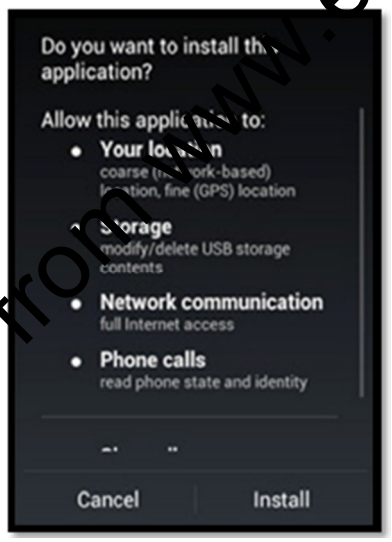

Figure 1: The screenshot of permissions asked by the app

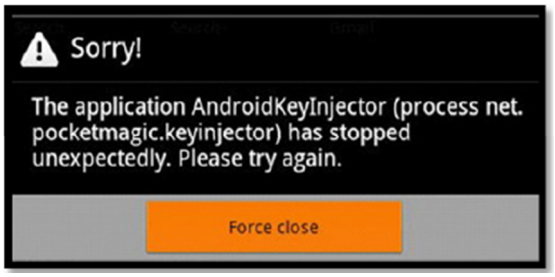

Fig 2: Security exception thrown by the system.

The chances of bypassing the permissions is less but if the permission is defined in the manifest file then the developer can easily befool the system and can access the private data of the user [14]. An example of this could be misusing the browser to upload information. A developer could develop an app to upload stolen data to the desired server by using intent to open a browser. An app can launch any app's content using intent. Figure 3 shows intent having function Intent_ACTION_VIEW that shows that the app wants to view the Google webpage. The Android OS will launch the browser and the malicious app would upload the Device ID to server http://example.com. This example shows how a developer could misuse the permissions mentioned in the manifest file and could do malicious activities without even being noticed by the user or the system.

```
Intent intent = new Intent(Intent.ACTION_VIEW,
Uri.parse("http://example.com/?device_id=xxx");
startActivity(intent);
```

Figure 3: Example of misusing app through intent

IV. Harmfull Permissions

Certain permissions are asked by the developer through app before they are installed in order to work properly in user's device after installation. The apps are dependent upon the permission users grant them, to do what they are supposed to do. Many apps request for network access so that they can download updates. Some apps ask permission to read user's phone state and identity; so calls don't disturb the apps from doing what they are doing [10]. Trojanized apps can alter the permissions to perform malicious actions like record user conversations and send device information like International Mobile Equipment Identity (IMEI) number to a command center.

In 2010, first Android Trojan app was found which sent text messages to certain numbers. Most of the Android apps after that perform one or combination of malicious activities like stealing data i.e. data stealers, allowing remote access i.e. backdoor apps, accessing fraudulent sites i.e. click-fraud enablers, listening to calls and reading personal text messages and contact information i.e. mobile spies, downloading other malwares i.e. downloaders, and gaining root or administrative privileges i.e. rooting enablers [11].

The trojanized apps seek acceptance of the permissions from the user. Once the permissions are granted the Trojan app starts doing attacks. The user not being aware of the outcome; accepts the permissions of the malware app. But there is a lot of difference in what the permissions ask for and what activities do they perform in real [10]. The following list provides information about the permissions asked by the trojanized app. The following list of permissions also tells what all the permissions ought to do and what are they doing in real.

A. Network Communication

Accepting network communication permission means "it allows an application to create network sockets". In real, Network communication is enabled in order to allow apps to access the Internet or Bluetooth-enabled devices. This is the Android permission which is mostly abused because Internet access is required by the malicious app in order to communicate with their command centers or to download updates. Mobile spies and data stealers look for this permission to be granted so that they can steal the information to send it to remote users. Mobile spies send the information about the user to command centers or remote users over internet. Leaving the device Bluetooth discoverable may allow Android malware to infect it like old Symbian OS malware.

B. Storage

The Storage permission 'allows an application to write to the SD card'. Granting an app to modify or delete your Storage Device (SD) card's secure data allows it to read, write and delete anything from the card. In real we are providing authorization to the developers to do anything with our data. The data stealers create a copy of the stolen data from the SD card and send it to the command center. All our private information, photos, audios, videos etc are now accessible to some third person without even our knowledge. What a layman understands by this permission is that the developer would just simply make a folder for his app in the SD card to store data related to his app but there are much more things in real that he do to the card other than this. The malicious app can easily overwrite the existing data on our SD card by this permission.

C. Phone Calls

Phone calls permission 'allows the app to access the phone features of the device. An app with this permission can determine the phone number of this phone, whether a call is active, and the number that call is connected to etc.' Data stealers steal the call log through this app and save them in .TXT file and send it to the command center. The .TXT file is sent over the internet. Phone calls are the favourite target of the data stealers because they provide lots of information. Malicious apps can record your conversation and text messages through this permission. Those users who conduct online banking transactions through their device are at greater risk, as credentials given over device or through messages may land in waiting hands of cybercriminals and then the credentials could be used by the cybercriminals.

D. Hardware Controls

Hardware controls permission 'allows the app to take pictures and videos, record audios, change your audio settings'. Through this permission the developers can take pictures and videos anytime and can send them to the command center or to some third party once your device is connected to the internet. The app could modify the audio setting and could record audio without even user's knowledge. The pictures and audios taken by this app could be used sell to third parties who are ready to buy data related to the user.

E. Messages

The messages permission 'allows reading instant messages, writing instant messages, receiving SMS or MMS, and editing SMS or MMS'. Through this permission the developer could easily sneak into the user device and see all the private and professional messages of the user. Reading someone's messages could give a lot of information about the person. This attack is similar to man in middle attack where the developer can easily read the messages sent and received by the user and can even edit the message. The instant messages sent by the developer without user intervention could cost the user from his balance.

F. System Tools

The System tools 'allows the app change network connectivity, change WLAN state, prevent phone from sleeping, reorder running applications, mount and unmount file Systems for removable storage. It also retrieves information about currently running app'. By abusing this permission, the malware infect the device like, automatically start at boot, Change Wi-Fi state, change network connectivity, and prevent from sleeping, which allows malicious app to run their malicious services. Example a game app doesn't need to start every time our phone boots up so it doesn't need permission to do so. This is a very strong indication that the app silently runs malicious service in the background every time the phone boots up.

G. Personal Information

The Personal Information 'allows the app to read all of the URL's and bookmarks of the browser and can even modify browser history or bookmarks'. Through this permission the cybercriminals can learn about

the browsing pattern of the device user. This mined data could be sold by the data stealers to the cyber criminals and third parties to post ad according and earn profit.

H. Services That Cost Money

Service 'allow app to call phone without user intervention'. The first Android Trojan abused this permission by sending text messages, phone calls and storage permissions. Granting this permission allows sending text messages to premium numbers costing the user a lot of money for the premium services which he don't even used. Through this abused permission, the cybercriminals can pay for certain premium numbers in order to turn profit from every text messages it sends from the infected device.

I. Location

Location 'allows seeing user's current location'. The data stealers sought permission to see where the user is geographically present or located. Information like this can be used to do crimes like stalking. This may be useful when dishing out region-specific spam or malware.

Most of the Android malware sought at least three permissions that are quite unusual for their intended use. These are:

- Full access to internet i.e. Network communication.
- Authority to send text messages i.e. Services that cost money.
- Access to online accounts.

When installing app this is a good indicator of legitimacy. Before giving a green signal to the permissions of the app and granting them, all the users should think carefully.

V. Preventions to be Taken

Android gives us freedom to install any app that we want but the responsibility of keeping the device safe from malware attacks lies in our own hand. Certain measures should be taken to prevent the device from the malicious app [13]. These are:

- All the information of an app should be read before downloading and installing it. The information should be gathered about the creator of the app and reading what other users have to say about this app. Reading the reviews about the help us know the pros and cons of the app. App's store rating should also be checked. Lot of trojanized app lure users to download them but the users should remain alert. Example Fig 4 and Fig 5 show real Angry Bird app and malicious Angry Bird app on Android Market respectively [1].
- Use of mobile security software that protects not only the user's device but also his data should be encouraged. The software's can identify and stop the malwares even before they reach user's device.

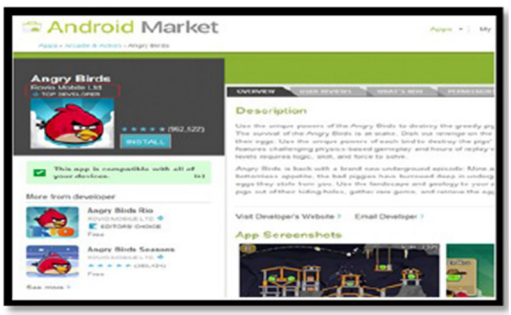

Figure 4: The real Android Market page for Angry Bird app

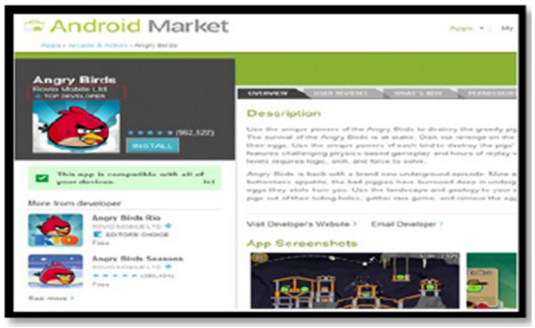

Figure 5: The malicious Angry Bird app in the Android Market

- The permission an app seeks should be carefully read and understand. Trojanized app happens to seek more permissions than they actually need in order to do work. Asking for too many permission by a legitimate app can put user's device and data in great danger. Example if an app of media player seeks permission to send text messages then it's an indicator that this app might be a malware. The user needs to think before accepting its terms of agreement.

VI. Conclusion

Android market consists of billions of apps. These apps seek certain permissions for the user to grant them before they can be installed on the user's device. This permission granting system in Android is known as Android Permission model. There are various malicious apps present in the Android market who take advantage of the permission modal and the permissions granted by the user. There are certain illegal activities which the malicious apps perform with the help of permission system. The activities which these permissions can lead to are unknown to the common people. The permission can help the trojanized apps to access and steal the private data of the user without the knowledge of the user. The trojanized apps share this users private data with their command centers and other third parties.

This paper deals with Android permission system and the illegal activities performed by these permissions. This paper shows how each and every permission of the Android permission system which seems to be so right, provide a gate to the data stealers to access and steal user's data. Certain preventions must be taken before granting permissions to the malicious apps. An app seeking too many permission than it actually require to do its work can put the user's device in great danger.

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Image Steganography Practices Classification by Object Oriented Approach: A Review

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Abstract - This paper focuses on reviewing the various Steganography techniques that have been reported by researchers and scientists in the literature. The motivation of this paper is to overview the past and current Steganography techniques to embed the Stego image which bypass the human visual system without being detected. The techniques which operate both on text and image are considered. The focus is also given for the use and future scope of these techniques ..The techniques are reviewed on the parameters of security, peak signal to noise ratio of stego image, mean square error and the capacity of data that can be carried out on the network without being detected. The paper is divided in three major sections which are the implementation in spatial domain, frequency domain, adaptive or mixed technique.

keywords- Stego object, MSE , payload capacity ,Image error Management, PSNR.

I .Introduction

With the advancement of internet and extensive use of online communication, the need of security and confidentiality is increased. This led to the requirement of secure communication techniques that are easy to use but is difficult to breach. Cryptography is one of the most widely used technique to solve this problem of secure communication. The problem with cryptography is that the message is sent in encrypted form possibly gather the attention of hackers. For this the solution is Steganography. It is being interpreted as the study and implementation of invisible communication, It differs from cryptography in the way that the aim is to protect the information on communication channel from eavesdropper .It focuses on hiding the presence of message from the observer[1]. Steganography is not the replacement of the cryptography rather it is the technique which increases the power of cryptography. Steganography has been evolved from ancient time when Greeks used to hide the message of high importance on the scalp of the secret message carrier. The concept of Steganography system can be explained as let data embedding method is “M” which is used to hide the message “MSG” in the cover image “IMG”.The new message formed is the combination of “MSG+IMG” and this is extracted on the receivers end without any change in the integrity of the message. A good steganographic algorithm is that which produce minimum entropy change e[2] .With the advancement of the digital world this technique is used to solve the famous “prisoners problem” given by simmons [20,1]. In this problem two prisoners have to communicate securely, so that the warden is unaware about the message passed between them. so they agreed on a technique which uses cover text to hide the message. The introduction of digital images in various formats the Steganography system uses images as the cover objects. The power of images is exploited in the Steganography technique. This paper describes the techniques related to images on an object oriented approach. Here the object is considered as the region, dimension and quality of image which is exploited to hide the message (MSG) securely.

Rest of the paper is organized as: - Section II discusses related work, Section III sets out the comparison of steganography techniques on the basis of security, payload and PSNR .The comparative analysis is concluded in secion IV.

II . Related Work

A. Steganography in Spatial Domain

This category broadly defines the data encapsulation applied on pixel value of image. This method uses payload which can be carried out is the least significant bit (LSB) plane of the image. In the 8 bits across the

plane of an 8*8 image the LSB is exploited for inserting the data .The concept used is explained by following equation:

$$X_n' = X_n - X_n \bmod 2^k + M_i \quad \text{.....(1)}$$

In the above equation X_n' is representing the nth value of the embedded image , X_n stands for the original image used for embedding the text and k stands for the number of bits used to hide the data, Where M_i is the nth place value of the embedded data in the image. After embedding the data it can be easily extracted by the mathematical formulation which is given as:

$$X_i' = X_i - \bmod 2^k \quad \text{.....(2)}$$

This is done in such a way that the above process of embedding does not affect the image pixel value. If it destroys the original features of the image it can be easily detected.

Hideki Noda [4] presented a method which uses a lossy compression image method to exploit the cover image characteristics. In this method the image is divided in a block of size $N \times N$. Here the complexity is set to $0.3A_{max.}$ The object used in this technique is the JPEG2000. The object is used to hide the data in the LSB [2, 18] plane. By this method the payload capacity achieved is 25% of the size of fresh image. The PSNR obtained is 48db.

K.B Raja [5] given a model for Steganography which operates only on raw formats of images. Two dimensional DCT is used in this technique. The LSB of the fresh image is considered for embedding the image. The stego [5] object is created by compressing the image using quantization and length of the fresh image. The object is considered to be the bits of less importance in the fresh image, which is not needed for the description of image after the extraction of image. In this method last two digits were replaced with the first two most significant bits of the hidden images. The author succeed to obtain a low MSE which result to satisfactory PSNR.

Rig Das [6] presented a Steganography technique in which main focus is done on Huffman encoding. In this technique the gray level value of the both image object is stored and calculation of the size of the secret data image is done. It consider size of image is N bit then the image is multiplied with N. After multiplying the size of image should be smaller in size of the cover object image ,then only be the embedding is possible. It is not possible to hide a larger image in smaller but vice versa is only possible. The next step comprise of obtaining the Huffman coding of the secret image to embed it in LSB of the fresh image .This technique is complex then the previous techniques . In this technique the author claims full recovery of the secret image which shows that the high PSNR [4] and low MSE [4] as both are inversely proportional to each other. The formula given by the author used for calculation is:

$$PSNR = 10 \times \log(255^2/MSE) \quad \text{.....(3)}$$

In which, $$MSE = \sum_{x=0}^{n-1} \sum_{y=0}^{n-1} (f(x,y)-g(x,y))^2/N^2 \quad \text{.....(4)}$$

The unit of PSNR is db and it indicates the quality of the image obtained, smaller the MSE means minimum error and higher the PSNR means better image quality of the recovered image. In this paper it is clearly stated that for successful embedding PSNR should be greater than 57db. The images are almost identical which are founded in the result. In this technique the use of Huffman coding results in to satisfactory results. This makes the image more secure and prevent it from destroying by hacker. The object used to hide the data is the result of Huffman coding [6].

Monoj Kumar Ramaiya [7] proposed a improved technique based on the mapping through the use of S- box tool and DES. In this paper a combination of nPr and substitution is used to obtain the stego image. The XOR operation is used to find the final stego image. The encoding algorithm separates 8×8 image in to 4

parts there for embedding these pixel in LSB of the fresh image. The last two LSB bits are used to embed and s-box integration makes it more effective .The capacity of data to be embedded is restricted to 25% of the original image. In this technique the gray value of less important pixel is changed which are needed for the security of the image. All the operation were performed on 64×64 images. The difference between the pixel values is calculated to be 0-3. The base for this technique is data encryption standards and the object used in the technique is the last two LSB of the fresh image which results to more promising results.

B. Steganography in Frequency Domain

Frequency domain methods comprise of the techniques which first convert the image into the frequency domain and then the embedding of data takes place. The data in this technique is less in payload but is more secure and robust than the spatial domain techniques. There is no such standard procedure to determine the amount of data which can be embedded in the frequency sub bands.

Nedal M.S. Kafri and Hani Y.Suleiman[8] proposed an algorithm to embed the image with more security and to make stego image more robust to attacks. The main focus is done on finding the method to bypass the steganalysis process (detection of presence of secret data in cover image)[11]. This is achieved by transforming the image in frequency domain. The data embedded in the non-zero coefficient obtained by the Discrete cosine transform. Inverse discrete cosine transform is applied to obtain the required stego image [8]. The output of the above process results in the bmp image [8]. In this technique the 4^{th} bit is exploited of the discrete cosine transform. The author show better result than the spatial domain techniques which comes to the average value of PSNR as 47.58db. The object taken for embedding the secret data is the discrete cosine transform coefficient which give more refined results.

Sachin.A.Thanekar[9] defined a new technique in frequency domain named OCTA PVD. This technique used the concept of generating the pixel pair of 3×3 rather than 2×2 image blocks for embedding the secret data. In this method the algorithm states that the 3×3 pair of pixel value differencing is used. The embedding algorithm is then implemented in the plane. The extraction process at the receiver end divides the image in the 3×3 pixel block to locate the range of extraction. This is being done by making the histogram of the concerned images. The author reached the PSNR of 37.90 [9].

Amrita Khamrui and J K Mandal [17] introduced a genetic algorithm using the discrete cosine transform. DCT is used to obtain the frequency bands and two bits of the image are embed in sub bands leaving the first bit. To create the population of bits initial sub mask of the image is taken. To increase the security the new generation of bits followed by crossover is done. The object taken for embedding is the crossover bits of the image mask. This technique gives PSNR of 44.92db but works only for gray scale images.

Po-Yueh Chen and Hung-Ju Lin[18] proposed a method where high frequency bands of image are obtained by discrete wavelet transform. These high bands are considered for embedding the secret data. Low frequency bands are preserved so that the maintain the integrity and quality of image. The object taken to embed the image is is the high frequency bands of the fresh image. The algorithm is designed for variable payload and image quality. The PSNR obtained is 54.94db which falls under the satisfactory range. However the algorithm is not compatible with JPEG format.

C. Adaptive Steganography Techniques

These techniques are the implementation of the combined features of spatial domain methods and frequency domain methods . These are called adaptive because these techniques target particular part in an image by making statistical calculation on the image before transforming the image in DCT plane.

Anjali,A.shejul [10] proposed an adaptive Steganography technique by using feature of (Hue, saturation, value) color space only for embedding the secret data in images. Followed by performing DWT to transform the image in to four sub bands. Only the high frequency bands are selected to embed the secret data as they are less prone to the histogram attacks. The author measures the efficiency of the algorithm on

the basis of invisibility by human visual system and capacity of the data which the cover object can carry. The author experimented two states of image firstly by embedding the data in fresh image and secondly by embedding the data in cropped part of image. The resulting payload of both the operation is satisfactory but the fresh image contains 15% payload as stated by the author. The object used by the author to hide the MSG is the YCbCr plane [10] which is found to be the more promising towards the protection of histogram attacks.

Abbas cheddad [11] came up with a new approach in which the use of biometrics is done . The algorithm used to identify the skin of human and by forming the subset of skin region the data embedding is applied. The author used a skin probability map (SPM) [11] which makes the clusters around the upper and lower boundaries of the skin. Then the DWT of the clustered image is created. As the human face image is an ellipse it has two dimensions they are used to determine the region. The data is then embedded in the upper and lower region of image graph which is extracted by applying inverse of it. The technique although provide less space for the embedding but on the cost of more security towards the blind histographic attacks[9]. The object used in the technique is the human skin on gray images only .

An adaptive technique is given by Nidhi Grover [12] in this technique the edge detection came into picture. The LSB [2] is used with combination of edge detection of the images resulting in to adaptive scheme of Steganography. The algorithm is divided into two modules .The first module is for embedding the information .which deals with detecting the edges of the grayscale image and then by converting the secret text in 0, 1 form is embedded to form stego image. The binary values are saved in two groups one with edge detection and other one without edge detection. The stego image is then saved in .png format and the reverse process is done for the extraction of image at the receiver's end. The result of this approach is satisfactory value of PSNR i.e. 49.74db.The object selected for hiding the secret message is obtained by edge detection of the fresh image.

Lifang Yu and Yao Zhao[13] proposed an adaptive algorithm for JPEG image. The algorithm implements the adaptive data hiding by preserving the first order values of the image. The data bits are randomly mixed and are selected by a genetic algorithm. The mixing of bits to overcome the problem of dissymmetry is applied in this method. To minimize the modification less modification rules are used. The ranking of the bits obtained by crossover is done and the high ranking bits are taken for embedding. The PSNR obtained is 44.32db. Object considered for embedding the data is the high ranking bits of the image.

III . Comparative Analysis

A number of parameters could be defined for comparing the performance of various steganography techniques. In this paper we have identified parameters like Security, maximum payload and PSNR. Security is defined as the robustness of the algorithm towards the steganoanalysis techniques. Maximum payload gives the amount of data that can be embedded without destroying the essential properties of image. PSNR value measures the quality of the image after restoration, higher the PSNR value better will be the quality of stego image.

Technique Used	Security	Maximum Payload	PSNR value
Spatial Domain Technique	Low	25% of the fresh Image	57db
Frequency Domain Techniques	Medium	15% of the fresh image	54.94db
Adaptive Domain Techniques	High	12.5% of the fresh image	49.74db

Table 1: Comparision of Steganography Techniques

The levels at which the algorithm satisfy security of application is taken as low, medium and high .The low levels indicates weakness in terms of providing security and hence are susceptible to attacks. Medium level defines that the security result depend on outside influence i.e High level states that the technique completely fulfill the security requirements. Thus it is considered robust in terms of security. Payload is expressed in terms of percentage of data of the fresh image used forn for embedding. The PSNR value is used to state the quality of stego image. Higher the PSNR better will be the quality of stego image. From the above table it is clear that there is been tradeoff between security,payload and PSNR value of the image. Spatial domain techniques are suitable for high payload and low security requirement application .While Adaptive domain techniques should be used in high security and comparatively low payload conditions. The frequency domain techniques are suitable for medium security and payload applications.

IV Conclusion

In this paper the evolution of major techniques of image Steganography being reviewed on the basis of the security, payload carried by the image and quality of the image in terms of PSNR. An object oriented scheme is used to deduce the embedding region of each technique. The discussed techniques have various tradeoffs as the techniques in spatial domain are more prone to attacks as compared to adaptive domain techniques. while the techniques of frequency domain are not prone attack only in the condition when the amount of data to be embed is small in size. Embedding secret data using DWT produce more uniform results. The adaptive method of Steganography is complex but produce more promising results and robust to the various types of statistical and histogram attacks. Even though there are various techniques but there is scope of research of Steganography techniques on various image formats .

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A Study on Customer Relationship Management in Banks

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Abstract: As economic globalization increases the competition and creates a climate of constant change, winning and keeping customers has never been more important. Nowadays, Banks have realized that customer relationships are a very important factor for their success. Customer relationship management (CRM) is a strategy that can help them to build long-lasting relationships with their customers and increase their revenues and profits. CRM in the banking sector is of greater importance.Traditionally, few people changed their banks unless serious problems occurred during the past days Consumers largely selected their banks based on how convenient the location of bank's branches was to their homes or offices. With the advent of new technologies in the business of bank, such as Internet Banking and ATMs, now customers can freely chose any bank for their transactions. Thus, the customer base of banks has increased, and so has the choices of customers for selecting the banks. Organization of financial institutions were focus on customer centric rather than product centric assumption and reflected in their marketing policies. Marketing operations consist of two activities: acquisition and retention of customers. In the world of mass and target marketing, the focus was on the acquisition side. On the other hand, in the world of relationship marketing, attention shifted to retention. This happened mainly because of the cost involved. In general, it is believed that it is five to 10 times more expensive to acquire a new customer than obtain repeat business from an existing customer. As the needs of customers became diversified, conventional promotions became less efficient and drove up costs. The pressures of competitive and dynamic markets have contributed to the growth of CRM in the Financial Services Sector.

Key words: CRM, Bank, Customer

Introduction

Customer relationship management (CRM) is a management strategy that unites information technology with marketing. It originated in the United States in the late 1990's, and, to date, has been accepted in a significant number of companies worldwide. CRM stands for Customer Relationship Management. It is a process or methodology used to learn more about customers' needs and behaviors in order to develop stronger relationships with them. There are many technological components to CRM, but thinking about CRM in primarily technological terms is a mistake. The more useful way to think about CRM is as a process that will help bring together lots of pieces of information about customers, sales, marketing effectiveness, responsiveness and market trends. CRM helps businesses use technology and human resources to gain insight into the behavior of customers and the value of those customers. We can view CRM as an integrated system of web enabled software tools and databases accomplishing a variety of customer-focused business processes that support the three phases of the relationship between a business and its customer**.** Customer relationship management (CRM) is a business strategy to acquire and manage the most valuable customer relationships. CRM requires a customer-centric business philosophy and culture to support effective marketing, sales and service processes. CRM applications can enable effective customer relationship management, provided that an enterprise has the right leadership, strategy and culture**.**

Definition

"Customer relationship management (CRM) is a business strategy to acquire and manage the most valuable customer relationships. CRM requires a customer-centric business philosophy and culture to support effective marketing, sales and service processes. CRM applications can enable effective customer relationship management, provided that an enterprise has the right leadership, strategy and culture."

Review of Literature

In a recent review of CRM, Boulding et al. (2005) argue that the field of CRM has now begun to converge on a common definition: "Specifically, CRM relates to strategy, managing thedual-creation of value, the intelligent use of data and technology, the acquisition of customer knowledge and the diffusion of this knowledge to the appropriate stakeholders, the development of appropriate (long-term) relationships with specific customers and/or customer groups, and the integration of processes across the many areas of the firm and across the network of firms that collaborate to generate customer value"

Objectives of the Study

- To study about CRM in banking sector
- To explore significance of CRM

Concept of CRM

Customer Relationship Management is the establishment, development, maintenance and optimization of long-term mutually valuable relationships between consumers and the organizations. Successful customer relationship management focuses on understanding the needs and desires of the customers and is achieved by placing these needs at the heart of the business by integrating them with the organization's strategy, people, technology and business processes.

At the heart of a perfect CRM strategy is the creation of mutual value for all the parties involved in the business process. It is about creating a sustainable competitive advantage by being the best at understanding, communicating, and delivering, and developing existing customer relationships in addition to creating and keeping new customers. So the concept of product life cycle is giving way to the concept of customer life cycle focusing on the development of products and services that anticipate the future need of the existing customers and creating additional services that extend existing customer relationships beyond transactions.

CRM is a customer-focused business processes that support the three phases of the relationship between a business and its customer**.**

Acquire

New customers by doing superior job of contact management, sales prospecting, selling, direct marketing and fulfilment.

Enhance

Relations by keeping customers happy by supporting superior service from a responsive networked team of sales and service specialists.

Retain

Its customers by rewarding loyal and profitable customers, expand their business and reward personalized business relationship

History of CRM

Beginning in the early 1980's, in the United States Customer Relationship Management (CRM) was called Contact Management. Information was collected from customers and companies. In the early 1990's call centers were generated and the customer service information analysis function was performed through data warehouse, data mining, and others technologies. Now, Web-enabled Call Centers are used to enlarge the market and determine customer initiated value-added services. Recently, CRM has become a popular issue and thus the enterprises focus their attention on the customers and the customers' consuming patterns. The customers' satisfaction after consumption also becomes more significant.

Significance of CRM in Business

- Helps identify their best customers
- It makes possible real time customization of products and services based on customer needs
- Helps in providing consistent customer experience and superior service

Benefits of CRM

Customer relationships are becoming even more important for banks as market conditions get harder. Competition is increasing, margins are eroding, customers are becoming more demanding and the life-cycles of products and services are shortening dramatically. All these forces make it necessary for banks to intensify the relationship with their customers and offer them the services they need via the channels they prefer. CRM helps banks to provide lot of benefits to their customers; some key benefits are as follow.

- Service provisioning throughout the entire life cycle of the corporate customer, from the initial stages to the establishment of a close, long-term relationship with profitable clients.
- Optimization of the use of bank resources, such as alternative channels of distribution.
- Significant reduction in and limitation of operational costs through system automation and standardization.
- Low maintenance and expansion costs owing to the use of modern administration tools which allow bank employees to make a wide range of modifications to the system.
- CRM permits businesses to leverage information from their databases to achieve customer retention and to cross-sell new products and services to existing customers.
- Companies that implement CRM make better relationships with their customers, achieve loyal customers and a substantial payback, increased revenue and reduced cost.
- CRM when successfully deployed can have a dramatic effect on bottom-line performance.

Result of CRM

- Higher revenues
- Lower costs
- Effective in targeting the right customer base
- Right services via the right channels
- Able to save money.

Conclusion

After above discussion it could be concluded that relationships with customers help a lot growing the revenues of the organization. Relationship marketing is all about creating, building and maintaining the relationships with the customers for the long-term profits.Transactional marketing is the one sale ahead strategy which doesn't mainly focuses on building the relations, but this approach of marketing is still applicable and many big organizations still use this approach of marketing more or less. While CRM is the comprehensive approach of creating and maintaining long term relationships. This one to-one marketing approach has impacted a lot on different aspects of the organization.

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Study of Mechanical Properties and Microstructure of Friction Stir Welded 5083 Aluminium Alloy

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Abstract: Friction stir welding (FSW) process is a solid state welding method developed by The Welding Institute (TWI) and now it is increasingly used in Aluminium welding. A study has been made of the FSW of 4mm thick Aluminium alloy 5083 plates. By considering the two different tool rotation speeds and by changing the transverse feeds, the mechanical properties vary. It is observed that higher mechanical properties are obtained at a rotation speed of 710 rpm and welding speed of 80mm/min. It is also observed that the fine microstructure obtained at the above mentioned condition. The mechanical properties were observed & correlated with the microstructure.

Keywords: Friction stir welding, tool, welding parameters, Mechanical Properties

I.Introduction

The 5083 aluminium alloy is exhibited good corrosion resistance to seawater, better mechanical properties. It has good formability, machinability and weldability. The 5083 aluminium alloy is used for providing of welded components for shipbuilding and railway vehicles. It has the highest strength of the non-heat treatable alloys. [1-2] It is not recommended for use in temperatures in excess of 650 c to a corrosive environment. [3] Many studies were made on the weld ability of 5083 aluminium alloy. [4-6]Aluminium alloys are friction-stir processed (FSP) then the properties of superplastic are obtained, as a consequence of grain refinement. [7] Friction stir processing (FSP) is used to transform a heterogeneous microstructure to a more homogeneous, refined microstructure before not reaching its melting temperature.

Table 1: Physical and Mechanical Properties of Aluminium 5083

Property	density	Tensile strength(*R*m/M Pa)	Yield stress(*R*p0.2/ M Pa)	T_{sol}/°c	T_{liq}/°c
AA5083	2.660	280	135	580	640

Property density Tensile strength(*R*m/M Pa) Yield stress(*R*p0.2/ M Pa) T sol/0c T liq/0c AA5083 2.660 280 135 580 640 In this study the investigation was done on weld ability of 5083 aluminum alloy using the technique of friction stir welding (FSW). The weld parameters like tool-rotation speed, the welding speed was considered in this study. The FSW is employed a tool-rotation speed from 710 r/min to 900 r/min.

II. Experimental Work

A. Dimensions and Composition of The Work Pieces

The standard EN-AW 5083 aluminium alloy with chemical composition in mass fractions: 4.34%Mg,0.51%Mn,0.14%Si,0.088%Cr,0.28%Fe,0.20%Zn,0.013%Ti and the remaining Al, and temper O, was

used for testing. The work piece sizes were 150mm×75mm×4mm. The physical and mechanical properties as per standards were taken.

B. FSW Tool

A high speed steel tool was taken to fabricate the joints. A basic FSW tool geometry was used with a conical pin that was 3.7mm long, pin diameter 6mm and the flat shoulder diameter 24mm with D/d ratio maintained as 4 shown in Fig 1.

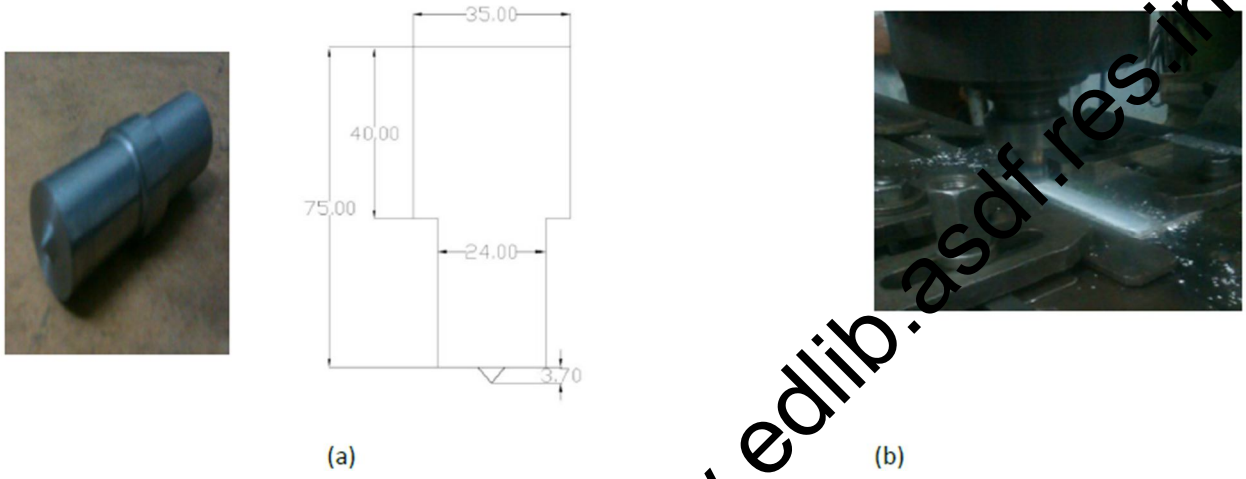

Figure 1: a) FSW tool geometry and b) experimental FSW

C. Specimen Preparation and Testing

The tensile test specimens were sectioned perpendicular to the welding direction from the welds. And weld crosssections for analysis of microstructure were prepared. The samples for analysis of microstructure were sectioned, grinded and polished. The samples for the macrostructure analysis were etched by using Keller reagent (1150 ml Hcl, 550ml HNO3, 200ml HF and 1500ml H2O) and the microstructure was analysed using an optical microscope.

III. Results and Discussions

A. Visual Assessment of Welds

The top views of the FSW welds were shown in Fig 2. A hole at the end of weld shows the negative of FSW tool pin. For this sample specimen the tool moved a little too much into the work piece, due to the higher frictional heat input, which then softened the material.

B. Tensile Properties

The tensile strength of the base metal alloy was measured and presented in (Table 1). The tensile strength was observed at the stir zone welds at different tool rotation speeds i.e.710r/min,900r/min and welding speeds of 40mm/min, 80mm/min, 125mm/min and 160mm/min. The tensile strength and yield stress reduced with increase of tool rotation speed, whereas the strength increases with the increase with the increase of welding speed. The results of friction stir welded 5083 aluminium alloy are shown in Table 2.

i. Effect of tool rotation speed on hardness:

Hardness value reduces with the increase of the tool rotation speed. Whereas hardness increases with the increase of welding speed, shown in Fig3.

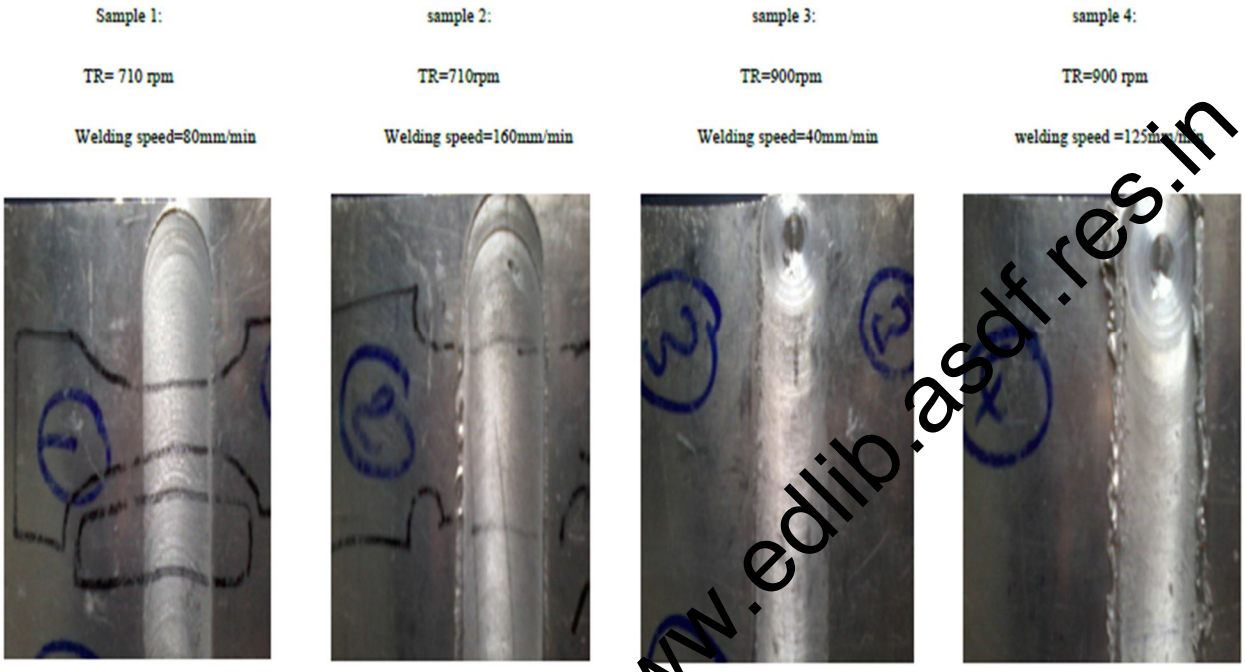

Figure2: The top view of the welds

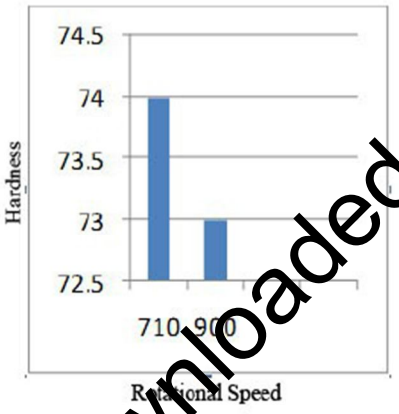

Fig3. Hardness Vs rotational speed

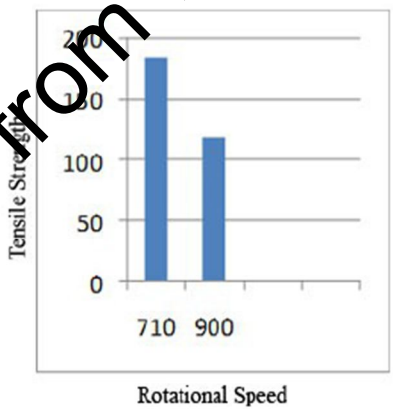

Fig4. Tensile strength Vs rotational speed

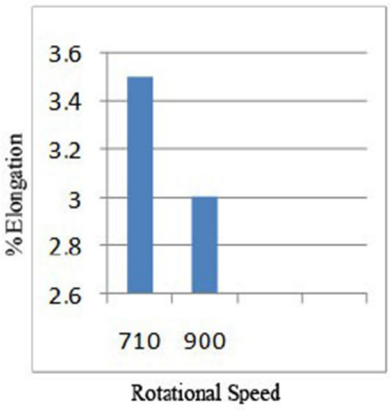

Fig 5. Elongation Vs rotational speed

ii. Effect of tool rotation speed on tensile strength:

The tensile strength decreases as the tool rotation increases. At 710r/min the strength was 185 M Pa and at 900r/min the strength shows 120MPa, shown in Fig 4.

iii. Effect of tool rotation speed on elongation:

The elongation (%) achieved maximum at the tool rotation speed 710r/min with welding speed 80mm/min was 4.56% shown in Fig 5.

Table 2 Welded Conditions at Constant Rotational Speed of 710r/min AND 900r/min

Condition FSW (rpm/mm)	YS (M Pa)	TS (M Pa)	Elongation (%)	Rockwell's Hardness	Brinell's Hardness
710/80	136.258	185.090	4.56	74	72.4
710/160	104.926	131.255	2.54	73	76.3
900/40	85.56	112.127	3.54	72	76.3
900/125	94.855	120.038	3.08	72	7[illegible]

C. Weld Microstructure

Based on the microstructure analysis under optical microscope across the weld it is to be observed that there were no defects and fine grains obtained. It is observed that the grain size reduced to half the size of base alloy due to the deformational hardening. The grains are equiaxed in the nugget zone shown in Fig 6. The microstructures of different conditions were shown in Fig 6. When welding of 710rpm with feed per minute(FPM) 80mm/min and 900rpm with FPM 40mm/min the grain size of welds were seems to be identical, due to the heat input was more

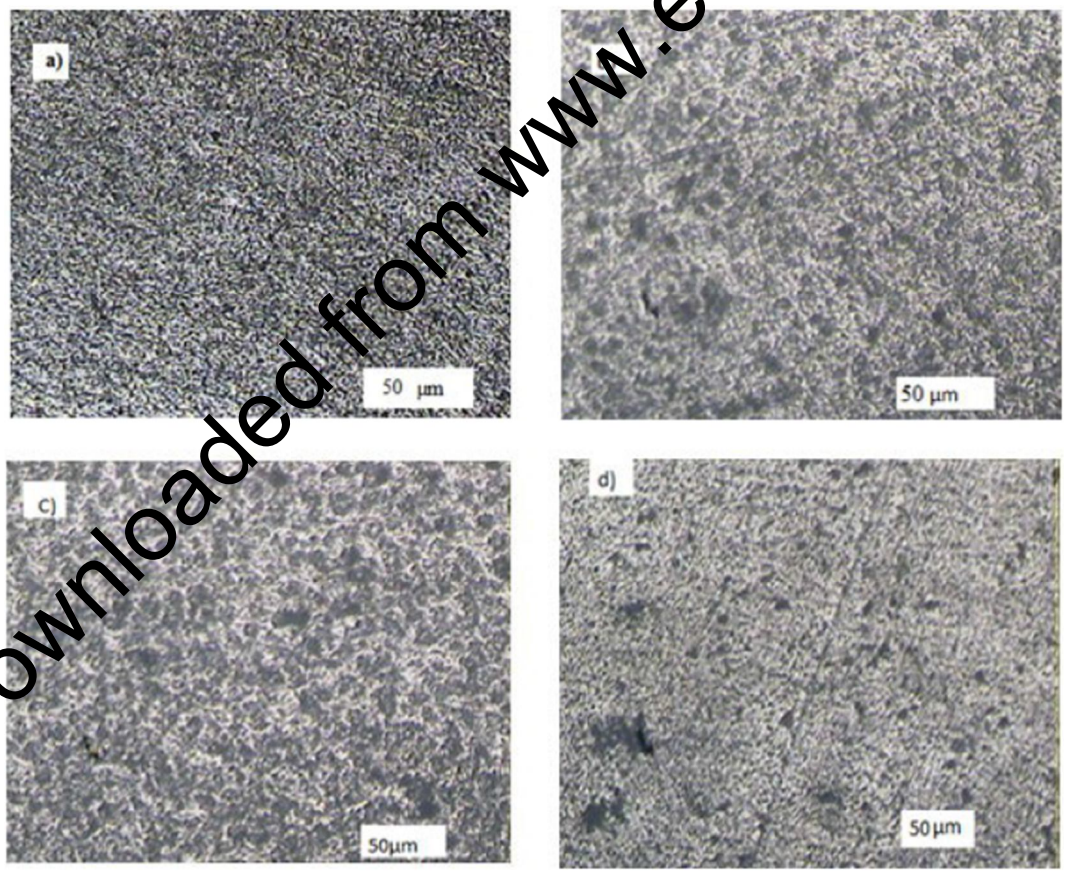

Figure 6.Microstructure of FSW weld produces at: a) 710rpm and welding speed 160mm/min b) 710rpm and welding speed 80mm/min c)900rpm and welding speed 40mm/min d) 900rpm and welding speed 125mm/min

(Figures 6b,c). When welding of 710rpm with FPM 160mm/min and 900rpm with 125mm/min the grain size was fine, because the heat input was very low, i.e., cold deformation had a great role in grain refinement. [9] In this case the grains were very small (Figure 6a, d).

Conclusions

Welding of AA5083 in FSW process successfully obtained for different welding speeds, rotation speeds and the tool profile. Based on the analysed results the following can be concluded.

1. It is observed that at rotation speed of 710 rpm, & 80 mm/min welding speed with conical profile resulted in good mechanical properties.
2. It is observed that at rotation speed of 900 rpm, 125 mm/min welding speed with conical tip profile resulted in good mechanical properties.
3. It is concluded that, at 710 rpm, the mechanical properties are better than at 900 rpm, this is due to sufficient heat is obtained at this condition. Hence weld with conditions 710 rpm & 80 mm/min gives the best results among all these welds.
4. It is to be concluded that for different welds of microstructure, 710rpm with 160mm/min and 900rpm with 125mm/min the grain size was very small. More grain refinement was there in this condition due to the cold deformation effect.

Acknowledgment

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Neural Networks And Its Learning Techniques

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Abstract: A neural network is an artificial representation of the human brain that tries to simulate its learning process. An artificial neural network (ANN) is often called a "Neural Network " or simply Neural Net (NN). This paper summarizes the some of the most important developments in neural network and its learning techniques. Learning can be done in supervised or unsupervised training. Our purpose is to provide a synthesis of the published research in this area and stimulate further research interests and efforts in the identified topics.

Index Terms— Learning and learning process, costs, neural networks, Error_correction learning, Memory based learning, mathematical ananlysis, Artificial intelligence.

Introduction

Research in the field of neural networks has been attracting increasing attention in recent years. Since 1943, when Warren McCulloch and Walter Pitts presented the first model of artificial neurons, new and more sophisticated proposals have been made from decade to decade. Mathematical analysis has solved some of the mysteries posed by the new models but has left many questions open for future investigations. Needless to say, the study of neurons, their interconnections and their role as the brain's elementary building blocks is one of the most dynamic and important research fields in modern computer science. It is not an exaggeration to say that we have learned more about the nervous system in the last fifty years than ever before. Artificial neural networks are an attempt at modeling the information processing capabilities of nervous system.

Neural networks are a branch of "Artificial Intelligence". Artificial Neural Network is a system loosely modeled based on the human brain. The field goes by many names, such as connectionism, parallel distributed processing, neuro computing, natural intelligent systems, machine learning algorithms, and artificial neural networks. Neural networks are a powerful technique to solve many real world problems. They have the ability to learn from experience in order to improve their performance and to adapt themselves to changes in the environment. In addition to that they are able to deal with incomplete information or noisy data and can be very effective especially in situations where it is not possible to define the rules or steps that lead to the solution of a problem.

Learning Process

One of the most important aspects of Neural Network is the learning process. The learning process of a Neural Network can be viewed as reshaping a sheet of metal, which represents the output (range) of the function being mapped. The training set (domain) acts as energy required to bend the sheet of metal such that it passes through predefined points. However, the metal, by its nature, will resist such reshaping. So the network will attempt to find a low energy configuration (i.e. a flat/non-wrinkled shape) that satisfies the constraints (training data).

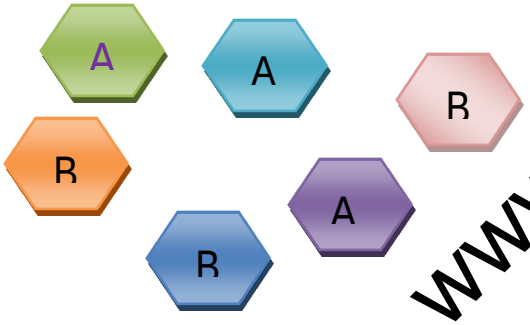
Learning is a process by which the free parameters of a neural network are adapted through a process of stimulation by the environment in which the network is embedded. The type of learning is determined by the manner in which the parameter changes take place.

This definition of the learning process implies the following sequence of events:

1. The neural network is stimulated by an environment.
2. The neural network undergoes changes in its free parameters as a result of this stimulation
3. The neural network responds in a new way to the environment because of the changes that have occurred in its internal structure.

Learning can be done in supervised or unsupervised training. In supervised training, both the inputs and the outputs are provided. The network then processes the inputs and compares its resulting outputs against the desired outputs. Errors are then calculated, causing the system to adjust the weights which control the network. This process occurs over and over as the weights are continually tweaked.

Supervised and un-supervised:



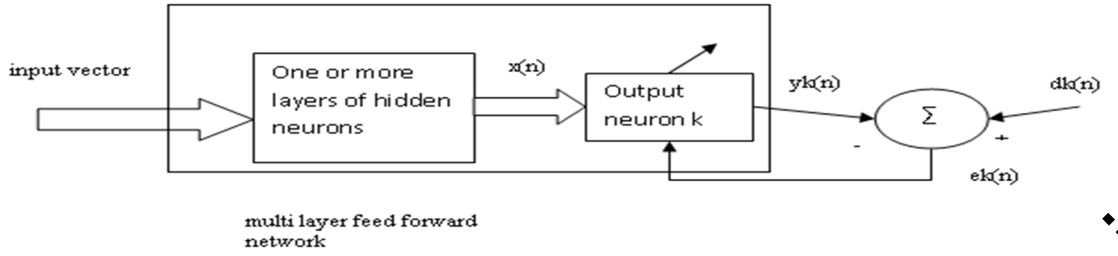
Two possible solutions:

1

2

In this paper we are going to learn different learning techniques those are 1. Error_ correction learning 2. Memory based learning

1. Error_correction learning: To understand this technique, assume a simple case of a neuron k constituting the only computational node in the output layer of a feed forward neural network, as depicted in fig1



Neuron k is driven by a signal vector x(n) produced by one or more layers of hidden neurons, which are themselves driven by an input vector applied to the source nodes of the neural network.

Consequently, an error signal, denoted by $e_k(n)$, is produced. By definition,

$$e_k(n) = d_k(n) - y_k(n)$$

this objective is achieved by minimizing a cost function or index of performance, £(n), defined in terms of the error signal $e_k(n)$ as

$$£(n) = ½\, e^2_k(n)$$

Let $\mathbf{w_{kj}}(n)$ denote the value of synaptic weight $\mathbf{w_{kj}}$ of neuron k excited by element $x_j(n)$ of the signal vector x(n) at time step n. in effect , $\mathbf{w_{kj}}$ (n) and $\mathbf{w_{kj}}$ (n+1) may be viewed as the old new values of synaptic weight $\mathbf{w_{kj}}$, respectively. In computational terms we may also write

$$\mathbf{w_{kj}}(n) = z^{-1}[\mathbf{w_{kj}}(n+1)]$$

where z^{-1} is the unit delay operator. That is z^{-1} represents a storage element.

2. Memory-based learning: here all the past experiences are explicitly stored in a large memory of correctly classified input- output

All memory-based learning algorithms involve two essential ingredients:

- Criterion used for defining the local neighborhood of the test vector X_{test}.
- Learning rule applied to the training examples in the local neighborhood of X_{test}.

The algorithms are differ from differ from each other in the way in which these two ingredients are defined.

Immediate neighborhood of the test vector X_{test}. In particular, the vector

$$X'_N \in \{ X_1, X_2, \ldots, X_N\}$$

Is said to be the nearest neighbor of X_{test} if

$$\min\ d(X_i, X_{test}) = d(X'_N, X_{test})$$

where $d(X'_N, X_{test})$ is the Euclidean distance between the vectors X_i and X_{test}. The class associated with the minimum distance that is vector X'_N is reported as the classification of X_{test}. this rule is independent of the underlying distribution responsible for generating the training examples.

A variant of the nearest neighbor classifier is the k-nearest neighbor classifier which proceeds as follows:

- Identify the k classified patterns that lie nearest to the test vector X_{test} for some integer k.
- Assign to the class that is most regularly represented in the k nearest neighbors to X_{test}.

Thus the k-nearest neighbor classifier acts like an averaging device.

Conclusion

In this paper, we have studied one of the most important limitations of neural networks, that is understanding why an neural networks, that is understanding why an neural network makes a particular decision is a very difficult task. Also we have learn about learning processes and how it works. How the data is divided into supervised and un-supervised. And what are the different learning techniques and how those works under various neural networks.

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Localization Through Low Power Techniques

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Abstract: The increasing use of navigation in day to day life drives the interest to develop more sophisticated mobile applications. Navigation is based on periodic localion update. The update procedure can be achieved in many ways. The selection of optimistic technique is very essential to increase the accuracy, precision, speed of updating, the correctness of the technique in any given situation and in any given place. This paper discusses and evaluates all the possible localization techniques. It also describes what technique to use in a given situation and discusses the pros and cons of using the remaining techniques. Power consumption is also quite challenging in localization. Reducing power consumption attracts wider range of audience. Hence an efficient solution to reduce the power consumption is proposed in this paper. Finally the results of using the low power technique with all the discussed localization techniques is been demonstrated and a real time situation which gets highly benifited using the low power solution along with the best suitable location finding technique is described.

I. Introduction

Navigation and finding Points of Interests(POIs) using location update based applications which is an integral part of any mobile / tablet eco-system. Navigation can only be achieved with the help of localization. There are many ways to get the current location of the device (tablet/ mobile) . The next sections mainly concentrates on GSM, GPS and dead reckoning techniques. As the technology is advancing the size of the battery, the maximum voltage of the battery and inherentely the energy in te battery to support the device are becoming very limited. So power management is very important. The hardware design of the new devices is also done in such a way that the power used by individual components in a device is very less. The only care lies within our scope is to design software algorithms in a way which will use the power efficiently and avoid unnecessarily usage of power.

In this paper, we described a situation which uses the GPS localization technique to automatically notify the user of a Point of Interest(POI) [1] based on user preference when the system (phone or tablet) in a low power mode. The situation assumes that a user is driving his car from Place A to Place B and he would like to be notified of Gas station or restaurants during his journey. One way to do is, the user can check manually his phone or a tablet at every milestone and search for his points of interest. The other way to do is the system can automatically understand his preferences and notifies about the places without user's intervention. This provides a seamless and better user experience with little power consumed and when the system is in idle.

The remaining paper is organized as followings: Section II describes different parameters to be considered to adopt a given localization technique.Section III will brief some localization techniques. Section IV describes how the low power technique. Section V proposes the algorithm for alerting user when the user arrives at his POI along his/her journey. Section VI shows the experimental results and concludes the paper.

II. Parameters in Localization

The cost parameters mainly involved in the localization techniques are described below.

1) Performance: This is the most important parameter to be considered in any localization scheme. The accuracy of the algorithm. The error tolerance levels changes according to the application. For example in fleet systems the error tolerance is more so the accuracy can be relaxed. But coming to navigatin in road transport systems the accuracy (as in describing how far the device is from the antenna)is very important.

So according to the application and the real time parameter analysis the localization technique should be decided.

2) Complexity: Sometimes using a combination of two or more location finding techniques gives better results that increases thr accuracy [2]. But this results in the increase of additional complexity. The combination of the techniques we are combining also determines the complexity. The additional disadvantage is it drains the power also. Hence the evaluation of complexity is must before applying a particular combination. This way of using two or more techniques is used in hybrid systems [3].

3) System Requirements: Some techniques may require extra implementations than what the is available in the existing systems to achieve minimum accuracy. The requirements may be hardware requirements of the network or it can be the software requirements of the handset devices.

III. Localization Techniques

1) GSM-based: In this method, the network and its coverage plays the entire role in determining the current position. The first requirement comes to use this technique is that the handset device must be registered in that particular cell in which the device is present. The information will be stored both in the device and in the network [4]. Now with this existing knowledge of the operators network, the cell identity (cell ID) can be converted to a geographic coordinate. GSM-based localization is accomplished with several benefits:

a) GSM coverage is all pervasive i.e its penetration power over the buildings, roofs etc is more. Its coverage is far outreaching than the coverage we get from of 802.11 networks.
b) This method doesn't require any additional radio interfaces. The existing hardware alone is self-sufficient. The wide coverage and acceptance of cellular handsets/tablets makes them ideal for the delivery of robust computing algorithms.
c) GSM-based localization works best in case of power failures also unlike the Wi-fi networks [5]. This is because the cellular towers are dispersed all across the coverage area [6].
d) The interference suffered from the nearby systems transmitting on the same frequency as in cordless phones, a microwave etc is very negligible. This is reflected to the GSM operation band which is a licensed band unlike other radio networks.

The location specific information can be taken from the database in the network. The accuracy depends on the cell size (pico cell or a macro cell), cell type (sectored or an omni-directional) etc. The main advantage is that even the legacy handsets, roaming subscribers are supported in this method. Accuracy can be improved using a sectored-cell which uses more number of antennas (mostly 3) in the cells, and they provide all the essential sector related information. As the sector number goes increasing, the accuracy of the location also increases. For example assume a three sectored cell, which gives a coverage of 1200 for each sector. The accuracy obtained will be 600. Now consider a six-sectored cell, this gives a coverage of 600 for each sector, the accuracy is 300. Now consider an omnidirectional cell, heres the location of the antenna is the location of the handset. Fig 1 shows the omni-directional cell, 3-sectored cell and a 6-sectored cell. For omni-directional cell, for the handsets A, B and C the location is same. While for 3-sectored cell, the locatin of A is the location of the antenna in sector-3, for B it is sector-1 antenna position. While for C it is sector-2 position. In the similar fashion the location in the 6-directional cell is given according to which sector they fall into and is more accurate.gives same location for positions A, B and C respectively.

The accuracy can be further improved if the data is collected from more than one cell. If the data is collected from multiple cells, the next task is which data should be taken into consideration. For this we can go for taking the data from the cell which gives highest receiving signal strength (RSS).

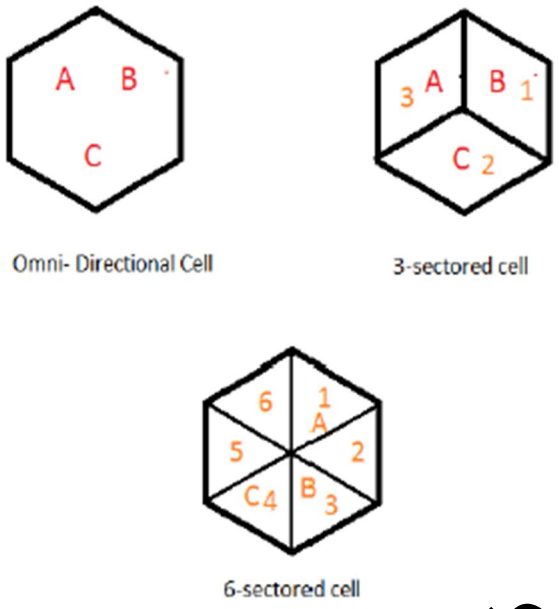

Fig. 1: Localization with omni, three-sectored and six-sectored cells

One more efficient way to do this is to take the weighted average of the RSS of all the data obtained. Equation 1 and equation 2 gives the calculation of the longitude and the latitude information resp, where 'lon' is the longitude, 'lat' is the latitude and RSS is the received signal strength.

$$lon = \frac{lon_1 * RSS_1 + lon_2 * RSS_2 + ...lon_n * RSS_n}{lon_1 + lon_2 + ..lon_3} \quad (1)$$

$$lat = \frac{lat_1 * RSS_1 + lat_2 * RSS_2 + ...lat_n * RSS_n}{lat_1 + lat_2 + ..lat_3} \quad (2)$$

2) GPS (Global Positioning System): GPS is a worldwide radio navigation system which constitutes of 24 satellites revolving in different orbits with a speed of 12 hours per orbit. This is a worldwide available navigation system having the highest accuracy. The entire system is designed for localization. Five ground stations monitor the working of a GPS [7]. It basically works on the principle of triangulation. The exact location information can be obtained if the device can be spotted out by a minimum of four satellites. If more satellites readings are taken into consideration the accuracy will improve further [8]. The requirement of four satellites can be understood by referring the table I.

There are many iterative and non-iterative methods to solve the GPS locatin equations which

Table I: Necessity of 4 satellites to find a location

Intersection	Equivalency	Result location
Intersection of exactly two spheres	Formation of a circle	circle
Intersection of exactly three spheres (each intersecting the rest)	intersection of a circle and sphere	two points
Intersection of four spheres	intersection of two points and a sphere	one point

are obtained by the four satellite data. Any timing error in the system will drastically effect the location of the system. So extreme care will be taken inorder to avoid the timing errors.

3) Other Techniques:

a) Dead Reckoning: Given the initial position, the location will be determined according to the speed and direction of propogation.The disadvantage is the error gets propogated with time.
b) Assisted GPS: This system improves the initial performance of the GPS network.
c) Access Points: Relaying on 802.11 radio or 802.11 access points, the laocation identity can be decided [9].

IV. Low Power Techniques

The handset has different modules integrated in it. The modules are specific in their functionality. For exampple Wi-Fi module is used to collect the Wi-Fi related information to the system. GPS module should be exclusively present to get the GPS data. Sound cards used for processing the audio data. Similarly all the other modules also have their dedicated purpose. Not all the modules are required at the same time. So if we want localization alone and we are sure about what localization technique to use, we can use the dedicated module and keep the other devices in low power state. This will certainly help reducing the power consumption [10]. This can be done both in OS level and in BIOS level. To have a good understanding on how a BIOS/OS can control the power consumption, let us see what happens as in the handset is powered ON.

1) The CMOS or a similar device check for the custom settings
2) The device drives, the interrupts handlers will be loaded.
3) The registers and power management gets initialized.
4) The power-on self-test sequence is performed
5) The system settings are displayed
6) The boot strap sequence gets initialized and the OS starts booting

The BIOS which resides in some flash memory, is the first thing that executes and performs all the required functionalites before the OS boots. The BIOS keeping ON running as long as the device is not shutdown. But OS is a big thing which manages all the devices. If there is a possibility to get some other device which uses can run the required module alone, the power consumption decreases many more times. The OS method of power controlling can be done by changing the device states. The device can be in any one of the device power states D0, D1, D2, D3 and D4 [11]. The device states and there functionality can be seen in the table II. To achieve the low power mode of operation, the deive which is in operation

Table II: Device power states

Device Power State	Device Power Condition	Behaviour
D0	Completely ON	Device is fully powered and running, capable of delivering full functionality to the user
D1	Low ON	Device ON with low power, performance less than D0. Can be used when peak performance is not necessary
D2	Standby	Partially powered, wakes up on request
D3	Sleep	Partially powered, Device-initiated wakeup. Less powered up than D3
D4	Completely Off	No power.

to find the location can be kept in D0 states and the rest of the devices can be kept in D4 state. The processor which runs the application will also be active. The remaining devices can be in sleep state. The general architecture of a tablet is shown in fig 2 . The idea is to keep the application which is used for navigation/ localization running on BIOS controller unit. Keep the selected localization module says GPS here in D0 state and put all the remaining devices in D4 state [12]. This considerably reduces the power consumption.

V. Positioning Algorithm for GPS

A scenario which uses GPS to find the location is stated in this section. Using low power algorithm in this scenario, it will show how efficiently the power consumption decreases compared to the native way of operating the devices.

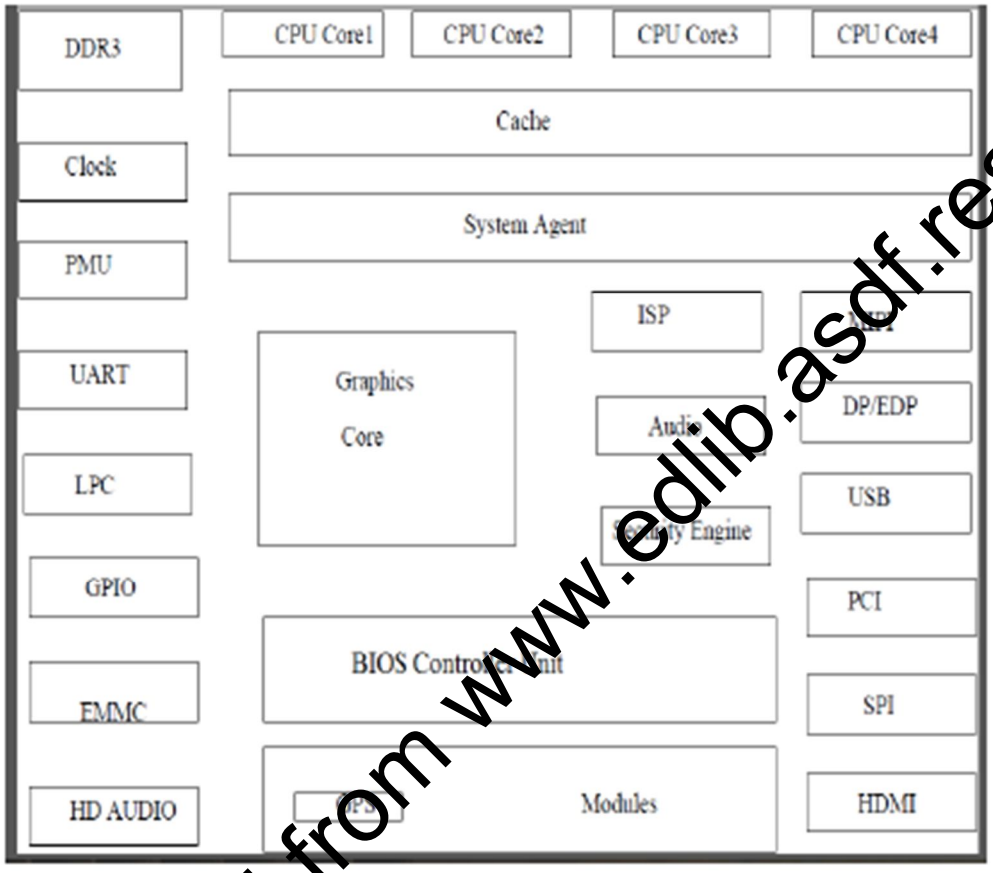

Fig. 2 Generalized architecture of tablet/mobile

A. Scenario

A user is driving his car from Place A to Place B and he would like to be notified of Gas station or restaurants during his journey. One way to do is, the user can check manually his phone or a tablet at every milestone and search for his points of interest. The other way to do is the system can automatically understand his preferences and alerts about the places without user himself tracking. This provides a better and seamless user experience with little power consumed and when the system is in idle. The purpose here is navigation alone so all the other devices shown in fig 2 are put into D4 state. Only the BIOS controller Unit and the GPS unit will be functioning.

B. Algorithm

1) Select the location A and B
2) Spot the route from A to B [13] [14]
3) Divide the entire route into subdivisions. This can be visualized in fig 3.
4) As the user is travelling from A to B, location update happens with GPS, if the coordinates of the current position and the coordinates of the Point of Interest matches, the user should be alerted.

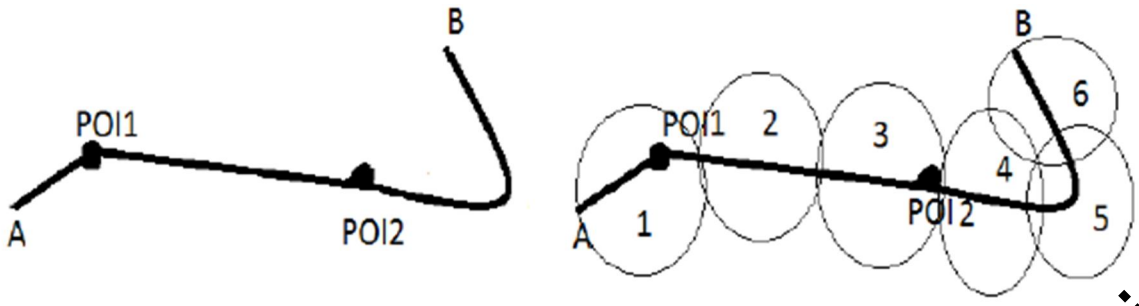

Fig. 3: Routing from A to B

This all happens in the low power state. The responsibilities of user, application and the handset is depicted below.

1) User:

a) The user opens the Location application and selects the points of interests which he would like to be notified, like an alarm.
b) The user selects his starting place and destination place.

2) Application:

a) The application saves user preferences in memory.
b) The application computes the coordinates of the journey and the places he have to navigate.
c) It builds a local database of the places along the journey path.
d) It communicates the journey details, places of interest that needs to be notified, database of points of interest to the sensor hub which is residing in the processor.

3) System:

a) The processor is made of many different modules along with core processor. The processor supports entering low power mode very aggressively by turning off devices and also parking the core microprocessors in a deep sleep mode (C6[the low power CPU state] or higher based on implementation)
b) The operating system will timeout if there are no further actions or if the user presses the power button to turn off the display, and after a certain interval the platform will enter low power state. In this state most of the devices will be in D3 or D4 (turned off),the core (microprocessor) will be in deep sleep state and the platform will be in S0i3 state where the power consumed will be negligible.
c) The PMU (Power management Unit) is responsible for managing of power to internal modules, voltage rails, managing CPU core states and power supply for the overall platform through the PMC interface.
d) Once all the cores are in C6, and if there is an idle resiliency detected, the PMU is responsible for putting the platform into S0i3 (deep sleep state) based on each devices D3 status. PMU initiates the action to put the platform into a deep sleep state (S0i3).
e) The PMU during transition to the platforms deep sleep state, leaves the following devices in powered on state
    i. System Agent
    ii. PMU
    iii. UART which communicates with GPS [15]
    iv. GPS module
f) Once the system in Low Power state (S0i3), the following actions takes place
    i. Polls the GPS sensor periodically to get the location coordinates

ii. Based on the coordinates, check for points of interest available in the periphery
iii. If any points of interests match
iv. Wakes the system from S0i3 and notifies the application
v. Application alerts the user by displaying the places and plays a sound.
vi. Else the polling continues

VI. Results and Conclusions

The scenario described in section V is shown here. The points of interest observed here is a petrol bunk. The handset here automatically alerts the user when it arrives to the petrol bunk. The points A and B are taken as Bangalore and Chennai. Fig 4 shows the traversing using the low power localization application using the GPS.

All the devices other the which are used for localization are kept in D4 state in this algorithm. This delibrately reduced the power consumption. The GPS navigation is taken here because it is the best

Fig. 4: Point of interest identification along the route from Bangalore to Chennai

technique for road traffic. Because GPS is available all the way. If any other technique like GSM, if the coverage is missing the localization will not work. The power drain due to GPS will be compensated by the low power technique used.

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Improving Association Rule based Data Mining Algorithms with Agents Technology in Distributed Environment

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Abstract- Applying distribution in the form of agents technology and improving association rule based data mining algorithms, agents are the best for doing the continuous data mining efficiently reducing network load and carrying the code to remote locations and the types of mobile agent which having the energy of moving from one place to another itself ,and interacting with the other mining agents for the purpose of data mining as component based communication, so working with communication agents for improvement of apriori algorithm for quality. By proposing architecture for improvement of apriori mining in distributed environment, this architecture can facilitate the services of instantaneous real time messaging; this study includes the issue of constantly executing queries on continuous data in heterogeneous platforms or environments.

I. Introduction

The Apriori Algorithm is used to find Frequent Item Sets (FISs) Using Candidate Generation Apriori is an influential algorithm for mining FIS for Boolean association rules. The name of the algorithm is based on the fact that the algorithm uses prior knowledge of FIS properties. Apriori utilizes an iterative approach known as a level-wise search, where k-item sets are used to explore (k+1)-item sets. First, the set of frequent 1-item sets is found. This set is denoted L1. L1 is used to find L2, the set of frequent 2-item sets, which is used to find L3, and so on, until no more frequent k-item sets can be found. The finding of each Lk requires one full scan of the local relational databases. With more importance of bigger data files distributed over widereanetwork (WAN), where limitations of efficient bandwidth and software tools, forced the development of distributed data mining (DDM). DDM is expected to partial analyze data partially at individual sites and then to send the outcome as partial result to other sites where it is, Partially at individual sites and then to send the outcome as partial result to other sites where it is sometimes required to be unified for achieving global result. In order to support distributed architectures, there are two architectures mainly client server and agents communicative agents. In this project we explore the capabilities of mobile agents in a DDM.

Consider these typical situations where, central data server that has to collect data from several computers; like WWW search engine collects data from web servers all over the world. Central information server in your company collects data from different departments and data mining on a large distributed database **[1, 9]**. Conventional Data Collection (CDC), Decentralized Data Collection (DDC), Data collection with communication agents (DCCM) are three preferred solutions. CDC collects data from several computers with the following Disadvantages like the central server needs all the data from the other computers before it can do some processing and, in DDC all computers run a kind of distributed search engine, for example Harvest. The local search engines process data locally and transfer the results to central server. And Disadvantages are, lot of maintenance for the local search engines is needed, when a new version of the search engine comes up it must be installed on every local server. Where as in DCCM, with the help of communication agents (CA), it travels around the distributed environment for mining. At each terminal it processes the data and sends the results back to the central server provides Low network traffic because the

agents do data local processing **[6]**. For identifying better algorithm and suitable mining architecture in distributed environments. The objective of the paper is to develop architecture to support Distributed Data Mining (DDM), which can be used to extract hidden predictive information from large databases, henceforth will be a great potential use to help companies. The focus is on the most important information on their data repositories.

The existing data mining algorithms for distributed data are of communication intensive **[2]**. Many algorithms for data mining have been proposed for a data at a local host based data repository, and applied some of them are implemented at multiple locations with little bit improvement, in terms of efficiency of these algorithms as a part of quality but complexity of algorithms are not efficient in distributed environment are not addressed, as data on the web/network are distributed by very of its nature. As a consequence, both new architectures and new algorithms are needed to merge together.

Mobile agents carries state attributes and code which defines agent's behavior like (when and where to move , what to process there , special type of agents is 'communication agent 'couriers messages back and forth between clients residing on various network nodes as multi server multi clients based computation environment. So distributed data mining is performed efficiently with the association of agents, where communication in between these agents achieved in the following methodology. The control of communication agents are managed by using java classes of Aglet tool kit, some important calls are briefed, those are Future Reply Class Evaluates Weather a Reply will Be Given to a Message, an Aglet Can Perform another Task while by calling proxy.sendAsyncMessage; Any aglet that wants to communicate with other aglets has to first obtain the proxy object. And use the following calls. getAgletInfo, communication achieved by exchanging aglets of Message class. Agletproxy Class is Responsible for Sending and receiving by sendMessage of Aglet proxy class.

II. Literature Survey

Association Rule Mining: In data mining, association rule Learning is a popular and well researched method for discovering interesting relations between variables in large databases [6, 7 and 8]. It analyzes and present strong rules discovered in databases using different measures of interestingness. Based on the concept of strong association rules for discovering regularities between products in large scale transaction data recorded by point – of - sale (POS) systems in supermarkets are introduced.

For example, the rule found in the sales data of a supermarket would indicate that if a customer buys onions and potatoes together, he or she is likely to also buy burger. Such information can be used as the basis for decisions about marketing activities such as, e.g., promotional pricing or product placements. In addition to the above example from market basket analysis association rules are employed today in many application areas including Web usage mining, intrusion detection and bioinformatics. Three parallel algorithms for mining association rules, an important data mining problem is formulated in this paper **[3]**. These algorithms have been designed to investigate and understand the performance implications of a spectrum of trade-offs between computation, communication, memory usage, synchronization, and the use of problem specific information in parallel data mining. Fast Distributed Mining of association rules, which generates a small number of candidate sets and substantially reduces the number of messages to be passed at mining association rules. Algorithms for mining association rules from relational data have been well developed. Several query languages have been proposed, to assist association rule mining. The topic of mining XML data has received little attention, as the data mining community has focused on the development of techniques for extracting common structure from heterogeneous XML data. For instance, [14] has proposed an algorithm to construct a frequent tree by finding common sub trees embedded in the heterogeneous XML data. On the other hand, some researchers focus on developing a standard model to represent the knowledge extracted from the data using XML. JAM has been developed to gather information from sparse data sources and induce a global classification model. The PADMA system is a document analysis tool working on a distributed environment, based on cooperative agents. It works

without any relational database underneath. Instead, there are PADMA agents that perform several relational operations with the information extracted from the documents.

An association rule is a rule which implies certain association relationships among a set of objects such as ``occur together'' or ``one implies the other'') in a database. Given a set of transactions, where each transaction is a set of literals (called items), an association rule is an expression of the form X Y,where X and Y are sets of items. The intuitive meaning of such a rule is that transactions of the database which contain X tend to contain Y Association rule mining(ARM) is one of the data mining technique used to extract hidden knowledge from datasets that can be used by an organizations decision makers to improve overall profit.

III. Apriori Analyses in Distributed Data Mining

However the data parallelism algorithms need more memory at each remote site for storing all candidates for each scan, performance will be degraded if not providing much memory. The task parallelism algorithms can avoid this type of degrading. The task distribution may work where data distribution may not work **[4]**. Henceforth estimated approach that is using mobile agents for task distribution will give efficient results. Investigating suitability of Apriori algorithm for parallel approach, proposed 4 parallel algorithms based on Apriori; speed up mining of frequent item sets.

Fourth type The Candidate Distribution Mining (CDM) algorithm parallelizes the task of generating longer patterns and load balancing algorithm that reduces synchronization between the processors and segments. The database is based upon different transaction patterns. These parallel algorithms were tested among each other and CD had the best performance against the Apriori algorithm. Its overhead is less than 7.5% when compared with Apriori by tried to make DDM and CDM scalable by Hybrid Distribution (HD) algorithm respectively.CDM addresses the issues of communication solves overhead and redundant computation in by using aggregate memory to partition candidates and move data efficiently.CDM improves over by dynamically partitions the candidate set to maintain good load balance. Experiment output results show that the response time of CDM is 4.4 times less than DDM on a 32-processors system and HD is 9.5% better than CDM on 128 processors. the following graph shows comparison of the running time of above four algorithms.; so it is considered as stable in DDM.and the proposed algorithm is given in Figure 3.1.

A. Apriori Algorithm

An association rule mining algorithm, Apriori has been developed for rule mining in large transaction databases by IBM's Quest project team. An itemset is a non-empty set of items.

They have decomposed the problem of mining association rules into two parts

- Find all combinations of items that have transaction support above minimum support. Call those combinations frequent itemsets.
- Use the frequent itemsets to generate the desired rules. The general idea is that if, say, ABCD and AB are frequent itemsets, then we can determine if the rule AB CD holds by computing the ratio r = support (ABCD)/support(AB). The rule holds only if r >= minimum assurance. Note that the rule will have minimum support because ABCD is frequent. The algorithm is highly scalable. The Apriori algorithm used in Quest for finding all frequent itemsets is given below.

ALGORITHM Apriori_gen ():-

For all agents if (agents=true) {
I1 =item set A; I2=item set B;
Procedure combine () {
For all up to k-1 {

Select p.item1... I1.itemk-1, I2.itemk-1 from Lk-1I1, Lk-1I2 where I1.item1 = I2.item1 and I1.itemk-2 = I2.itemk-2 and I1.itemk-1 < I2.itemk-1 ;}}
If (agent=false)

// eliminate item sets such that some (k-1)-subset not in L_{k-1} for all c in Ck
Procedure eliminate () {
For all (k-1)-subsets s of c if (s is not in L_{k-1}) {eliminate c from c_k; break; } }

Figure 1: Algorithm for Apriori_Agent

It makes numerous passes over the database. In the first pass, the algorithm basically counts item occurrences to determine the frequent 1-itemsets (itemsets with 1 item). A successive pass, say pass k, consists of two phases. First, the frequent itemsets I_{k-1} (the set of all frequent (k-1)-itemsets) found in the $(k-1)^{Th}$ pass are used to generate the candidate itemsets C_k, using the apriori-gen () function. This function first joins L_{k-1} with I_{k-1}, the joining state being that the lexicographically ordered first k-1 items are the same. Next, it deletes all those itemsets from the join result that have some (k-1)-subset that is not in I_{k-1} yielding C_k.

The algorithm now scans the database. For each transaction, it determines which of the candidates in C_k are contained in the transaction using a hash-tree data structure and increments the count of those candidates. At the end of the pass, C_k is examined to determine which of the candidates frequent, yielding I_k. The algorithm terminates when I_k becomes empty.

IV. Architecture for Web Services in Distributed Data Mining

The Proposed architecture uses XML standards and web services which are important **[5]**. They keep data mining algorithms as web services, which are invoked and utilized by different knowledge discovery applications located in distributed, locations. The main components and the functionalities of these components are described in the sequential order.

Describing components from top-left the webbot is a very fastest and reliable web walker with support for regular expressions, sql logging files continuousdata, web log files collected in parallel,webserver Log files are downloaded and sessionizer generates a LOGML file, Integration Engine(IE) which is the part of Data Warehouse (DW) functionality which is suited for preprocessing of data at remote sites, after integration finally loading into database and later generating patterns in the form of graphs, User sessions from web logs are extracted for studying and analyzing sequences of similarity, so distribute mined by using DDM, Here using the logic in the following manner, frequent contiguous sequences with a given minimum support. These are imported into a database, the minimal frequent sequences are suppressed, and Different queries are faced Algorithms. Apriori and AprioriTid as combination of Apriori _agent (); against this data according to some criteria of minsupport of each pattern. Different fragmented results obtained by different communication agents are to be merged for obtaining target output. Predictive Model Markup Language (PMML) is an XML-based language which follows a very intuitive structure to describe data pre- and post-processing as well passing models as input to the another algorithms .PMML is used to transform raw data into meaningful features It wouldn't be complete to describe web services without mentioning the SOAP protocol **[10, 11 and 12]**. SOAP is not really simple protocol and "object" has nothing to do with the protocol, there is no importance to understand SOAP as it is transparent to you unless you deal with related low-level programming. The web service architecture is shown in the Figure 2.

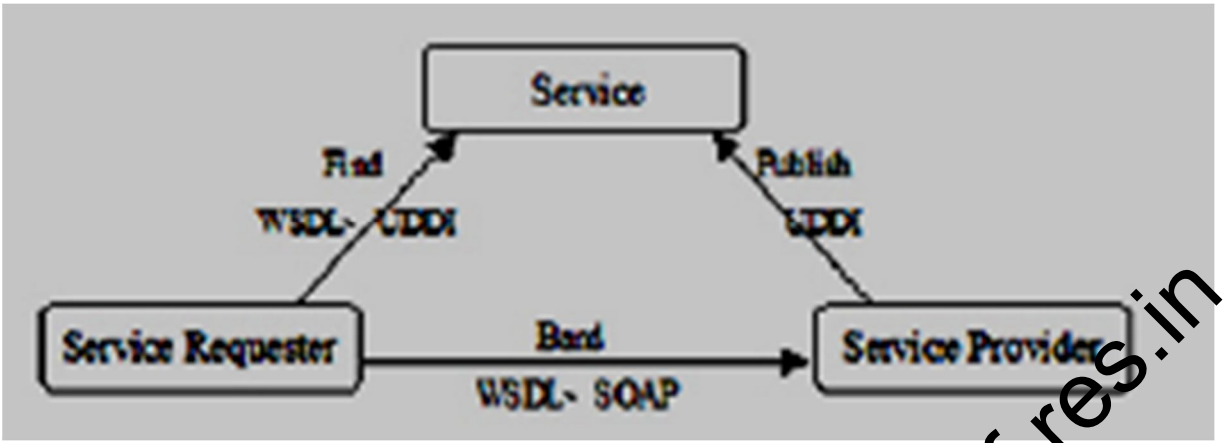

Figure 2: Web Service Architecture and related standards

V. Implementation with Results

The implementation of Apriori_Agent () algorithm with Aglet class, AgletMessageclass and Aglet Proxy classes and writing..\cnf\aglets.props and build XML files, build successful after running ANT command; Tahiti server automatically started after running C:\aglets\bin\agletsd -f.\ aglets. props command, now dispatching the mining aglet to another host, the following graphical user interface created and our data mining agent ready to do apriori mining on the Web Server Log files which are downloaded and processed through a sessionizer and save that file as LOGML ,another host located in distributed environment may asked to supply support values and the task of apriori mining is completed at remote host as shown in Figure 3 in the similar way any remote host supply datasets like log files, weblogs,LOGMLs,data.txt as input to our Distributed Data Mining (DDM) with the help of aglets which are event based mechanisms.

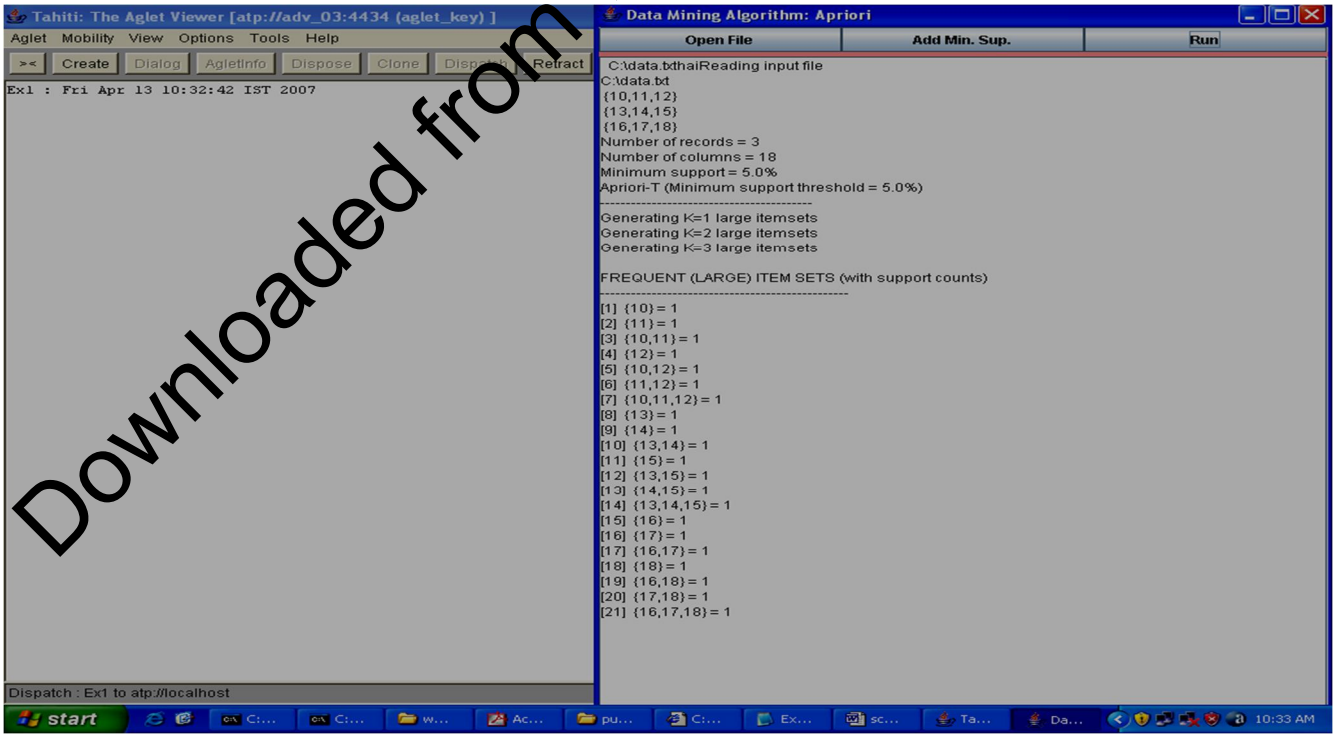

Figure 3: clicking on the run button to get the output

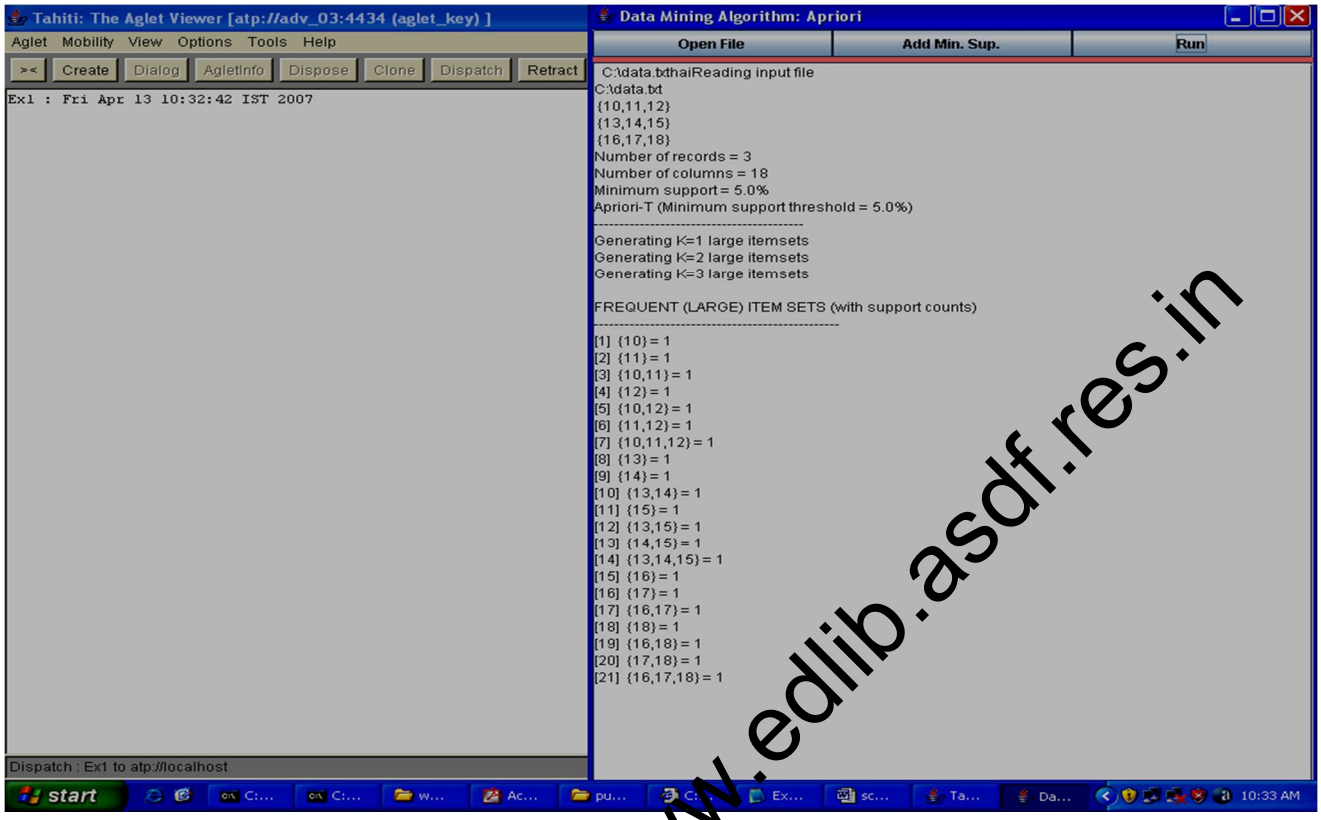

Figure 4: Aglet dispatched to another host

The architecture sends the agent to another server. After dispatching agent, new agent on the current server does no more exists on your server. The protocol for the destination URL is Agent Transfer Protocol (ATP). A dispatched agent from a remote server. First specify the target server and you will get a list of agents on the target server. Then, you can specify one of the aglets form the server. The architecture of distributed data mining will act on data Warehouses located in remote locations. The architecture works on DM with different heterogeneous data. The aglet dispatch to another host is shown in the Figure 4.

VI. Conclusion

This paper proposes the solutions to the issue of knowledge discovery in distributed data mining with less complexity, and tried with mobile agents with less exchange of data distribution, Mobile agents are used for candidate distribution, by conducting the above experiments, proved that mobile agents can be as used for candidate distribution in distributed data mining efficiently. And security of communication agents for reducing processing and storage issues , so some research has to be done in these areas or simplify the use of the mechanisms available like some tools, investigation to be carried out in the area of security design tools , so authors are working in these areas.

Acknowledgment

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Fabrication and Performance Evaluation Of Mixed Fuel Fired Furnace for Aluminum Melting

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Abstract— Many foundries use coal as a major source for heating the furnaces which causes serious pollution to the environment. Around 6.6 billion tons of hard coal was used worldwide last year, and 1 billion tons of brown coal. Since 2000, global coal consumption has grown faster than any other fuel. The manufacturing philosophy is to eliminate the use of heating elements requiring coal power and electrical power which is highly used in the region (AP).

Deliberate attempts were made to reduce the consumption of coke by replacing it with charcoal and oil. As a part of the project mixed fuel fired furnace have been designed and fabricated. For this purpose some initial melting and performance tests were performed using Aluminum alloy melting after initial test design modifications hade made to reduce the heat losses. Finally Mixed fuel furnace that runs on coke and diesel oil for melting non-ferrous alloys have been installed successfully eventually.This furnace can be effectively utilized as a melting furnace in our foundry laboratory.

Keywords—Coke fired furnace; Performance analysis; Crucible furnace; oil fired furnace;Mixed fuel fired furnace.

I. Introduction

This paper is about construction of crucible fired furnace. The furnace is used to heat and melt the solid metal and transform it to the liquid state. The furnace use of combustion of coal and diesel as a fuel and melt the solid metal inside that for a certain time. The fire brick coated with refractory inside the furnace will keep the heat around the crucible to make sure heat is not lost and save the time while melting the metal. After the metal totally melts, the liquid will flow out and used for casting. The main objective of this paper is to fabricate a furnace for melting aluminum in mini crucible using coal and diesel oil as heat sources. To carry out comparative study of coal and diesel fired sources.

II. Literature Review

K. C. Bala, [5], the paper deals principally with the mechanical and electrical requirements for induction furnace production. The mechanical aspect gives consideration to the geometrical components, cooling system, and the tilting mechanism. The electrical aspect deals with the furnace power requirement to make it functional.

K.K. Alaneme and S.O. Olanrewaju, [11], the research is centered on the design of a diesel fired heat-treatment furnace using locally sourced materials. The design philosophy is to eliminate the use of heating elements requiring electric power which is poorly supplied in the country. Design drawings were produced and mild steel was used for the fabrication of the furnace casing, while the other components needed for the design were selected based on functionality, durability, cost and local availability.

Martocci and Mihalow [15] the incentive for conducting research and development on reheat furnaces is substantial; the domestic steel industry spent approximately one billion dollars on fuel in reheat furnaces in 1981. Bethlehem Steel Corp. spent $145 million of that total, and neither figure includes fuel consumed in soaking pits or annealing furnaces. If we set a goal to save 10% of these annual fuel costs, that translates into $100 million for the domestic steel industry and $14.5 million for Bethlehem Steel. These large sums of

money are significant incentives. The purpose of this paper is to review the historical heating practices and equipment at steel reheat furnaces along with current practices and instrumentation.

2.2 Melting of Aluminum

Various types of furnaces employed in melting of aluminum alloys in the foundry may be broadly grouped into three types:

1. Direct fuel fired furnaces.
2. Indirect fuel fired furnaces.
3. Electrically heated furnaces.

2.2.1 Direct Fuel Fired Furnaces

The direct fuel type is further classified into wet hearth and dry hearth. In wet hearth furnace products of combustion are in direct contact with the top of the molten charge and heat transfer is by combination and convection and radiation. In a dry hearth furnace the charge of the solid aluminum is placed on sloping hearth above the level of the molten metal so that charge is completely enveloped in hot gases. Heat is absorbed rapidly by solid charge, which causes melting and molten aluminum drains from the sloping hearth into the wet holding chamber.

3.1 Crucible

A crucible is a container use to hold metal for melting in a furnace. Crucible furnaces are of small capacity typically used for small melting applications. A crucible is needed to withstand the temperatures encountered in melting metals as shown in table 3.1.

The crucible material must have a much higher melting point than that of the metal being melted and it must have good strength even when white hot. The metal is placed in a crucible which is made of clay and graphite. The energy is applied indirectly to the metal by heating the crucible to melt metals such as zinc and aluminum because these metals melt at a temperature well below of steel as shown in fig.3.1. Thermal conductivity of the crucible is 25-50 W/Mk

Table: 3.1 Crucible properties

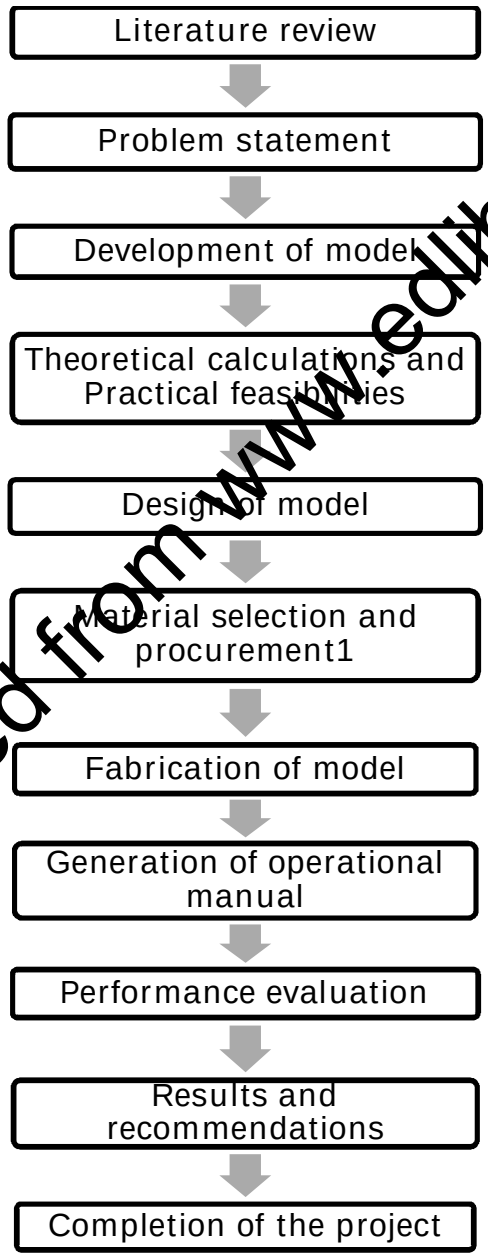
Material	*Percentage*
Graphite +C (%)	***30-55***
Sic (%)	20-55

Fig.3.1. Clay graphite crucible

3.2 Refractory Bricks

Refractory is a material which can withstand high temperature and does not fuse. Refractory materials are produced to meet the diversified as shown in Fig.3.2. Requirements of high temperature processes carried out in metal extraction, cement, glassmaking, manufacturing, ceramic industries.

4. Methodology



4.1 Construction of Furnace

Crucible furnace consists of crucible which is surrounded by refractory bricks, refractory cement. Arrange the refractory bricks one over the other filling the vacant space with refractory cement, which acts as a binder and also has good insulating property, the bricks must be closely packed as that no heat transfer may occur through the voids as shown in fig.4.1.

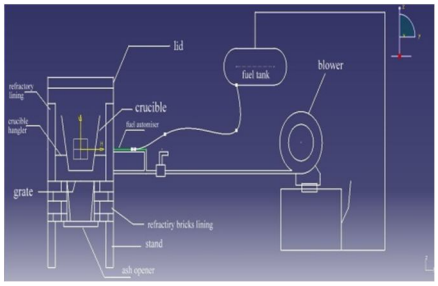


Fig.4.1 Furnace outline

4.2 Furnace Fabrications

Based on the available area in the workshop Mixed fuel fired furnace setup is installed by prior designing in CATIA as shown in fig.4.2 and fig.4.3.based on design calculations furnace is fabricated which is shown in Figures 5.1 and 5.2.

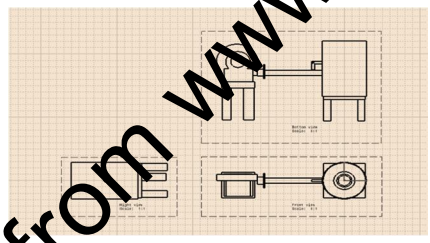


Fig.4.2 Furnace drafting

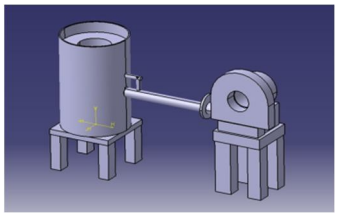


Fig4.3Assembled furnace

Fig.5.1 Fabricated Coke Fired Furnace

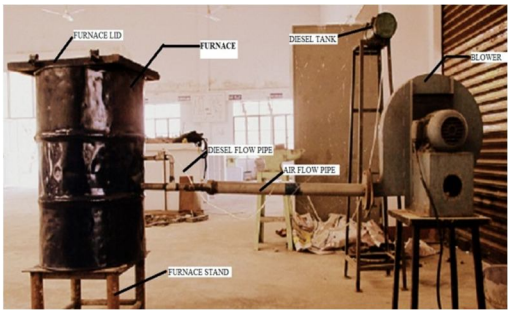


Fig: 5.2 Fabricated mixed fuel Fired Furnace

5.1 Performance Evaluation of Furnace

Performance evaluation is carried out under supervision of technicians by proper operational instructions. Heat transfer is shown in fig 5.1. First moulds of different patterns by calculating the amount of aluminum required. The moulds are dried two days and made ready for the casting. The crucible is preheated to 300^0C in oven in order to remove moisture.

Based on theoretical calculations with 10-20%furnace is charged with B grade coke and crucible is placed on the crucible stand inside the furnace. The crucible filled with aluminum is surrounded by coke, wood pieces for initial ignition. Air is sent through the blower for combustion and dynamometer is connected to measure the temperature. Aluminum casting is made and following observations were recorded as shown in table 5.1.

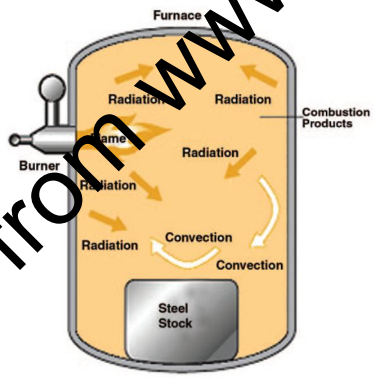


Fig.5.1 Heat transfer in furnaces

Table: 5.1 Observations for evaluation with coke

SI.NO	OBSERVATION	READING(MIN)
1.	Charging time	5.9
2.	Time for flame to start	3.2
3.	Time for continuous flame	4.2
4.	Melting start time	8.3
5.	Flux added time	12.5
6.	Time for complete melting of aluminum	29.6

5.2 Experiment Using Mixed Fuel:

During second experiment diesel is injected into the furnace through atomizing equipment from the diesel tank overhead. Diesel is atomized in the atomizer pipe placed over the blower and injected during firing by regulating valve. Furnace is covered with lid to decrease the heat loses as shown in table 5.2.

Table: 5.2 Observations for evaluation with Mixed Fuel

SI.NO	**Observation**	**Reading(min)**
1.	Charging time	4.1
2.	Time for flame to start	2.5
3.	Time for continuous flame	3.5
4.	Melting start time	6.8
5.	Flux added time	10
6.	Time for complete melting of aluminum	15.6

6. Results

Performance evaluation of the furnace was carried in two trails in first trail coke as chosen as a fuel melting of aluminum scrap was melted and castings were produced Second trail fuel is mixed fuel (diesel and Coke) furnace is operated melting was carried and castings were produced as shown in fig.6.1and 6.2 performance tests were conducted. There is no change in casting quality but Increase in efficiency of furnace when compared to coke fired is about 4.08**%** (refer to table 6.1).

It shows that the efficiency of the furnace is in the required range 20-30%.Castings produced were sound when fired with coke and diesel when compared to coke alone

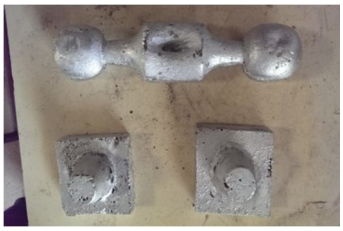


Fig.6.1 Castings produced when fired with coke

Fig.6.2 Castings produced when fired with coke and diesel

Table 6.1. Comparison between coke and mixed fuel fired furnaces

Factor	Coke fired	Coke and diesel fired
Time required for complete melting of aluminum	15min	25min
Cost of fuel	240/melt	280/melt
Cost of fuel for melting 100kg of aluminum	10000/melt	9800/melt
Advantage	Economical for lower melts(0-40kg of Al)	Economical for higher melts(40-200kg of Al)
Initial cost of the furnace for melting 10kg of Al	15000	18000
Efficiency of furnace	**28.16%**	**33.27%**

Conclusion

An energy efficiency of 28.2% was obtained when burnt with coke alone and it increased to 4% when fired with Mixed fuel (coke and diesel) the efficiency obtained in case of mixed fuel fired furnace is 32.3%.This is quite appreciable increase in efficiency. It is concluded that the furnace fabricated has reasonably for good efficiency with reference to standard efficiency (20-30%).The melting temperature was attained in short time starting from pouring time to tapping time. Finally Mixed fuel furnace that runs on coke and diesel oil for melting non-ferrous alloys have been installed successfully eventually This furnace can be effectively utilized as a melting furnace in our foundry laboratory. After the complete experimentation it is concluded that furnace may be effectively used for melting non-ferrous metals.

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Content Based Image Retrieval Using GLCM & CCM

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Abstract—The growth of digital image archives is increasing the need for the tools that effectively filter and efficiently search through large amounts of visual data. Towards this goal we propose a technique by which the color content and texture features of images is automatically extracted by using content based image retrieval (CBIR). CBIR has become one of the most active research areas in the past few years. Many visual feature representations have been explored. Image CBIR is emerging as an important research area with application to digital libraries, data mining, education, medical imaging, crime prevention and multimedia databases. The focus is on image processing aspects and in particular using color and texture features. Color feature is extracted by HSV. The color feature is represented by color histogram and texture feature extraction is obtained by using gray-level co-occurrence matrix (GLCM) or color co-occurrence matrix (CCM). Through the quantification of HSV color space, we combine color features and GLCM as well as CCM separately.

Keywords- Digital Image, color, CBIR, GLCM & CCM.

1 .Introduction

Content-based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases..

"Content-based" means that the search will analyze the actual contents of the image rather than the metadata such as keywords, tags, and/or descriptions associated with the image. The term 'content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. CBIR is desirable because most web based image search engines rely purely on metadata and this produces a lot of garbage in the results.

In CBIR, images in database are represented using such low level image features as color, texture and shape, which are extracted from images automatically. Among this level features, color features are the most widely used features for image retrieval because color is the most intuitive feature and can be extracted from images conveniently. However image retrieval using color and features often gives disappointing results, because in many cases, image with similar colors do not have similar content. This is due to the global color features computed often fails to capture color distributions or textures within the image. Several methods have been proposed to incorporate special color information in attempt to avoid color confusion by machine. However, this methods often results in very high dimensions of features which drastically slow down the retrieval speed of the system. In this paper we propose a method combining both color and

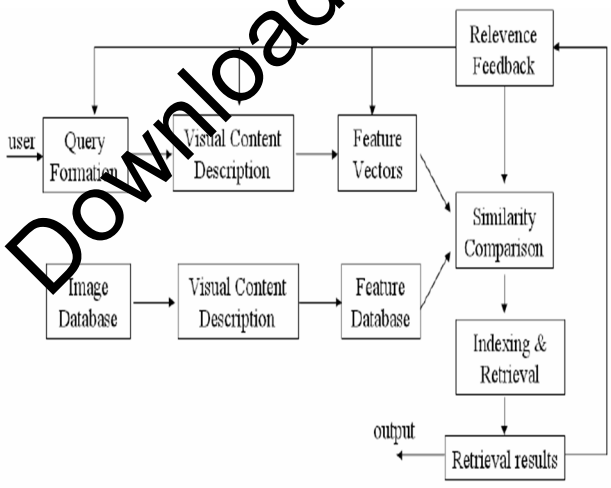


Diagram for content-based image retrieval system

texture features to improve retrieval performance. We compute both the color and texture features from the images and images in the database are indexed using both type of features. During retrieval process, given a query image, images in the database are firstly ranked using color features. Then in the second process, a number of top ranked images are selected and re–ranked according to their texture features. Because the texture features are extracted globally from the image, they are not an accurate description of the image in some cases. Therefore, we provide two alternatives to user, one is the retrieval based on color features, and the other is retrieval based on combined features. When the retrieval based on color fails, the user will use the other alternative which is the combined retrieval.

2. Color Feature Extraction

Basically there are three properties or three dimensions of color that being hue, saturation and value HSV means Hue, Saturation and Value. It is important to look at because it describes the color based on three properties. It can create the full spectrum of colors by editing the HSV values. The first dimension is the Hue. Hue is the other name for the color or the complicated variation in the color. The quality of color as determined by its dominant wavelength. This Hue is broadly classified into three categories. They are primary Hue, Secondary Hue and Tertiary Hue.

Saturation is the degree or the purity of color. Then the second dimension is the saturation. Saturation just gives the intensity to the colors. The saturation and intensity drops just by mixing the colors or by adding black to the color. By adding the white to the color in spite of more intense the color becomes lighter. Then finally the third dimension is the Value. The value is the brightness of the color. When the value is zero the color space is totally black with the increase in the color there is also increase in the brightness and shows the various colors. In accordance with the quantization level above, the H, S, V three-dimensional feature vector for different values of with different weights to form one dimensional feature vector and is given by the following equation:

G = Qs*Qv*H+Qv*s+V

Where Qs is the quantized series of S and Qv is the quantized series of V. And now by setting

Qs = Qv = 3, Then G = 9H+3S+V

In this way three component vector of the HSV from one dimensional vector, Which quantize the whole color space for the 72 kinds of the main colors. So we can handle 72 bins of one dimensional histogram. This qualification is effective in reducing the images by the effect of the light intensity, but also reducing the computational time and complexity.

$$H = \begin{cases} 0 \text{ if } h \in [316,20] \\ 1 \text{ if } h \in [21,40] \\ 2 \text{ if } h \in [41,75] \\ 3 \text{ if } h \in [76,155] \\ 4 \text{ if } h \in [156,190] \\ 5 \text{ if } h \in [191,270] \\ 6 \text{ if } h \in [271,295] \\ 7 \text{ if } h \in [296,315] \end{cases} \quad S = \begin{cases} 0 \text{ if } s \in [0,0.2) \\ 1 \text{ if } s \in [0.2,0.7) \\ 2 \text{ if } s \in [0.7,1) \end{cases} \quad V = \begin{cases} 0 \text{ if } v \in [0,0.2) \\ 1 \text{ if } v \in [0.2,0.7) \\ 2 \text{ if } v \in [0.7,1) \end{cases}$$

3. Proposed Method

We are proposing two algorithms for image retrieval based on the color histogram and wavelet-based color histogram.

3.1 Color Histogram

Step-1. Convert RGB color space image into HSV color space

Step-2. Color quantization is carried out using color histogram by assigning 8 level each to hue , saturation and value to give a quantized HSV space with 8*8*8=512 histogram bins

Step-3. The normalized histogram is obtained by dividing the total number of pixels.

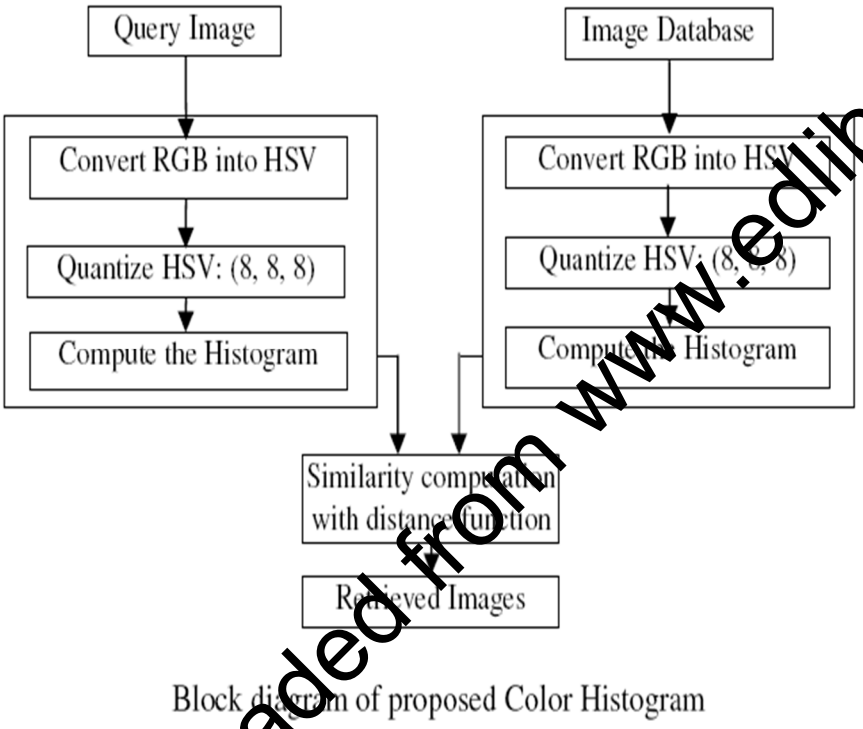
Step-4. Repeat step-1 to step-3 on an image in the database.

Step-5. Calculate the similarity matrix of query image and image present in the database.

Step-6. Repeat the steps from 4 to 5 for all the images in the database.

Step-7. Retrieve the images.

3.2 Wavelet-Based Color Histogram (WBCM)



Block diagram of proposed Color Histogram

Step1. Extract the red, Green and Blue components from an image.

Step2. Decompose each Red, Green and Blue Component using Haar wavelet transformation at 1st level to get approximate coefficient and vertical, horizontal and diagonal detail coefficients.

Step3. Combine approximate coefficient of Red, Green and Blue component.

Step4. Similarly combine the horizontal and vertical coefficients of Red, Green and Blue component.

Step5. Assign the weights to approximate components to horizontal and vertical coefficients.

Step6. Convert the approximate, horizontal and vertical coefficients into HSV plane.

Step7. Color quantization is carried out by color histogram by assigning 8 level to HSV space with 8*8*8=512 histogram bins.

Step8. The normalized histogram is obtained by dividing with total number of pixels.

Step9. Repeat step1 to step8 on an image in the database.

Step10. Calculate the similarity matrix of query image and image present in database.

Step11. Repeat the steps from9 to 10 for all the images in the database.

Step12. Retrieve the images.

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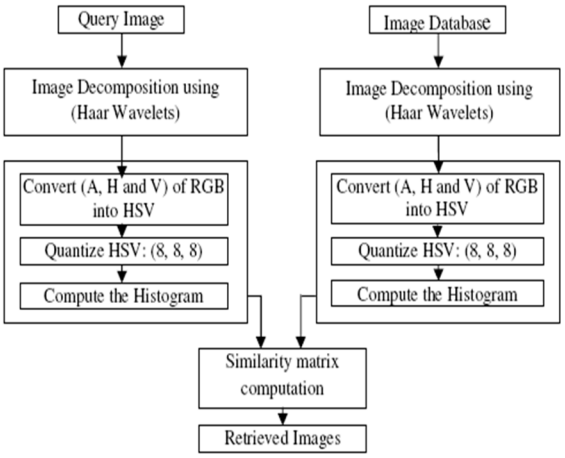
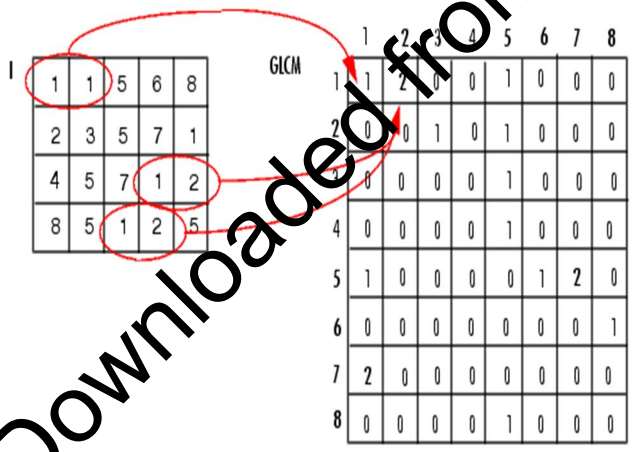


Block diagram of proposed Wavelet-Based Color Histogram (WBCH).

4. Texture Feature Extraction by GLCM

Gray-co-matrix function can be used to create the GLCM (Gray level co-occurance matrix). Graycomatrix function calculates how often the relationship between the pixel value i occurs with respect to the pixel value j. The pixel to its immediate right and by default the spatial relationship is defined as the pixel of interest. Even though the spatial relation between the two pixels is verified. Each element in the GLCM is nothing but the sum of the number of times that the pixel value i occurs with relation to the pixel value j.in the input image. For the full dynamic range of an image the processing required to calculate a GLCM is prohibitive. The input image was scaled by the gray matrix. By default to reduce the intensity values from 256 to 8 in Grayscale image graycomatrix use scaling. Using the num levels and the gray limits parameters of the graycomatrix function the number of gray levels and the scaling of the intensity values in the GLCM can be controlled. The properties about the spatial distribution of the Gray level in the texture image can be revealed by the Gray level co-occurance matrix.

The following figure shows how gray co matrix calculates the first three values in a GLCM. In the output GLCM, element (1, 1) contains the value 1 because there is only one instance in the input image where two horizontally adjacent pixels have the values 1 and 1, respectively. GLCM (1,2) contains the value 2 because there are two instances where two horizontally adjacent pixels have the values 1 and 2. Element (1,3) in the GLCM has the value 0 because there are no instances of two horizontally adjacent pixels with the values 1 and 3. Gray co- occurance continues processing the input image, scanning the image for other pixel pairs (*i, j*) and recording the sums in the corresponding elements of the GLCM.



GLCM expresses the texture feature according the correlation of the couple pixels Gray level at different positions. It quantification ally describes the texture features. But here mainly four things are considered they are energy, contrast, entropy and the inverse difference.

Energy:

$$E = \sum_x \sum_y p(x,y)^2$$

It is a gray scale image texture measure of the homogeneity changing reflecting the distribution of the image gray-scale uniformity of the image and the texture.

Contrast:

$$I = \sum\sum (x-y)^2 p(x,y)$$

Contrast is the main diagonal near the moment of inertia, Which measures the value of the matrix is distributed and images of local changes in the number, reflecting the image clarity and the texture of the shadow depth if the contrast is large then the texture is deeper.

Entropy:

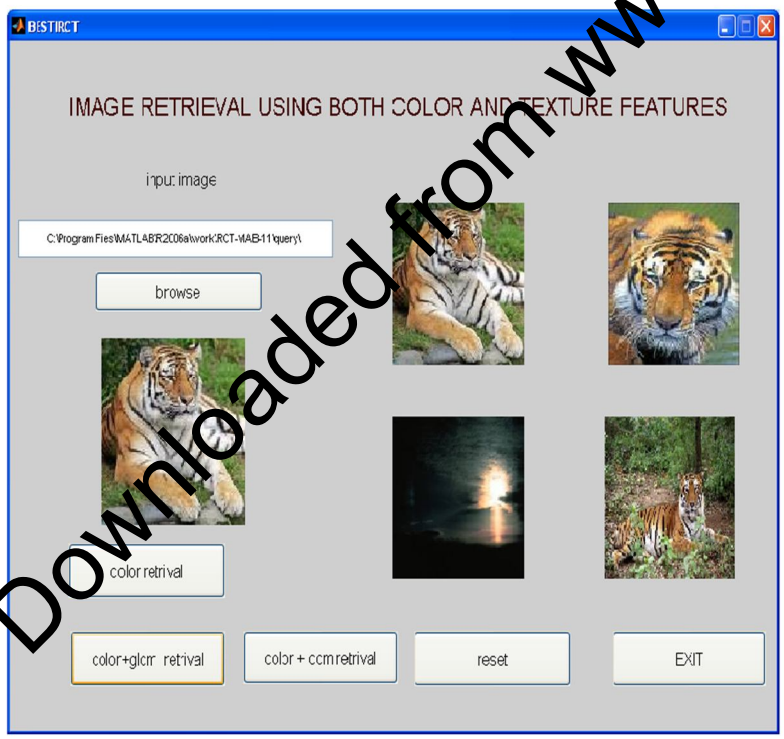
$$S = -\sum_{x}\sum_{y} p(x,y)\log p(x,y)$$

Entropy measures image texture randomness, when the space co- occurrence matrix for all values is equal, it achieved the minimum value; on the other hand, if the value of co-occurrence matrix is very uneven, its value is greater. Therefore, the maximum entropy implied by the image gray distribution is random.

Inverse difference:

$$H = \sum_{x}\sum_{y} \frac{1}{1+(x-y)^2} p(x,y)$$

It measures local changes in image texture number. Its value in large is illustrated that image texture between the different regions of the lack of change and partial very evenly. Here p(x, y) is the gray level value at the co ordinate (x , y).



4.1 Texture Feature Extraction Based on CCM

A co-occurance matrix or co-occurance distribution is a matrix or distribution that is defined over an image to be the distribution of co-occurring values at a given offset. Mathematically a co-occurance matrix c is defined over an n*m image I, Parameterized by an offset. The value of the image originally referred to the grayscale value of the specified pixel. The value could be anything, from a binary on/off value to 32-bit color and beyond. Note that 32-bit color will yield a $2^{32}x2^{32}$ co-occurrence matrix. Really any matrix or pair of matrices can be used to generate a co-occurrence matrix, though their main applicability has been in the measuring of texture in images, so the typical definition, as above, assumes that the matrix is in fact an image. It is also possible to define the matrix across two different images. Such a matrix can then be used for color mapping. The statistic features extracted from the CCM are as follows:-

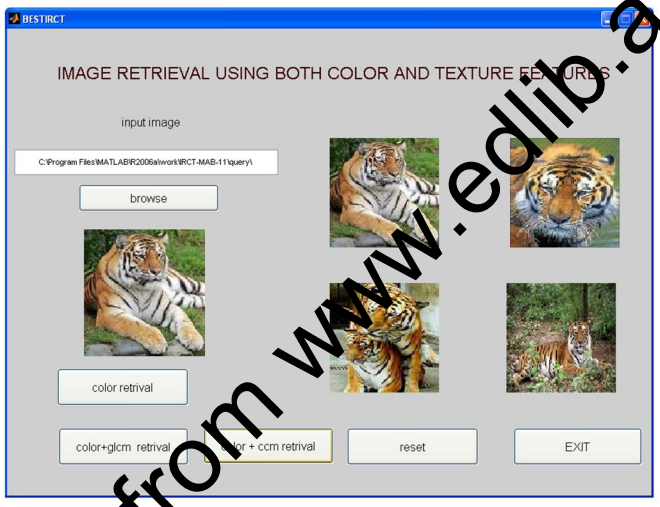
$$\text{Energy} \quad E = \sum_{i=1}^{D}\sum_{j=1}^{D}[m(i,j)]^2$$

$$\text{Contrast} \quad I = \sum_{i}^{D}\sum_{j}^{D}(i-j)^2 \bullet m(i,j)$$

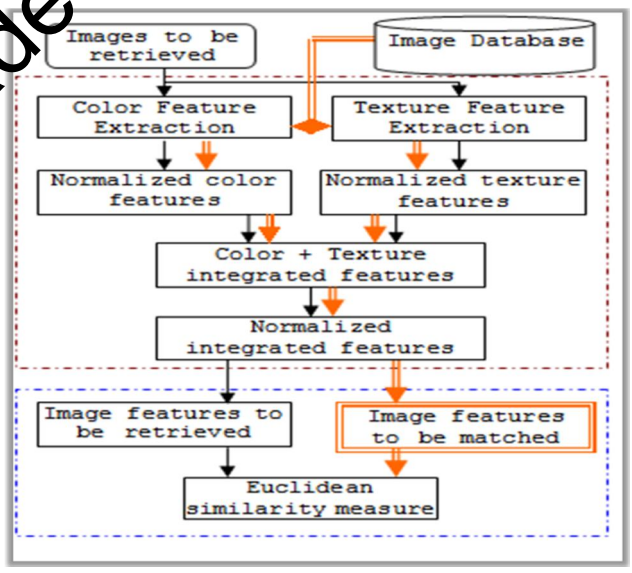
$$\text{Entropy} \quad S = -\sum_{i}^{D}\sum_{j}^{D} m(i,j) \bullet \log[m(i,j)]$$

$$\text{where,} \quad \text{if} \quad m(i,j) = 0, \quad \log[m(i,j)] = 0$$

$$\text{Inverse difference} \quad H = \sum_{i}^{D}\sum_{j}^{D} \frac{m(i,j)}{1+(i-j)^2}$$



5. Algorithm



6. Applications

1. In the military to find tanks or airstrips.
2. In urban development to determine the extent of housing sprawl.
3. In local government to track highway assets.

7. Conclusion

We presented a novel approach for Content Based Image Retrieval by combining the color and texture features called Wavelet-Based Color Histogram Image Retrieval (WBCHIR). Similarity between the images is ascertained by means of a distance function. The experimental result shows that the proposed method outperforms the other retrieval methods in terms of Average Precision. Moreover, the computational steps are effectively reduced with the use of Wavelet transformation. As a result, there is a substantially increase in the retrieval speed. The whole indexing time for the 1000 image database takes 5.6 minutes.

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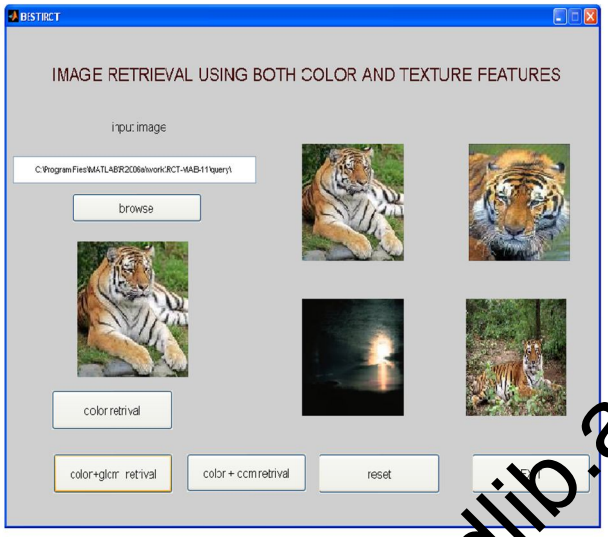
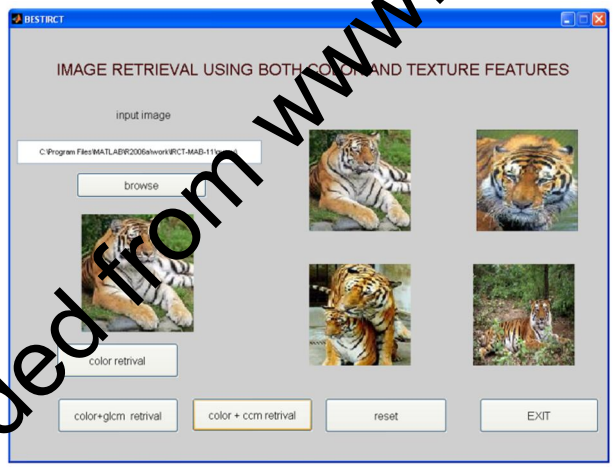
Experiment Results

1. Color + GLCM retrieval



2. Color + CCM retrieval



A Novel Approach for Faulty Phase Detection of Series Compensated Transmission Line

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ABSTRACT- Like fault location and identification and Classification, faulty phase identification is also an important aspect, if any fault has been taken place in the transmission line. This will help to take preventive measures and quick fault restoration. In this paper a method is discussed to identify the phase of the fault by using the sampling of voltage and current waveforms in the system with different conditions and cases and with different fault data's by using SMIB and WSCC-9bus system. Like in case of an LG fault, fault could be a Ph-A to G or Ph-B to G or Ph-C to G type. It is seen that phase of the fault can be predicted from the study of the properties of voltage and current waveform samples by using certain mathematical operator on it. Fault data is obtained through simulation of the studied system implemented by PSCAD/SIMULINK/EMTDC software.

Index Terms: Faulty Phase Identification, Greatest change, Voltage, Current, fault resistance, Distance, Sampling.

I. Introduction

In Power system majority of the faults are happened to be single line to ground fault [9]. Other than this, other important type of faults are LLG, LLL, LL, LLLG faults. In case any of these types of faults happens in the system, it is necessary to detect the presence, type, location as well as which phase involves fault to diagnose and restoration of the fault. Earlier the line or phase of the fault is tried to identify with the help of the electromagnetic coupling approach between faulty phases and non-faulty phases in a wide range of free oscillation frequency enables us to extract multiple frequency signals from non-faulty phases that includes the information of the free oscillating components of transient current in the faulty phase[8].In order to identify the faulty phase/line, many principles and methods have been proposed earlies line opening line approach, the injection signal technique and methods based on steady state components of fault currents. All the methods having many drawbacks like long outage time, inaccuracy and improper operation.

This paper presents a new method for identification of the faulty phases in case of occurance of fault in a transmission line. The Technique here is used by tracking the greatest change of current and greatest current sample or the least change of voltage and the least voltage sample. The faulty phase can be identified fast, accurately and reliably. The faulty data is provided by simulation of the studied system implemented by PSCAD/SIMULINK/EMTDC software. Other than this software mat lab codings are used to do complex and indispensible long calculations.

II.Studied System

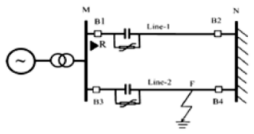

Fig: 1: A 400 KV SMIB System

The system is simulated using PSCAD to develop fault voltage and current signals including harmonics and decay DC components in addition to the fundamental frequency. Both Line1 and Line2 are 40% compensated here. Different types of faults are created at different conditions and combinations and with the proposed methodology the phase of the fault is detected.

III. Proposed Methodology for Detection of Faulty Phase/phases

Faulty phase identification can be categorized into two cases.

1) When only one Phase is involved in fault.
2) When more than one phase is involved in fault.

The necessary parameters required for the calculation are as follows:

a) Greatest Voltage
b) Greatest Change in Voltage
c) Greatest Current
d) Greatest Change in current.

The necessary steps for computation are as follows:

1) Sampling the simulated voltage and current waveforms.
2) From the samples calculate either greatest current and greatest change in current or greatest voltage and greatest change in voltage containing sample.
3) The phase which contains the greatest change in current sample or least change in voltage sample must contain fault. This will eliminate the problems of Zero Crossing Detector (ZCD) Case.

Now check for whether two or more phases contain fault or not. The computational steps are as follows:

1) Find out greatest current or least voltage contain sample.
2) Check the magnitude of the all the phases of current or voltage of that particular sample. If the values are found within ±5% tolerance limit of the greatest current or least voltage then those Phase or Phases will also contain the fault. Due to discrete time samples taken during the experiment the values of all the phases may not be exactly equal, so, a tolerance limit in the magnitude is set up. If the sampling frequency is increased then the accuracy of the algorithm will also be increased. Here sampling frequency is used 4KHZ for the work of this particular paper.

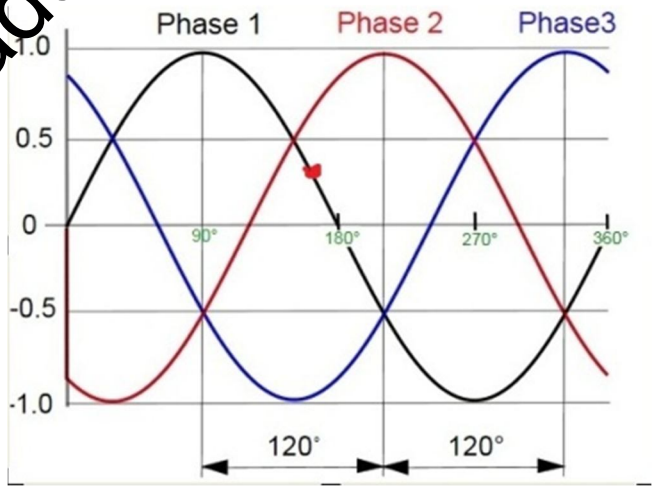

Fig2: A 3-Ph Waveform (Red mark Indicates the Occurrence of the fault-ZCD case)

IV. Case-I

Smib Test System & Results

Different types of faults are created by varying different parameters of the system like fault resistance and length and cross checked the obtained phase with this methodology and results are tabulated as below :

Least Voltage /Voltage Change Check Approach:

Table-1 with varrying Fault Resistance

Type of The Fault	Fault Resistance(Ohm)	Least voltage change(v)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	0.1	3.33715E-07	Ph-A	Ph-A
LG	1	3.33714E-06	Ph-A	Ph-A
LG	10	0.002171937	Ph-A	Ph-A
LG	100	0.000333597	Ph-A	Ph-A

Type	Fault Resistance(Ohm)	V_a (v)	V_b (v)	V_c (v)	Actual Phase	Ph-obtained
LLL	0.1	-2.9156	-3.04483	-3.00503	Ph-A,B,C	Ph-A,B,C
LLG	0.1	-0.0003	0.000298	-3.092	Ph-A,B	Ph-A,B
LL	0.1	5.407825	5.407529	-10.3163	Ph-A,B	Ph-A,B
LLG	10	-0.0292	0.030091	-30.6149	Ph-A,B	Ph-A,B

Table-2 with varrying Fault Distance

Type of The Fault	Fault Distance(KM)	Least voltage change(v)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	50	0.00017851	Ph-A	Ph-A
LG	100	0.000626696	Ph-A	Ph-A
LG	180	-0.00022962	Ph-A	Ph-A

Type	Fault Distance(KM)	V_a (v)	V_b (v)	V_c (v)	Actual Phase	Ph-obtained
LLG	150	-0.29763	0.295076	7.875798	Ph-A,B	Ph-A,B
LLG	100	-0.29363	0.298981	-18.4249	Ph-A,B	Ph-A,B

Greatest Current /Current Change Check Approach:

Table-3 with varrying Fault Resistance:

Type of The Fault	Fault Resistance(Ohm	Greatest Current change(Amp)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	0.1	0.000323	Ph-A	Ph-A
LLL	0.1	0.000322924	Ph-A,B,C	Ph-A,B,C
LLG	100	0.000289536	Ph-A,B	Ph-A,B
LLG	1	0.000322816	Ph-A,B	Ph-A,B

Table-4 with varrying Fault Distance

Type of The Fault	Fault Distance(KM)	Greatest Current change(Amp)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	100	0.000322658	Ph-A	Ph-A
LG	120	0.000322536	Ph-A	Ph-A

Type	Fault Distance(KM)	I_a (amp)	I_b (amp0	I_c (amp)	Actual Phase	Ph-obtained
LG	240	0.003456	-0.00092	-0.00081	Ph-A	Ph-A
LLG	80	-0.00296	0.002973	9.62E-06	Ph-A,B	Ph-A,B
LLG	80	-0.00134	-0.00306	0.002041	Ph-B,C	Ph-B,C
LL	100	-0.00293	0.002995	-6.12E-05	Ph-A,B	Ph-A,B
LL	100	-0.00297	0.001457	0.001518	Ph-B,C	Ph-B,C

V.Case-II

Application to the Multimachine 9-Bus System:

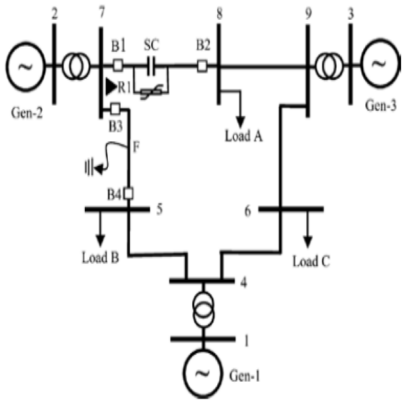

Fig3: A WSCC-3Machine-9bus System

The experimental result on Multi-machine-9 bus system is as follows:

Table-5 Least Voltage Change Approach With Varrying Fault Resistance

Type of The Fault	Fault Resistance(Ohm)	Least voltage change(v)	Actual Phase Involved fault	Obtained Phase involved Fault
LLL	1	1.74149255	Ph-A,B,C	Ph-A,B,C
LLL	10	1.74006701	Ph-A,B,C	Ph-A,B,C
LG	1	0.011717168	Ph-A	Ph-A
LL	10	0.451666	Ph-A,B	Ph-A,B

With varying fault distance:

Type	Fault Distance(KM)	V_a (v)	V_b (v)	V_c (v)	Actual Phase	Ph-obtained
LLL	50	-1438.79	-1438.67	-1438.97	Ph-A,B,C	Ph-A,B,C
LLG	20	-841.86	0.286246	-869.074	Ph-A,C	Ph-A,C

Greatest Current/current change Check Approach

Table-6 with Varrying fault Distance

Type of The Fault	Fault Distance(km	Greatest Current change(Amp)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	20	2.20481	Ph-A	Ph-A
LG	50	2.2603	Ph-A	Ph-A

Type	Fault Distance(KM)	I_a	I_b	I_c	Actual Phase	Ph-obtained
LLG	20	1.320816	0.003487	-0.0032	Ph-B,C	Ph-B,C
LL	20	-0.00572	0.005683	-0.00242	Ph-A,B	Ph-A,B

By varrying fault resistance :

Type of The Fault	Fault Resistance(Ohm	Greatest Current change(Amp)	Actual Phase Involved fault	Obtained Phase involved Fault
LG	10	0.002133	Ph-A	Ph-A

Type	Fault Resistance(Ohm)	I_a	I_b	I_c	Actual Phase	Ph-obtained
LLG	0.1	-7.46157	-0.00292	0.002479	Ph-B,C	Ph-B,C

LLG	1	2.109717	0.003337	-0.00346	Ph-B,C	Ph-B,C

VI. Conclusion

From the above results it is cleared that Phase detection for all types of faults are possible by analysis of the properties of voltage and current waveforms irrespective of varying fault resistance, fault distance or any other parameters.

Hence, we developed a technique for the actual detection of faulty phase of a series compensated transmission line with the sampling analysis of voltage and current waveforms.

Appendix A

System data for SMIB
Geneator:
600MVA,22KV,50HZ,H=4.4MW/MVA
Xd=1.81p.u,Xd'=0.3p.u,Xd''=0.23p.u,Td0'=8s,Td0''=0.03s,X0=1.76 p.u,Xq''=0.25p.u,Tq0''=0.03s,Ra=0.003p.u,Xp(Potier reactance)=0.15p.u.
Transformer:
600MVA,22/400KV,50HZ,D/Y,X=0.163p.u,
Xcore=0.33p.u,Rcore=0.0p.u,Pcopper=0.00177p.u
Transmission lines:
Length=320Km
Positive-sequence impedance=0.12+j0.88 Ohm/Km
Zero-Sequence Impedance=0.309+j1.297 Ohm/Km
Positive-sequence capacitive reactance=487.723x1000 Ohm-Km
Zero-sequence capacitive reactance=419.34x1000 Ohm-Km.

Appendix B

System data for 3-machine 9-bus configuration:
Gererators
Gen-1: 600 MVA,22KV,50HZ
Gen-2: 465 MVA,22KV,50HZ
Gen-3: 310 MVA,22KV,50HZ
Transformers
T1: 600 MVA,22/400KV,50HZ,D/Y;
T2: 465 MVA,22/400KV,50HZ,D/Y;
T3: 310 MVA,22/400KV,50HZ,D/Y;
Transmission line:
Length of line 7-8=320Km.,line 8-9=400Km,line 7-5=310Km.,line 5-4=350Km,line 6-4=350Km,line 6-9=300Km.
Loads
Load A=300MW+j100MVAr.
Load B=200MW+j75MVAr.
Load C=150MW+j75MVAr.
Other parameter used are same as APPENDIX A

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Cost Free Voice Communication between two portable devices over Local Area Network using Bluetooth Technology

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Abstract: Bluetooth technology is used to transfer data over short distances between mobile devices. Once the mobile is enabled with Bluetooth technology, we can transfer data to another portable device located within certain range of distance at free of cost. This paper aims at developing an application used to transfer voice data between two portable devices which are out of Bluetooth range. This is possible when the two portable devices are connected to PC's which are in turn connected over LAN.

Keywords : Local Area Network(LAN) , Personal Computer(PC), Personal Digital Assistant(PDA) , Internet Protocol(IP), Transmission Control Protocol(TCP), Java 2 Micro Edition(J2ME), Network Interface Card(NIC), Java Virtual Machine(JVM)

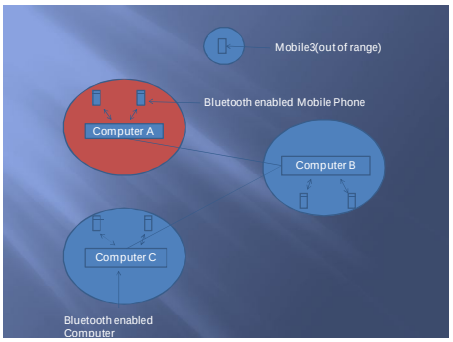
I. Introduction

Wireless communication plays an important role in present day life. We can have call facility , SMS facility etc. For this we have to pay certain amount of service charge to the service provider. This paper can be used to implement wireless communication services between two mobile phones without any service charges. It uses Bluetooth technology which is low cost, low power, short range radio technology intended to replace cable connections between cell phones and other portable devices. The communication services can be provided between two mobile phones separated beyond 10 meters range , provided the sender mobile and receiver mobile are connected to two different Bluetooth enabled PC's which are in turn connected using a LAN.

First, the signals are transmitted from source mobile phone to the connected PC which is within the range of 10 meters using Bluetooth technology and then the signals are transferred to the nearest host in the Bluetooth range of the destination mobile phone. Then this data is communicated to the destination phone.

II. Design

A. Hardware Architecture: Following figure shows the hardware architecture.



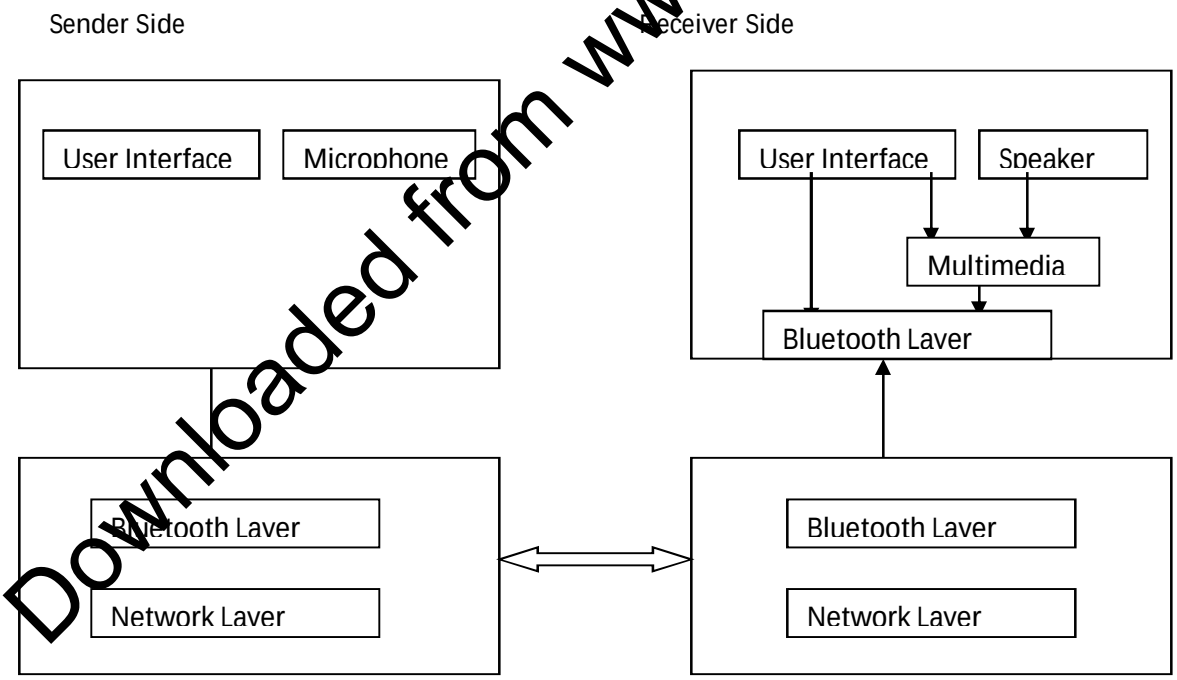
It shows computers connected via Local Area Network (LAN). Each computer is Bluetooth enabled and some Bluetooth enabled mobile phones are connected to them. The sender and receiver need not be within the Bluetooth range and they may be in the vicinity of different computers. The sender mobile sends the voice data to the computer present within it's Bluetooth range and then be transmitted to receiver computer (nearest computer in the Bluetooth range of destination mobile phone) via Local Area Network. This data is later transmitted to the receiver mobile.

B. Software Architecture

The sender/receiver mobile consists of four functional units. They are

1) User Interface: This is an interface between application and user. User can view the contacts, add new contact, set up a call by dialing the number. Appropriate messages such as "calling", "call terminated" etc are displayed to the user. The user at the receiver end enables the user to accept or reject the call.
2) Multi media: This unit is responsible for buffering audio data sent/received.
3) Hardware: It is the microphone for the sender to read the audio signals from the user and convert it to the digital data and speaker for the receiver to read audio signals received and playing it.
4) Bluetooth Communication Layer: At the sender side, this is responsible for transmitting audio packets and maintaining the connection with the sender side computer. At the receiver end, the unit is responsible for maintaining the connection with the receiver side computer and receiving the audio packets

The following figure depicts the system design.



The sender/Receiver side computer consist of two functional units each

1) Bluetooth Communication layer: This is for the communication between sender/receiver mobile phone and sender/receiver side computer. i.e., at the sender side, it waits for any incoming

connection request and receives the packets from sender mobile and forwards it. Similarly, at the receiver side the received data packets are forwarded to the receiver mobile.

2) Network Communication Layer: At the sender side , it waits for acknowledgement from the receiver and exchanges data packets. At the receiver end, the receiver side computer receives data packets from the sender side computer.

C. Classes Used:

The application consists of the following classes:

1) Buffer Class: The data structure called Buffer is used at the sender's and receiver's mobile phone. This indicates the length of the digital voice packets and also tells whether voice packets are available or not. The Buffer class is used at both sender's and receiver's end and is shared by multimedia and Bluetooth classes.
2) Control Flag Class: There is a data structure called Control Flag and is responsible for providing the control signals such as No Response, Terminate, Accept, Reject etc. to all the modules in the mobile side. Control Flag class is shared by all the modules at the mobiles end.
3) Multimedia handler class: This class is used at the sender's end to record or buffer the data which is then sent to receiver side.
4) Mobile Bluetooth class: At the sender mobile, this class is responsible for sending audio data to the personal computer in the Bluetooth range.
5) User Interface Frontend Class: This class provides the user a simple interface to use the application. The typical methods are ShowContacts(), addcontact(), call(), receive().
6) Bluetooth Listener class: This class present in the sender computer will listen to the incoming connection request from the senderside mobile and creates a data transfer object.
7) Network Listener Class: This class present at the receiverside computer will listen the requests from other computers and when there is an incoming request, it will create a data transfer object to serve the request.
8) Data Transfer Class : This class is used by Bluetooth listener and network listener classes

III Technologies Used

1) J2ME: Java 2 Micro Edition provides a robust and flexible environment for applications running on mobile and embedded devices. This technology was originally created in order to deal with the constraints associated with building applications for small devices. It makes possible to create Java applications running on small devices with limited memory, display and power capacity.
2) Bluetooth: Bluetooth is a wireless technology standard for exchanging data over short distances. Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables . It can connect several devices overcoming problems of synchronization.

Bluetooth technology is a communication protocol that uses radio frequencies to establish common talking points between compatible devices. All Bluetooth communications take place from 2.4 to 2.485 GHz band, which is used only for electronic devices and appliances.

The Bluetooth connection jumps from frequency to frequency (known as spread spectrum frequency hopping) thousands of times per second at random. This eliminates interference and increases security. Secured communication takes place because only the two linked devices know the pattern to unscramble the signal. The range of Bluetooth network is purposefully designed to be limited so that the devices donot use too much power. Most Bluetooth devices will stay in contact to a range of 10 meters. However we can find high power Bluetooth devices that work to a range of 100 feet.

IV Implementation

1. User Interface Module: This module is implemented at the sender's and receiver's mobile. It provides the user a way to interact with the system. The user can view the contact list and he can select the user with whom he wants to talk. The user can accept or reject calls. The user can also add new contacts into his existing contact list.

   Algorithm for User Interface at sender's end:

   Step1: Upon opening the application, the user is provided with the options-show contact list and adds contact.
   Step2: Read User's selection
   Step3: If option= 'add contact' then Read and add the new contact to the existing list.
   Step4: If option='show contact list' then Display the contact list.
   Step5: Read the user's input
   Step6: If option = 'call'

```
Begin
    Initiate the call
    Wait for time period 't', i.e., for receiver's response
    If no response within time period 't'
        Display "no response" and stop the application.
    If receiver's response='accept'
    Begin
        Display speak
        Read for user's input
        If input = call transfer
            Change the role of the sender and receiver.
        If input = terminate
            Stop the application.
    End
    If receiver's response= reject then stop the application.
End.
```

2. Multimedia Module: Multimedia module at the sender side is responsible for recording audio data for't' milliseconds. The recorded voice data is then stored in a buffer which is then forwarded to receiver mobile. At the receiver side, it is responsible for playing the audio data received from the sender side for 't' milliseconds.
3. Bluetooth Layer Module: Bluetooth is the transmission medium for communication between sender side mobile to nearest computer and between the receiver side computer and receiver side mobile. This module consists of four different stages:

   3.1. Sender side Mobile: The sender side mobile receives the receiver mobile's address with which call has to be set up. First, it checks whether a Bluetooth enabled computer is present in the current vicinity. If there is no such computer, it intimates the user interface module and exits. If computer is available, this module establishes the connection with the computer. Once the connection is established, the sender Bluetooth address is sent and it waits for the control packet from the computer and if the packet is "Not Found" it stops. If the packet is "Reject" it stops else if the packet is "Accept" , the multimedia module will start buffering the data and then write method will be called. It sends the buffered voice packets and control packets if any, to the computer. If the packet is "Transfer" then the read method will be invoked.

   3.2. Sender side Computer: In the sender side computer, there will be a Bluetooth listener object which establishes the service and waits for the incoming connections. When there is an

incoming connection, it creates a data transfer object to handle the connection , and goes back to listening state. The data transfer object receives the destination Bluetooth address and forward it to the network layer and then starts transferring the data from source mobile to the network layer.

3.3. Receiver side Computer: First, it receives the destination mobile's Bluetooth address . It checks whether the destination device is present in the vicinity. If not present , it intimates the network layer and exits. Otherwise establishes the connection and sends the source mobile's Bluetooth address to the destination mobile and intimates it to the network layer. Once the connection is established, it transfers data from network layer to mobile phone.

3.4. Receiver side Mobile Phone: Once the application is invoked at the receiver side mobile, it starts Bluetooth module , which will aquire the connection and receive the source address which is forwarded to the user interface module. Then it waits for the "Accept" signal and calls the read method which receives the packet from the nearest computer. And supplies it to the multimedia module for playing. If a "Transfer" packet is received , write method is called.

4. Network Module: This is responsible for sending the digital voice packets from computer at the sender side and to the computer at the receiver side. It also sends the control packets.

4.1. Network Module at Sender side: It first obtains the Bluetooth address of the destination mobile from the Bluetooth module. Then it will multicast the Bluetooth address to the computers which have the application installed. Then the module will create a process that will wait for time period't' . If no response is obtained, intimation is sent to the Bluetooth module that no response is received. Otherwise, with the information sent from the receiver side computer, the process created already at sender side computer establishes a TCP connection which acts as 'System-Mobile Thread'. It will listen for "Terminate" packet from the sender as well as the receiver. If it receives the "Terminate" packet then it will stop the application. When the connection is established, one more thread called Mobile-System thread' is created. It will listen to the packets from the Bluetooth module. It will send the packets to the receiver side computer until it gets a control packet.

4.2. Network Module at Receiver side: At the receiver side computer, this module waits for Bluetooth address sent by the sender. It forwards this address to the Bluetooth module and waits for response from it. If no response is obtained within time 't' , 'no response' intimation is sent to the sender side computer. Otherwise, it establishes a connection with the sender side computer which acts as System-Mobile thread'. This thread listens to the incoming digital voice packets from sender's side and forwards it to the Bluetooth module until a "Terminate" packet arrives. When the connection is established, this module creates another thread called 'Mobile-System thread'. This thread will be listening for packets from the receiver's mobile and will continue to do so until a "Terminate" packet arrives. Upon arrival of a "Terminate" packet tha application is stopped.

V Conclusion

The voice communication is made possible by combining LAN and Bluetooth technologies. The development of this application is mainly concentrated on using the existing infrastructure available in the campus or organization. Thus communication becomes cheaper. A half-duplex form of communication is implemented in which only one user can speak at a time and the other one listens. This application is developed for smart phone supporting Java technology.

VI Further Enhancements Done

The paper can be extended to support for computers which have dynamic IP addresses. This is accomplished by having a centralized server. All other computers will register with the centralized server by

giving it's IP address. This extension is implemented by my students R. Ranjith Kumar, K. Moses David, Ch. Anusha ,K. Shiva Kumar and Ch. Abhiramu as partial fulfillment of the requirement for the award of B. Tech degree in Information Technology Department at Christu Jyothi Institute of Technology and Science during the year 2012-13 under my guidance.

They have written a client program and server program using Java. The client reads the voice signal from the source mobile (Before this the mobile must get registered at that client) and sends it to the server process installed in the centralized server. Then the server process broadcasts the voice packets to all clients connected. The client under whose vicinity the destination mobile is present, accepts the voice packets and transmits to the destination mobile My students have practically implemented this application by executing client program and server program concurrently and then transmitting voice from client to server and then back to client (which may be connected to the destination mobile). In fact , it is a simulation. In a real situation , the exe files of client program has to be installed on number of clients connected in LAN and server exe file on centralized server.

VII Future Enhancements to be done

The application can be enhanced with additional features such as :

- Full Duplex mode of communication can be supported. This can be achieved by having two connections between communication parties.
- Connection can be maintained even if the user moves between the ranges. This can be achieved by initiating the nearby computer that there may be an out of range condition which has to be taken care of.

Acknowledgements

I thank my students who have implemented the extension part of this paper under my guidance Also, I would like to thank the management (Rev. Fr. Y. Papi Reddy , the director) and Principal (Dr. J.B.V. Subrahmanyam) for providing this opportunity and for their constant encouragement.

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An Efficient Resource Allocation Using Load Matrix Concept for Cellular System

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Abstract: Efficient radio resource allocation in cellular systems envisages the assignment of the number of subcarriers and relative transmission format on the basis of link quality. Traditional schemes have approached this problem mainly focusing on resources within a cell and to large extent ignoring effects of multi-cell architecture. In this paper we propose an optimum centralized radio resource allocator for the multi-cell scenario of cellular system which allows to highly out-performing iterative decentralized allocation strategies based on local optimization criteria. Simulation results show significant improvement in the resource utilization and overall network performance. Results show that maintaining cell interference within a margin instead of a hard target can significantly improve resource utilization.

I. Introduction

Resource allocation of the cellular systems is facing new challenges created by the demand for emerging services and applications. Wide range of services with diverse Quality of Service (QoS) requirements is becoming more popular and widely used [1]. The demand of higher bandwidth and data rates has been increased substantially during recent years. This has made it so important for future mobile cellular systems to implement an efficient resource allocation scheme .To achieve such a far-reaching goal, it is well known [2] that wireless systems should exploit multi-user diversity in order to share the radio resources among users with good channel conditions. However, the decision about which terminal is allowed to transmit is a difficult task on account of mutual interactions among mobile users due to radio interference. A variety of resource allocation strategies and schemes, mainly for downlink. In resource allocations were based on the specific characteristic resulting in minimization of power consumption [3]-[8] or maximization of system capacity. Under mixed service traffic including both real-time and non-real time services ,efficient resource allocation from a shared resource pool is a challenging task due to varied and stringent QoS requirements .In [4] a fixed resource partitioning method in which total resource pool was partitioned between different service classes and independent resource schedulers were responsible for each resource partition whereas in scheduling [5] is more unified and partitioning was dynamic to enhance spectral efficiency. Another approach towards resource allocation, called Utility Based Approach (UBA), tries to maximize the total network utility and thereby enhancing resource allocation. For example, pricing is a well-known utility function [6] for resource allocation. User's QoS as utility function and then converts the resource allocation problem in to a non-cooperative game [7], where each user tries to maximize its own utility. A downlink resource allocation method based on dynamic pricing was proposed in [8][9][10] was aimed to maximize the summation of users utility. On the link level, adaptive transmission is one of the most recent technologies being investigated for enhancing the spectral efficiency [11] in future cellular systems. Fast scheduling together with adaptive modulation-coding, facilitates exploitation of channel variations resulting in multi-user diversity gains [12]. This approach takes advantage of instantaneous channel conditions of different users where the channel fading are relatively independent. The basic advantage of decentralized over centralized approach is due to its fast response to dynamic and fast varying environment of mobile systems for resource allocation. However, the decentralized scheduling algorithms have an inherent short coming, due to their vulnerability to inter-cell interference, which has not been addressed yet. In other words, considerable proportion of Rise over Thermal Noise (RoT) at the base station is made up from multiple access inter-cell interference which the base station has little knowledge about or control upon. This in turn may lead the system to interference outage and poor resource utilization particularly when interfering cells have similar traffic load variations. We address inter-cell interference

problem of scheduling process by introducing a new and efficient resource allocation strategy called Load Matrix (LM). The aim of resource allocation in wireless cellular system is to assign radio resources to individual users in a way to achieve maximum system capacity whilst meeting the required quality of service.

This paper is organized as follows:

Section II, describes the system model. Section III, introduces the Single-cell scenario, i.e., a scenario where no extra cell interference is present, and proposes an optimization approach which is based on network flow formulation. Section IV, proposes a centralized optimization approach for the multi-cell scenario. Section V, describes a possible decentralized allocation strategy for the multi-cell scenario. Section VI, shows the results obtained for the centralized and the decentralized allocation strategies .Finally, Section VII, provides conclusive remarks.

II. System Model

A. Importance of Inter-Cell Interference Optimization

Uplink cell capacity in interference-limited systems is basically limited by the total received power at the base station .As the uplink load increases, user terminals have to increase their transmit power substantially to overcome the increased interference level at the base station. Due to the fact that the transmit power of user terminals is limited, total received power at the base station actually limits the uplink capacity .In decentralized scheduling, each base station assigns radio resources (i.e. rate and time) to its users until the estimated RoT reaches a predefined target value, RoT target. We assume RoT target is a fixed target value set by the network controller to maintain the uplink interference level. The main short coming for decentralized scheduling in general becomes more visible in a multi-cell scenario where a considerable proportion of RoT is inter-cell interference and base station has little knowledge about and control upon. By inter-cell interference any signal will received by the base station coming from those users which belong to other cells.

B. Resource Allocation Problem

A basic scenario is considered where resource allocation is down to assigning transmission rate and time to individual users with the objective of throughput maximization. To analyze the problem, we begin with the single cell scenario and then extend the conclusion to the multi-cell case. Without loss of generality, we assume that transmission rates are chosen from a limited set of rates .Let $S_{i,1}$ denote Candidate Rate Set (CRS) of user *i*, which includes all the allowed transmission rates for the user to choose. Rate"0" is always included in $S_{i,1}$ and will be chosen if the user is not scheduled to transmit in the current scheduling instant. We treat transmission rates in different CRSs as different items even if they have the same rate value:

$$S_{i,1} \cap S_{j,1} = \Phi \ \forall i \neq j \qquad (1)$$

Let S_1 denote the union of all the CRSs from $S_{1,1}$ to $S_{M_1,1}$ and M_1 is the total number of users in the cell sharing the radio resource pool .Choosing an element t from set S_1 is an assignment action, which means allocating a specific transmission rate to a particular user.

II. Single-Cell Scenario

If we are given a set of subcarriers $M = \{1, \ldots, m\}$, a set of users $U = \{1, \ldots, n\}$in the cell. Transmission requirements for a given user *i* set the corresponding rate R_i. Due to interference phenomena, users cannot share sub-carriers. Given a certain Signal-to-Interference Ratio (SIR), the ideal rate achievable on a channel that spans a bandwidth *B* is $R = B\eta$, where $\eta = log_2(1 + SIR)$ is the channel spectral efficiency in bit/s/Hz. Depending on the users rate requirements and on channel condition, the BS sets for each user a target

spectral efficiency. The spectral efficiency η_i for user *i* is set so that the rate constraint R_i can be converted into an integer number of sub-carriers $r_i = R_i / \eta_i$. In particular, setting the spectral efficiency η_i is tantamount to set the target SIR_i for user *i*: $SIR_i = 2^{\eta_i} - 1$. If sub-carrier *j* is assigned to user *i*, it requires a transmission power $p_i(j)$ equal to

$$p_i(j) = SIR_i \frac{BNo}{G_i(j)} \qquad (2)$$

Where SIR_i is the Signal-to-Interference Ratio of user *i* to achieve target spectral efficiency η_i, $G_i(j)$ is the channel gain of user *i* on sub-carrier *j* and N_0 is the power spectral density of the zero-mean thermal noise.

IV. Multi-Cell Scenario

In this section, the Multi-cell scenario is addressed, and the downlink transmission is considered. In particular, we address the problem of allocating sub-carriers among users, in such a way that users transmission requirements, in terms of Transmission quality and throughput are satisfied. The objective is to minimize the overall transmission power. The problem in the multi-cell scenario is formally described in the following. We are given a set of sub carriers $M = \{1, \ldots, m\}$, a set of cells $\{1, \ldots, K\}$, and for each cell *k for* a set of users $U_k = \{1, \ldots, n_k\}$. Let $U = \bigcup_{k=1}^{K} U_k$ be the set of all users in the system. Fo reach user *i*, we denote by $b(i)$ the cell of user *i*. Hence, $b(i) = k$ for all $i \in U_k$. Having set for each user a certain target spectral efficiency, transmission requirements for a given user *i* correspond to a certain number of sub-carriers r_i. In general, users belonging to different cells can share the same sub-carrier (while interference phenomena do not allow to users in the same cell to transmit on the same sub-carrier). However, the power to transmit on a given sub-carrier increases as the number of user's transmitting on those sub-carrier increases. More precisely, let $S(j)$ be the set of users (belonging to different cells) which are assigned with same sub-carrier *j*. Hence, the transmission powers requested by users in $S(j)$ on sub-carrier *j* are linked by the following relations.

$$SIR_i = \frac{G_i(j)\, p_i(j)}{\sum_{h \in s(j), h \neq i} G_i^{b(h)}(j) Ph(j) + BNo} \qquad (3)$$

where SIR_i is the target Signal-to-Interference Ratio corresponding to the spectral efficiency η_i of user *i*, $G_i(j)$is the channel gain of user *i* on sub-carrier *j*,$G_i^k(j)$ is the channel gain between user *i* and the base station of cell $k \neq b(i)$ on sub-carrier *j*. values $G_i^K(j)$ are a measure of the interference between user *i* and users of other cells transmitting on the same sub-carrier *j*. In Equation (2), we refer to the term $\sum h \in s(j), h \neq i(G_i^{b(h)}(j))$ Ph (j) as *co-interference term* .Thus, being SIR_i the target SIR corresponding to the spectral efficiency η_i, we use (2) to determine the power $p_i(j)$

$$P_i(j) = SIR_i \frac{\sum h \in s(j), h \neq i G_i^{b(h)}(j) Ph(j) + BNo}{G_i(j)} \qquad (4)$$

It is to be noted that, power $p_i(j)$ increases as the interference term increases, moreover, the interference term depends on the set of users, other than i, which are assigned the same sub carrier. On the other hand, if only user i is assigned sub-carrier j(i.e. if the Interference term is 0),by (3) is power $p_i(j) = \frac{SIR_i BNo}{G_i(j)}$.

V. Load Matrix Concept

One of the main challenges in resource allocation in a multi cell system is the control of inter-cell interference. In uplink scheduling, the basic problem is to assign appropriate transmission rate and time to all active users in such a way that result in maximum radio resource utilization across the network whilst satisfying the QoS requirements of all the users. Amongst other constraints, another important factor in the resource allocation is the users transmit power.

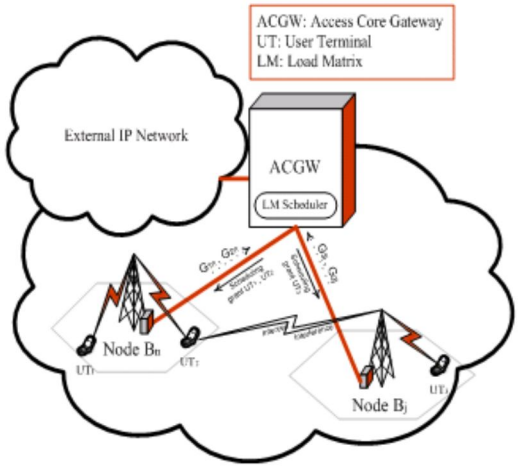

Fig 1.Centralized LM scheduling in a 3G LTE system

Load Matrix (LM) can be regarded as a data base containing the load factors of all active users in the network. LM scheduling can be implemented in both centralized and decentralized strategies. In a decentralized LM scheduling, each base station should implement identical LM database. For simplicity, we only present the centralized LM scheduling where a central scheduler entity assigns radio resources to all the users in the network. Figure 1 illustrates an example of LM scheduling implementation based on the proposed system architecture for the 3 rd Generation Long-Term Evolution (3G LTE). We assume the averaged channel gain (over the scheduling period) from users to base stations is known to scheduler prior to rate assignment.

VI. Simulation Results

To evaluate the performance of the LM concept, extensive system level simulations have been carried out and to emphasize the impact of other cell interference existing in both centralized and decentralized scheduling algorithms. Another important objective is to show the performance of the scheduling algorithms compared with the upper-bound limit rather than comparison between different algorithms. Comparison with the upper-bound limit is a better indication of scheduling algorithm efficiency. The upper-bound limit on the interference outage performance is defined as a "step function" in CDF of RoT interference out age performance directly

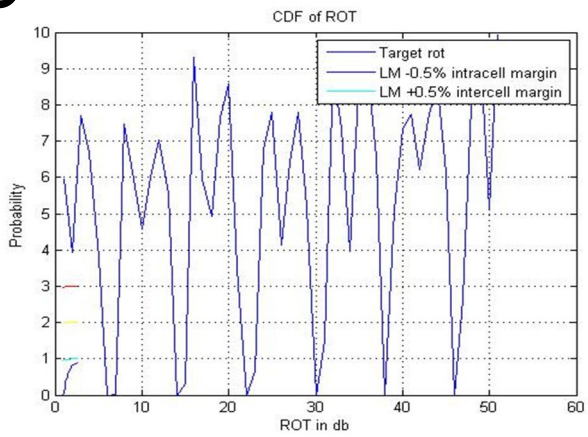

Fig 2.ROT fluctuation in a multi-cell scenario

Affects all other performance measures like throughput and packet delay. The comparison with the benchmark algorithm is provided here as an example to show the effectiveness of the LM scheduling compared with atypical scheduling algorithm used. General comparison between centralized and decentralized scheduling is already available in existing methods. The system level simulation models 19 Omni directional cell structure with 10 users per cell randomly and uniformly distributed. The resource allocation performance is carried out in terms of interference outage probability, averaged cell throughput and packet delay

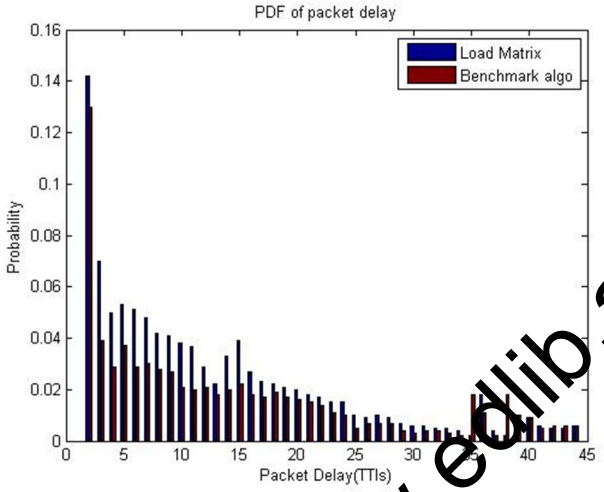

Fig 3.PDF (Histogram) of packet delay

The simulation results provided here are of two different types. The first type is to show the impact of the margin concept (both inter-cell and intra-cell) on the interference outage performance. The second type illustrates the performance of the LM (based on the best margin setup) compared with the benchmark algorithm and the upper bound limit in terms of interference outage.

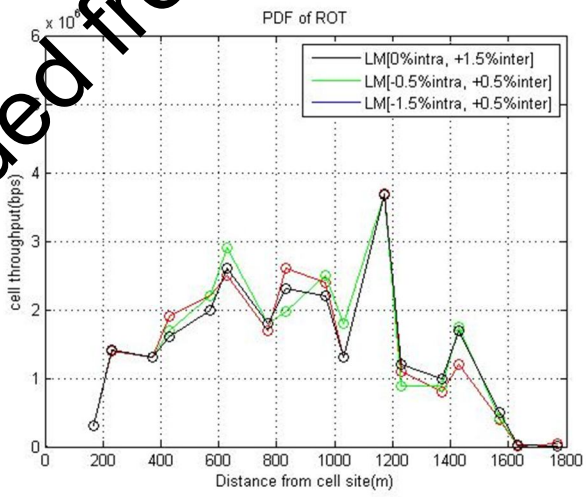

Fig 4.Average service throughput versus distance

.

The proposed centralized resource allocation strategy is characterized by huge implementation complexity, and, hence, it can be hardly implemented in the real world. To be specific, while the distributed heuristic

achieves a convergence point (in the positive case convergence is achieved) in few simulations seconds, the centralized approach requires several hundreds of seconds to come out with the optimum solution.

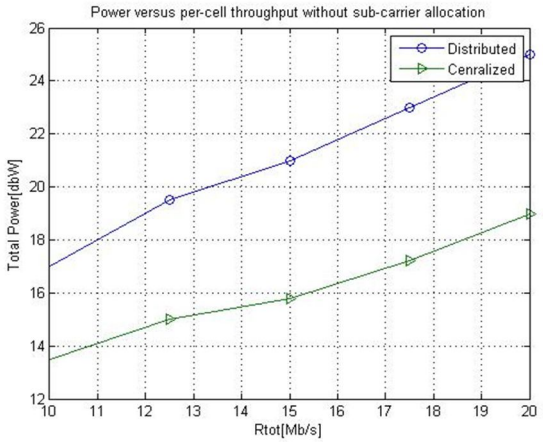

Fig 5 .Power vesus per-cell throught without sub-carrier allocation.

However, despite its implementation complexity, it is very useful for its ability of catching the essence of interference limit a tions in cellular systems. We consider two different scenarios .In the first case we assume that all users adopt the same transmission format, i.e., it $\eta_i = \eta$ for all users on all sub-carriers. Since the rate per sub-carrier is $B\eta$, the condition to achieve the requested R_{tot} is that $\eta = \frac{R_{tot}}{8*B}$. Note that, in this case, each user is assigned a fixed number of sub-carriers N= 2.The results relative to this first case are shown in Fig .5**.** The algorithm presented is supposed to achieve better performance than just assigning the same amount of resources to all users regards less of their channels. The results relative to this second case are shown in Fig.6.

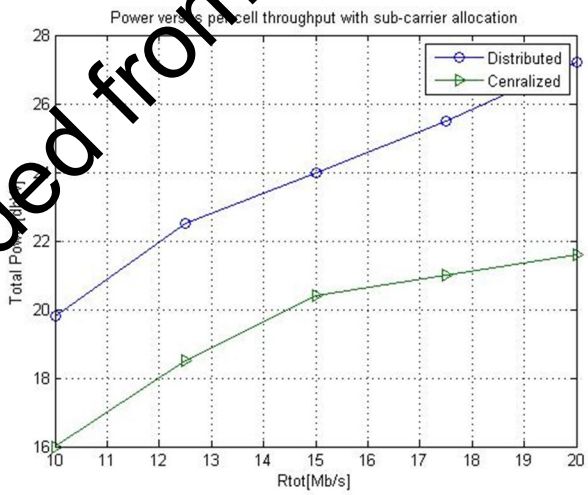

Fig 6**.** Power versus per-cell throughput with sub-carrier allocation.

VII. Conclusion

A novel approach towards efficient resource allocation for future wireless cellular systems was presented. The vulnerability of traditional resource allocation and scheduling schemes to inter-cell interference resulting in interference fluctuations was demonstrated. Such interference fluctuation, results incapacity wastage and excessive packet delay performance .The Load Matrix concept presented addresses this

problem specifically and provides an efficient resource allocation by jointly considering inter-cell and intra-cell interference before making decision on allocating radio resources .this paper to produce the performance results, the concept is generic for single-carrier spread spectrum based systems. In case of multi-carrier systems, the load on subcarriers can differ significantly and therefore RoT (averaged) is no longer a good measure for load over all subcarriers. It is worth noting that the sub-carrier allocation algorithm described in leads to performance degradation for both the centralized and the distributed heuristic cases. This is because users at cell border tends to consume the most of the resources (i.e., they are assigned the most of sub-carriers), thus producing interference over the neighbor cells over a large set of sub-carriers. Hence, since in this case neighbor cells are forced to use those (few) sub-carriers which experiment low interference, the diversity gain tends to be missed. This effect has not been foreseen in previous works dealing with a single-cell environment, and is one of the most interesting results of this study.

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Online Transactions Using Asp.net & Ado.net

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Abstract: The business-to-consumer aspect of electronic commerce (e-commerce) is the most visible business use of the World Wide Web. The primary goal of an e-commerce site is to sell goods and services online.

This project deals with developing an e-commerce website for Online Book Sale. It provides the user with a catalog of different books available for purchase in the store. In order to facilitate online purchase a shopping cart is provided to the user. The system is implemented using a 3-tier approach, with a backend database, a middle tier of Microsoft Internet Information Services (IIS) and ASP.NET and a web browser as the front end client.

In order to develop an e-commerce website, a number of Technologies must be studied and understood. These include multi-tiered architecture, server and client side scripting techniques, implementation technologies such as ASP.NET, programming language (such as C#, VB.NET), relational databases (such as MySQL, Access).

This is a project with the objective to develop a basic website where a consumer is provided with a shopping cart application and also to know about the technologies used to develop such an application.

This document will discuss each of the underlying technologies to create and implement an e-commerce website.

Keywords: e-commerce-online-asp.net-ado.net-server-client-mysql-html-

1. Introduction

E-commerce is fast gaining ground as an accepted and used business paradigm. More and more business houses are implementing web sites providing functionality for performing commercial transactions over the web. It is reasonable to say that the process of shopping on the web is becoming commonplace.

The objective of this project is to develop a general purpose e-commerce store where any product (such as books, CDs, computers, mobile phones, electronic items, and home appliances) can be bought from the comfort of home through the Internet. However, for implementation purposes, this paper will deal with an online book store.

An online store is a virtual store on the Internet where customers can browse the catalog and select products of interest. The selected items may be collected in a shopping cart. At checkout time, the items in the shopping cart will be presented as an order. At that time, more information will be needed to complete the transaction. Usually, the customer will be asked to fill or select a billing address, a shipping address, a shipping option, and payment information such as credit card number. An e- mail notification is sent to the customer as soon as the order is placed.

2. Literature Review

Electronic Commerce (e-commerce) applications support the interaction between different parties participating in a commerce transaction via the network, as well as the management of the data involved in the process [2].

The increasing importance of e-commerce is apparent in the study conducted by researchers at the GVU (Graphics, Visualization, and Usability) Center at the Georgia Institute of Technology. In their summary of the findings from the eighth survey, the researchers report that “e-commerce is taking off both in terms of the number of users shopping as well as the total amount people are spending via Internet based transactions”.

Over three quarters of the 10,000 respondents report having purchased items online. The most cited reason for using the web for personal shopping was convenience (65%), followed by availability of vendor information (60%), no pressure form sales person (55%) and saving time (53%).

Although the issue of security remains the primary reason why more people do not purchase items online, the GVA survey also indicates that faith in the security of e-commerce is increasing. As more people gain confidence in current encryption technologies, more and more users can be expected to frequently purchase items online [11].

A good e-commerce site should present the following factors to the customers for better usability [11]:

- Knowing when an item was saved or not saved in the shopping cart.
- Returning to different parts of the site after adding an item to the shopping cart.
- Easy scanning and selecting items in a list.
- Effective categorical organization of products.
- Simple navigation from home page to information and order links for specific products.
- Obvious shopping links or buttons.
- Minimal and effective security notifications or messages.
- Consistent layout of product information.

Another important factor in the design of an e-commerce site is feedback [4]. The interactive cycle between a user and a web site is not complete until the web site responds to a command entered by the user. According to Norman [5], "feedback--sending back to the user informa tion about what action has actually been done, what result has been accomplished--is a well-known concept in the science of control and information theory. Imagine trying to talk to someone when you cannot even hear your own voice, or trying to draw a picture with a pencil that leaves no mark: there would be no feedback".

Web site feedback often consists of a change in the visual or verbal information presented to the user. Simple examples include highlighting a selection made by the user or filling a field on a form based on a user's selection from a pull-down list. Another example is using the sound of a cash register to confirm that a product has been added to an electronic shopping cart.

Completed orders should be acknowledged quickly. This may be done with an acknowledgment or fulfillment page. The amount of time it takes to generate and download this page, however, is a source of irritation for many e-commerce users. Users are quick to attribute meaning to events. A blank page, or what a user perceives to be "a long time" to receive an acknowledgment, may be interpreted as "there must be something wrong with the order." If generating an acknowledgment may take longer than what may be reasonably expected by the user, then the design should include intermediate feedback to the user indicating the progress being made toward acknowledgment or fulfillment.

Finally, feedback should not distract the user. Actions and reactions made by the web site should be meaningful. Feedback should not draw the user's attention away from the important tasks of gathering information, selecting products, and placing orders.

3. Implementation Technologies

The objective of this project is to develop an online book store. When the user types in the URL of the Book Store in the address field of the browser, a Web Server is contacted to get the requested information. In the .NET Framework, IIS (Internet Information Service) acts as the Web Server. The sole task of a Web Server is to accept incoming HTTP requests and to return the requested resource in an HTTP response. The first thing IIS does when a request comes in is to decide how to handle the request. Its decision is based upon the requested file's extension. For example, if the requested file has the .asp extension, IIS will route the request to be handled by asp.dll. If it has the extens ion of .aspx, .ascx, etc, it will route the request to be handled by ASP.NET Engine.

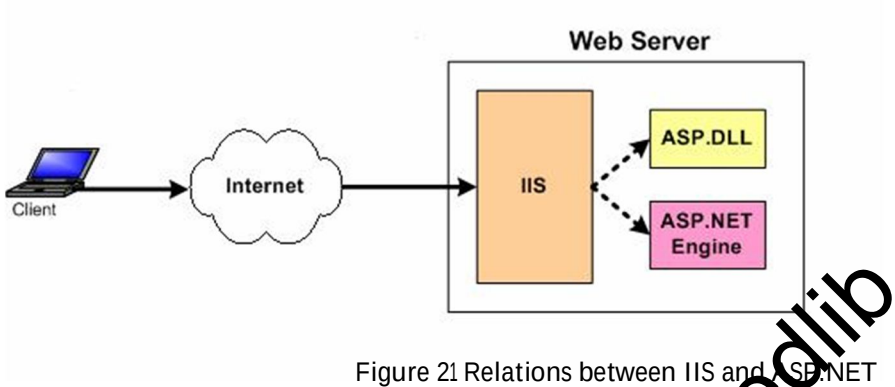

Figure 21 Relations between IIS and ASP.NET

The ASP.NET Engine then gets the requested file, and if necessary contacts the database through ADO.NET for the required file and then the information is sent back to the Client's browser. Figure 21 shows how a client browser interacts with the Web server and how the Web server handles the request from client.

1. Internet Information Services (IIS)

IIS is a set of Internet based services for Windows machines. Originally supplied as part of the Option Pack for Windows NT, they were subsequently integrated with Windows 2000 and Windows Server 2003). The current (Windows 2003) version is IIS 6.0 and includes servers for **FTP** (a software standard for transferring computer files between machines with widely different operating systems), **SMTP** (Simple Mail Transfer Protocol, is the de facto standard for email transmission across the Internet) and **HTTP/HTTPS** (is the secure version of HTTP, the communication protocol of the World Wide Web) [12].

Features: The web server itself cannot directly perform server side processing but can delegate the task to ISAPI (Application Programming Interface of IIS) applications on the server. Microsoft provides a number of these including ones for Active Server Page and ASP.NET.

Compatibility: Internet Information Services is designed to run on Windows server operating systems. A restricted version that supports one web site and a limited number of connections is also supplied with Windows XP Professional.

Microsoft has also changed the server account that IIS runs on. In versions of IIS before 6.0, all the features were run on the System account, allowing exploits to run wild on the system. Under 6.0 many of the processes have been brought under a Network Services account that has fewer privileges. In particular this means that if there were an exploit on that feature, it would not necessarily compromise the entire system.

2 ASP.NET

ASP.NET is a programming framework built on the common language runtime that can be used on a server to build powerful Web applications. ASP.NET has many advantages – both for programmers and for the end users because it is compatible with the .NET Framework. This compatibility allows the users to use the following features through ASP.NET:

a) **Powerful database-driven functionality:** ASP.NET allows programmers to develop web applications that interface with a database. The advantage of ASP.NET is that it is object-oriented and has many programming tools that allow for faster development and more functionality.
b) **Faster web applications:** Two aspects of ASP.NET make it fast -- compiled code and caching. In ASP.NET the code is compiled into "machine language" *before* a visitor ever comes to the website. Caching is the storage of information in memory for faster access in the future. ASP.NET allows programmers to set up pages or areas of pages that are commonly reused to be cached for a set period of time to improve the performance of web applications. In addition, ASP.NET allows the caching of data from a database so the website is not slowed down by frequent visits to a database when the data does not change very often.
c) **Memory leak and crash protection:** ASP.NET automatically recovers from memory leaks and errors to make sure that the website is always available to the visitors.

ASP.NET also supports code written in more than 25 .NET languages (including VB.NET, C#, and Jscript.Net). This is achieved by the Common Language Runtime (CLR) compiler that supports multiple languages.

3.2.1. Authentication in ASP.NET

There are two separate authentication layers in an ASP.NET application. All requests flow through IIS before they are handed to ASP.NET, and IIS can decide to deny access before ASP.NET even knows about the request. Here is how the process works [14]:

1. IIS checks to see if an incoming request is coming from an IP address that is allowed access to the domain. If not, the request is denied.
2. IIS performs its own user authentication, if it is configured to do so. By default, IIS allows anonymous access and requests are authenticated automatically.
3. When a request is passed from IIS to ASP.NET with an authenticated user, ASP.NET checks to see whether impersonation is enabled. If so, ASP.NET acts as though it were the authenticated user. If not, ASP.NET acts with its own configured account.
4. Finally, the identity is used to request resources from the operating system. If all the necessary resources can be obtained, the user's request is granted; otherwise the request is denied.

3.3. MySQL Database

In this project, MySQL is used as the backend database. MySQL is an open-source database management system. The features of MySQL are given below:

- MySQL is a relational database management system. A relational database stores information in different tables, rather than in one giant table. These tables can be referenced to each other, to access and maintain data easily.
- MySQL is open source database system. The database software can be used and modify by anyone according to their needs.
- It is fast, reliable and easy to use. To improve the performance, MySQL is multi-threaded database

engine. A multithreaded application performs many tasks at the same time as if multiple instances of that application were running simultaneously.

In being multithreaded MySQL has many advantages. A separate thread handles each incoming connection with an extra thread that is always running to manage the connections. Multiple clients can perform read operations simultaneously, but while writing, only hold up another client that needs access to the data being updated. Even though the threads share the same process space, they execute individually and because of this separation, multiprocessor machines can spread the thread across many CPUs as long as the host operating system supports multiple CPUs. Multithreading is the key feature to support MySQL's performance design goals. It is the core feature around which MySQL is built.

MySQL database is connected to ASP.NET using an ODBC driver. Open Database Connectivity (ODBC) is a widely accepted application-programming interface (API) for database access. The ODBC driver is a library that implements the functions supported by ODBC API. It processes ODBC function calls, submits SQL requests to MySQL server, and returns results back to the application. If necessary, the driver modifies an application's request so that the request conforms to syntax supported by MySQL.

4. Integrating IIS and ASP.NET

When a request comes into IIS Web server its extension is examined and based on this extension, the request is either handled directly by IIS or routed to an ISAPI extension. An ISAPI extension is a compiled class that is installed on the Web server and whose responsibility is to return the markup for the requested file type. By default, IIS handles the request, and simply returns the contents of the requested file [13].

This makes sense for static files, like images, HTML pages, CSS files, external JavaScript files, and so on. For example, when a request is made for a .html file, IIS simply returns the contents of the requested HTML file.

For files whose content is dynamically generated, the ISAPI extension configured for the file extension is responsible for generating the content for the requested file. For example, a Web site that serves up classic ASP pages has the .asp extension mapped to the asp.dll ISAPI extension. The asp.dll ISAPI extension executes the requested ASP page and returns its generated HTML markup. If the Web site serves up ASP.NET Web pages, IIS has mapped the .aspx to aspnet_isapi.dll, an ISAPI extension that starts off the process of generating the rendered HTML for the requested ASP.NET Web page.

The aspnet_isapi.dll ISAPI extension is a piece of *unmanaged code*. That is, it is not code that runs in the .NET Framework. When IIS routes the request to the aspnet_isapi.dll ISAPI extension, the ISAPI extension routes the request onto the ASP.NET engine, which is written in *managed code* - managed code is code that runs in the .NET Framework.

The ASP.NET engine is strikingly similar to IIS in many ways. Just like IIS has a directory mapping file extensions to ISAPI extensions, the ASP.NET engine maps file extensions to *HTTP handlers*. An HTTP handler is a piece of managed code that is responsible for generating the markup for a particular file type.

5. Database Connectivity

In e-commerce applications it is very typical for the Web server to contact the database to get information as needed. ASP.NET uses a technology called ActiveX Data Objects.NET (ADO.NET) to connect to the database.

5.1 ADO.NET

Classic ASP pages used ActiveX Data Objects (ADO) to access and modify databases. ADO is a

programming interface used to access data. This method was efficient and fairly easy for developers to learn and implement. However, ADO suffered from a dated model for data access with many limitations, such as the inability to transmit data so it is easily and universally accessible. Coupled with the move from standard SQL databases to more distributed types of data (such as XML), Microsoft introduced ADO.NET.

Although ADO.NET is known as the next evolution of ADO, it is very different from its predecessor. Whereas ADO was connection-based, ADO.NET relies on short, XML message-based interactions with data sources. This makes ADO.NET much more efficient for Internet-based applications.

A fundamental change from ADO to ADO.NET was the adoption of XML for data exchanges. XML is a text-based markup language, similar to HTML that presents an efficient way to represent data. This allows ADO.NET to reach and exchange. It also gives ADO.NET much better performance because XML data is easily converted to and from any type of data.

Another major change is the way ADO.NET interacts with databases. ADO requires "locking" of database resources and lengthy connections for its applications, but ADO.NET does not; it uses disconnected data sets, which eliminates lengthy connections
and database locks. This makes ADO.NET much more scalable because users are not in contention for database resources.

In ADO.NET there are two core objects that allow us to work with data initially: the DataReader and the DataSet. In any .NET data access page, before we connect to a database, we first have to import all the necessary namespaces that will allow us to work with the objects required. Namespace in .NET is a set of classes that can be used while creating an application. The .NET Framework has about 3,500 classes which can be accessed through a namespace. The application will be using a technology known as Open DataBase Connectivity (ODBC) to access the database; therefore we must first import necessary namespaces. Below is a sample namespace declaration used by .NET.

```
<%@ Import Namespace="System" %>
<%@ Import Namespace="System.Data" %>
<%@ Import Namespace="System.Data.Odbc" %>
```

After all the necessary namespaces are imported, a connection to the database is made.

```
OdbcConnetion odbcCon = new OdbcConnection ("DRIVER = {MySQL ODBC 3.51
                        Driver}; SERVER=localhost; DATABASE=project;
                        UID=root; PASSWORD=pwd");
odbcCon.Open();
```

The above statement creates a connection to the database with an OdbcConnection object. This object tells ASP.NET where to go to get the data it needs. Since the data is stored in the same computer as the application, the SERVER is given as *localhost.* Next we open the connection object. Listed below are the common connection object methods we could work with:

- ***Open*** - Opens the connection to our database
- ***Close*** - Closes the database connection
- ***Dispose*** - Releases the resources on the connection object. Used to force garbage collecting, ensuring no resources are being held after our connection is used.
- ***State*** - Tells you what type of connection state your object is in, often used to check whether the connection is still using any resources.

Once the connection is made, in order to access the data in a database, ADO.NET relies on two components: DataSet and Data Provider [20]. These components are explained below.

Dataset

The dataset is a disconnected, in- memory representation of data. It can be considered as a local copy of the relevant portions of the database. The DataSet resides in memory and the data in it can be manipulated and updated independent of the database. If necessary, changes made to the dataset can be applied to the central database. The data in DataSet can be loaded from any valid data source such as a text file, an XML database, Microsoft SQL server database, an Oracle database or MySQL database.

Data Provider

The Data Provider is responsible for providing and maintaining the connection to the database. A DataProvider is a set of related components that work together to provide data in an efficient and performance driven manner. Each DataProvider consists of the following component classes:

- The Connection object which provides a connection to the database
- The Command object which is used to execute a command
- The DataReader object which provides a read only, connected recordset
- The DataAdapter object which populates a disconnected DataSet with data and performs the update.

The Connection Object

The Connection object creates the connection to the database. Microsoft Visual Studio .NET provides two types of Connection classes: the SqlConnection object, which is designed specifically to connect to Microsoft SQL Server 7.0 or later, and the OleDbConnection object, which can provide connections to a wide range of database types like Microsoft Access and Oracle. The Connection object contains all of the information required to open a connection to the database.

The Command Object

The Command object is represented by two corresponding classes: SqlCommand and OleDbCommand. Command objects are used to execute commands to a database across a data connection. The Command objects can be used to execute stored procedures on the database, SQL commands, or return complete tables directly. Command objects provide three methods that are used to execute commands on the database:

ExecuteNonQuery: Executes commands that have no return values such as INSERT, UPDATE or DELETE.
ExecuteScalar: Returns a single value from a database query
ExecuteReader: Returns a result set by way of a Data Reader object

The DataReader Object

The DataReader object provides a read-only, connected stream recordset from a database. Unlike other components of the Data Provider, DataReader objects cannot be directly instantiated. Rather, the DataReader is returned as the result of the Command object's ExecuteReader method. The SqlCommand.ExecuteReader method returns a SqlDataReader object, and the OleDbCommand.ExecuteReader method returns an OleDbDataReader object. The DataReader can provide rows of data directly to application logic when one does not need to keep the data cached in memory. Because only one row is in memory at a time, the DataReader provides the lowest overhead in terms of system performance but requires the exclusive use of an open Connection object for the lifetime of the DataReader.

The DataAdapter Object

The DataAdapter is the class at the core of ADO .NET's disconnected data access. It is essentially the middleman facilitating all communication between the database and a DataSet. The DataAdapter is used either to fill a DataTable or DataSet with its Fill method. After the memory-resident data has been manipulated, the DataAdapter can commit the changes to the database by calling the Update method. The DataAdapter provides four properties that represent database commands:

Select Command
Insert Command
Delete Command
Update Command

When the Update method is called, changes in the DataSet are copied back to the database and the appropriate InsertCommand, DeleteCommand, or UpdateCommand is executed. .NET follows the below process, Figure 24, to connect to the database and retrieve data to the application [2].

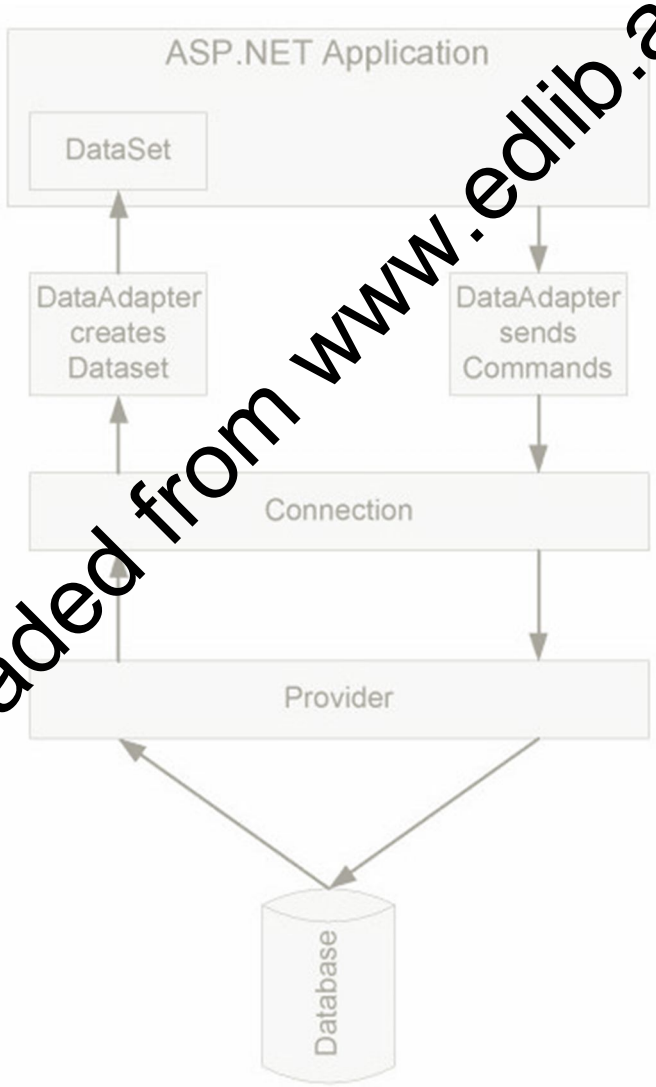

Figure 24 ADO.NET Architecture

- When an ASP.NET application needs to access the database, it submits an appropriate request to ADO.NET through a DataAdapter object, which in turn sends a command to the Connection object.
- The Connection object establishes a connection to the database and submits the request sent by DataAdapter.
- The Connection object connects to the database through a Provider such as ODBC.NET. The Provider acts as a translator between the Connection object and the database. It translates the request for data to database's language and brings back the data, if needed.
- The Provider sends the data back to the DataAdapter through the Connection object and DataAdapter places the data in a DataSet object residing in application's memory.

Instead of storing data in a DataSet, a DataReader can be used to retrieve data from the database. Results are returned in a resultset which is stored in the network buffer on the client until a request is made to **Read** method of the DataReader. Using the DataReader can increase the application performance by retrieving as soon as the data is available, rather than waiting for the entire results of the query to be returned [22].

A DataSet can be used to interact with data dynamically such as binding to a Web Form, cache locally in the application, provide hierarchical XML view of the data, etc. If such functionalities are not required by the application, a DataReader can be used to improve the performance of the application. By using a DataReader, the memory can be saved that is used by the DataSet, as well as the processing required to Fill the contents of a DataSet.

When a DataReader is used, a DataAdapter is not required to send the data to the application. In this project, DataReader is used to read the data and Command object called ExecuteNonQuery is used to write into the database.

5.2 Connecting ASP.NET application to a Database

The steps required to connect our ASP.NET application to the MySQL database and access the data are given below:

1. Import the required namespaces.

```
using System;
using System.Data;
using System.Data.Odbc;
```

2. Create a connection object.

```
string myConnectionString;
myConnectionString = "DRIVER = {MySQL ODBC 3.51 Driver}; SERVER = localhost;
                      DATABASE = project; UID = root; PASSWORD = ''"
OdbcConnection odbcCon = new odbcConnection(myConnectionString)
```

3. Create a SQL query

```
string str;
str="Select * from Customer where UserID='admin';
```

4. Create a Command object to run the SQL query

```
odbcCmd=new OdbcCommand(str,odbcCon);
```

5. DataReader to read the result

```
OdbcDataReader odbcReader;
String text, text2;
while (odbcReader.Read())
{
        text = odbcReader["UserID"].ToString();
        text2 = odbcReader[“FirstName”].ToString();
}
```

6. Close odbcReader and odbcConnection

```
odbcReader.Close();
odbcCon.Close();
```

The data can now be used as desired by the application.

6. Limitations and Future Development

There are some limitations for the current system to which solutions can be provided as a future development:

1. The system is not configured for multi- users at this time. The concept of *transaction* can be used to achieve this.
2. The Website is not accessible to everyone. It can be deployed on a web server so that everybody who is connected to the Internet can use it.
3. Credit Card validation is not done. Third party proprietary software can be used for validation check.

As for other future developments, the following can be done:

1. The Administrator of the web site can be given more functionalities, like looking at a specific customer's profile, the books that have to be reordered, etc.
2. Multiple Shopping carts can be allowed.

7. Conclusion

The Internet has become a major resource in modern business, thus electronic shopping has gained significance not only from the entrepreneur's but also from the customer's point of view. For the entrepreneur, electronic shopping generates new business opportunities and for the customer, it makes comparative shopping possible. As per a survey, most consumers of online stores are impulsive and usually make a decision to stay on a site within the first few seconds. "Website design is like a shop interior. If the shop looks poor or like hundreds of other shops the customer is most likely to skip to the other site"[16]. Hence we have designed the project to provide the user with easy navigation, retrieval of data and necessary feedback as much as possible.

In this project, the user is provided with an e-commerce web site that can be used to buy books online. To implement this as a web application we used ASP.NET as the Technology. ASP.NET has several advantages such as enhanced performance, scalability, built- in security and simplicity. To build any web application using ASP.NET we need a programming language such as C#, VB.NET, J# and so on. C# was the language used to build this application. For the client browser to connect to the ASP.NET engine we used Microsoft's

Internet Information Services (IIS) as the Web Server. ASP.NET uses ADO.NET to interact with the database as it provides in- memory caching that eliminates the need to contact the database server frequently and it can easily deploy and maintain an ASP.NET application. MySQL was used as back-end database since it is one of the most popular open source databases, and it provides fast data access, easy installation and simplicity.

A good shopping cart design must be accompanied with user-friendly shopping cart application logic. It should be convenient for the customer to view the contents of their cart and to be able to remove or add items to their cart. The shopping cart application described in this project provides a number of features that are designed to make the customer mo re comfortable.

This project helps in understanding the creation of an interactive web page and the technologies used to implement it. The design of the project which includes Data Model and Process Model illustrates how the database is built with different tables, how the data is accessed and processed from the tables. The building of the project has given me a precise knowledge about how ASP.NET is used to develop a website, how it connects to the database to access the data and how the data and web pages are modified to provide the user with a shopping cart application.

Acknowledgments

In completing this graduate project I have been fortunate to have help, support and encouragement from many people. I would like to acknowledge them for their cooperation.

First, I would like to thank HARISH REDDY, my project advisor, for guiding me through each and every step of the process with knowledge and support. Thank you for your advice, guidance and assistance.

I would also like to thank SALMON, my project committee members, who showed immense patience and understanding throughout the project and provided suggestions.

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A New Hybrid 9-Level Cascaded H-Bridge Multi Level Inverter for Low Power Applications

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Abstract: Multilevel converters offer advantages in terms of the output waveform quality due to the increased number of levels used in the output voltage modulation. This advantage is particularly true for cascade H-bridge (CHB) converters that can be built to produce a large number of levels owing to their modular structure. When increase the number of levels it requires more number of switches, it implies the size and cost of the device increases. To overcome this problem here we present a new Hybrid Cascaded H-Bridge Multi Level Inverter with reduced number of switches, this Hybrid Cascaded H-Bridge MLI is effective & efficient in improving the quality of the inverter output voltage as well as the output Power. Here, we describe about the structural parts, switching strategy and operational principles of the Hybrid Cascaded H-Bridge MLI. The Proposed topology reduces the number of switches as well as the number of Pulse generators. The simulation is done in MATLAB/SIMULINK software and the results shown for the existing multilevel inverter & proposed multilevel inverter, THD is reduced and also better speed response.

Keywords: Multi Level Inverter (MLI), Cascaded H-bridge, THD, Multi Level DC Link (MLDC), MATLAB/ SIMULINK Software.

1. Introduction

Multilevel inverter (MLI) structures have been developed to overcome shot comings in solid states switching device rating so that they can be applied to high voltage electrical systems. The multilevel; voltage source inverters unique structure allows them to reach high voltages with low harmonics without the use of the transformers. This makes these unique power electronics topologies suitable for flexible ac transmission system (FACTS) and custom power applications. The use of multilevel inverter to control the frequency, voltage output (including the phase angle), and real and reactive power flow dc/ac interface provides significant opportunities in the control of distributed power systems.

The multilevel topologies can be classified into three main categories: the neutral point clamped (NPC) [1], the flying capacitors [2] and the cascade H-bridge (CHB) converters [3]. The three-level NPC bridge is probably the most widely used topology for medium-voltage ac motor drives and pulse width modulation (PWM) active rectifiers [4]. NPC converters with more levels are also possible, although there are significant problems in the balancing of their dc- link capacitor voltages [5] unless modified modulation strategies [6] or an additionally circuitry [7] is used. On the other hand, the CHB converter is normally implemented with a large number of levels but at the cost of complicated and bulky input transformers with multiple rectifiers [8] or multi winding three-phase output transformers [9]. For this reason, in applications with no active power transfer, such as in reactive power compensation, where the converter can operate without the rectifier front end, the CHB is a highly attractive solution [10].

Multilevel inverters have recently increased interest in the research and industry communities in these kinds of inverters, the output voltage can take several discrete levels of equal magnitude. The multilevel inverters are aimed at reducing the harmonic content of generated voltage or current waveforms. The harmonic content of such a waveform is greatly reduced, if compared with a two-level waveform.

As the number of voltage levels m grows the number of active switches increases according to 2(m-1) for the existing cascaded H-bridge multilevel inverters. This project presents a nine level cascaded H-bridge multilevel inverter based on a Multilevel DC Link (MLDCL) and a bridge inverter. Compared with the existing cascaded multilevel inverters, the cascaded MLDCL inverters can significantly reduce the switch count as well as the number of gate drivers as the number of voltage levels increases. For a given number of voltage levels m, the cascaded MLDCL inverter requires m+3 active switches, roughly half the number of switches Simulation results are included to verify the operating principle of the proposed MLDCL inverters.

2. Multilevel Inverter

The voltage source inverters produce an output voltage or current with levels either 0 or ±Vdc. They are known as the two-level inverter. To produce a quality output voltage or a Current wave form with less amount of ripple content, they require high switching frequency. In high- power and high voltage applications these two level inverters, however, have some limitations in operating at high frequency mainly due to switching losses and constraints of device ratings. These limitations can be overcome using multilevel inverters. The multilevel inverters have drawn tremendous interest in power industry. It may be easier to produce a high-power, high voltage inverter with multi-level structure because of the way in which the voltage stresses are controlled in the structure. The unique structure of multilevel voltage source inverters allows them to reach high voltages with low harmonics without use of transformers or series connected synchronized-switching devices. As the number of voltage levels increases, the harmonic content of the output voltage wave form decreases significantly.

The multilevel inverter consists of series connection of switching power devices and each device is clamped to the dc link capacitor voltage through the clamping diodes, it does not require special consideration to balance the voltages of the power devices. In a multilevel inverter, each device is stressed to a voltage $V_{dc}/(n-1)$ where n is the number of levels and V_{dc} is the dc bus voltage. Hence the device stress is considerably reduced as the number of levels increases. This makes the multi-level inverters a best choice for the high voltage and high power applications and hence drawn a lot of attention for high power industrial applications.

The most attractive features of multilevel inverters are 1. They can generate output voltages with extremely low distortion and low dv/d t. 2. They draw input current with extremely low distortion. 3. High Efficiency.
A. Cascaded H-Bridge MLI: A single-phase structure of an m-level cascaded inverter is illustrated in Figure.

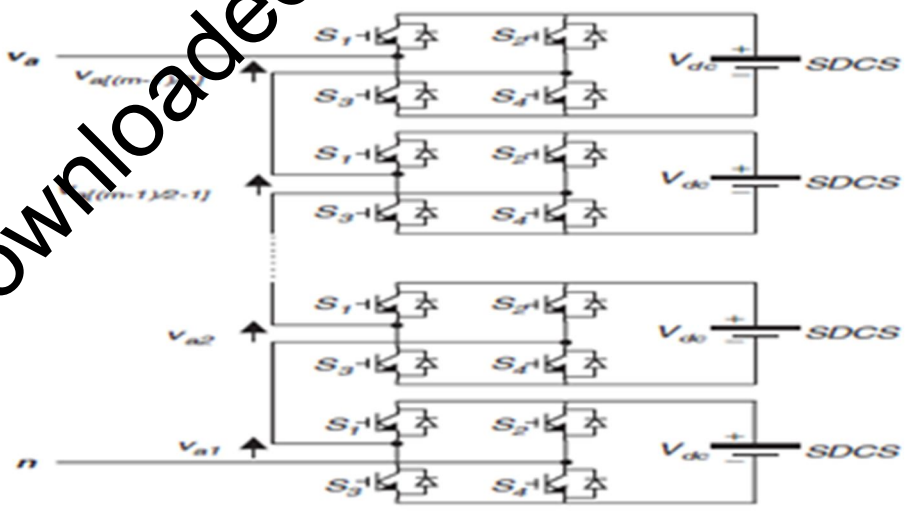

Fig. 1. Single-phase structure of a multilevel cascaded H-bridge Inverter

Table1.Switching Sequence for five levels Cascaded H-Bridge MLI

Switches / Output voltage	S1	S2	S3	S4	S_1'	S_2'	S_3'	S_4'
0 v	1	0	1	0	1	0	1	0
1v	1	0	1	0	1	1	0	0
2 v	1	1	0	0	1	1	0	0
1v	1	1	0	0	0	1	0	1
0 v	0	1	0	1	0	1	0	1
-1v	0	1	0	1	0	0	1	1
-2 v	0	0	1	1	0	0	1	1
0 v	0	0	1	1	1	0	1	0

Each separate dc source (SDCS) is connected to a single-phase full-bridge, or H-bridge, inverter. Each inverter level can generate three different voltage outputs, $+V_{dc}$, 0, and $-V_{dc}$ by connecting the dc source to the ac output by different combinations of the four switches, S1, S2, S3, and S4. To obtain $+V_{dc}$, switches S1 and S4 are turned on, whereas $-V_{dc}$ can be obtained by turning on switches S2 and S3. By turning on S1 and S2 or S3 and S4, the output voltage is 0. The ac outputs of each of the different full-bridge inverter levels are connected in series such that the synthesized voltage waveform is the sum of the inverter outputs. The number of output phase voltage levels m in a cascade inverter is defined by m = 2s+1, where s is the number of separate dc sources.

3. Proposed Hybrid Multilevel Inverter Scheme

The proposed cascaded H-bridge MLDCL inverter topology consists of a multilevel DC source to produce DC-link bus voltage V_{bus} and a single-phase full-bridge (SPFB) inverter consists of four switches S1-S4 to alternate polarity of DC-link bus voltage to produce an AC voltage. The DC source is formed by Connecting a number of half-bridge cells in series with each cell having a voltage source controlled by two switches S_{ak} and S_{bk}. The two switches and operate in a toggle fashion. The cell source is bypassed with S_{ak} on and S_{bk} off, or adds to the dc link voltage by reversing the switches. Figure.2 shows a circuit diagram of the proposed cascaded H-bridge MLDCL inverter topology.

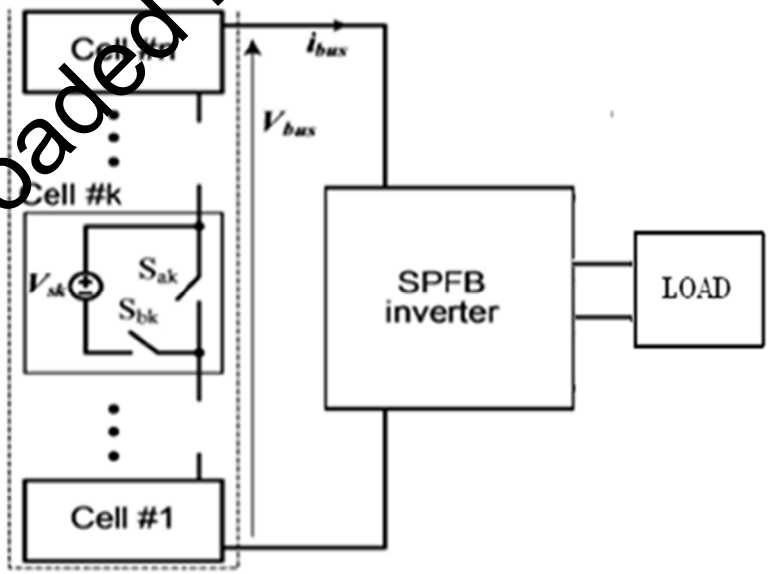

Fig.2 Block diagram of Proposed Hybrid MLI

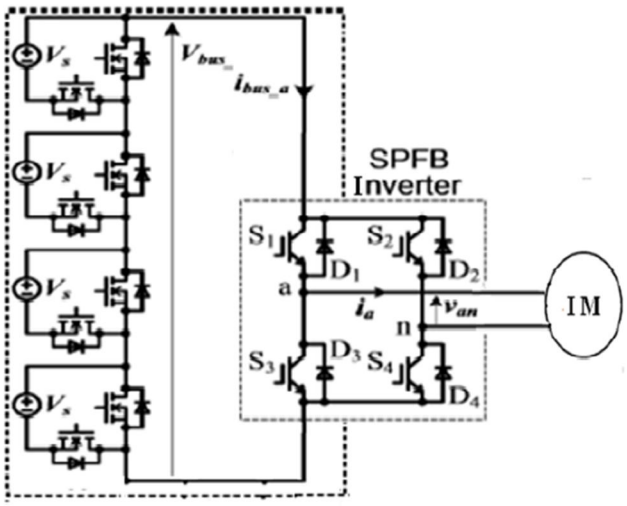

Fig.3 Circuit diagram of Proposed Hybrid MLI

The circuit diagram of the cascaded H-bridge multilevel DC-link inverter topology shown in Figure.3, it consists of multilevel DC-link voltage source and single phase full bridge inverter.

Multilevel DC-link voltage source:

Multilevel DC-link voltage source is formed by connecting a number of half-bridge cells in series with each cell having a voltage source controlled by two IGBT switches as shown in the Figure 4.

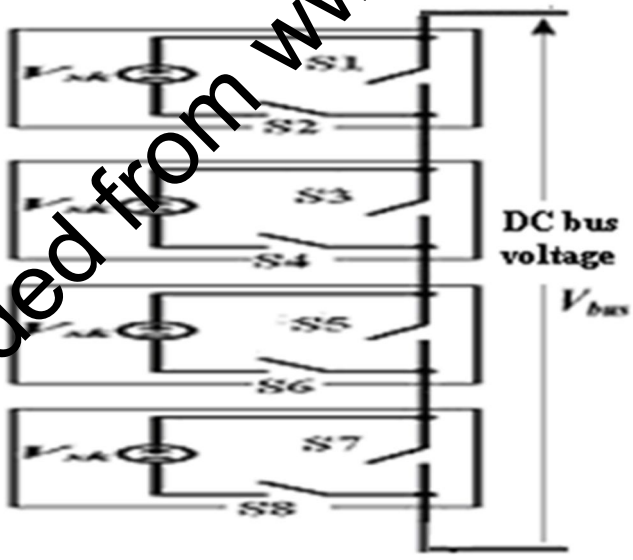

Fig.4 MLDCL Voltage source

The two IGBT switches will operate in a toggle fashion. Low on resistance and fast switching capability, low voltage IGBTS are utilized in each cell source to reduce the inverter cost or to provide a high bandwidth sinusoidal output voltage. The IGBT switches are triggered by proper switching signals to produce multi level DC-link bus voltage which is indicated by Vbus in the circuit diagram. Various modes of switching sequence is given in the table 2 to produce DC bus voltage Vbus with the shape of stair case with (n=4) steps, where n is the number of cell source that is given to the SPFB inverter.

Table2.Various modes of switching sequence to produce DC bus voltage

MODE 1		MODE 2		MODE 3		MODE 4		MODE 5	
S1-ON	S2-OFF	S2-ON	S1-OFF	S2-ON	S1-OFF	S2-ON	S1-OFF	S2-ON	S1-OFF
S3-ON	S4-OFF	S3-ON	S4-OFF	S4-ON	S3-OFF	S4-ON	S3-OFF	S4-ON	S3-OFF
S5-ON	S6-OFF	S5-ON	S6-OFF	S5-ON	S6-OFF	S6-ON	S5-OFF	S6-ON	S5-OFF
S7-ON	S8-OFF	S7-ON	S8-OFF	S7-ON	S8-OFF	S7-ON	S8-OFF	S8-ON	S7-OFF
MODE 6		MODE 7		MODE 8		MODE 9			
S2-ON	S1-OFF	S2-ON	S1-OFF	S2-ON	S1-OFF	S1-ON	S2-OFF		
S4-ON	S3-OFF	S4-ON	S3-OFF	S3-ON	S4-OFF	S3-ON	S4-OFF		
S6-ON	S5-OFF	S5-ON	S6-OFF	S5-ON	S6-OFF	S5-ON	S6-OFF		
S7-ON	S8-OFF	S7-ON	S8-OFF	S7-ON	S8-OFF	S7-ON	S8-OFF		

By giving the switching pulses to the switches in four H-bridge cells the MLDCL voltage source produces DC bus voltage Vbus with the shape of stair case with (n=4) steps that approximates the rectified waveform of the commanded sinusoidal voltage, where n is the number of cell sources that is given to the SPFB inverter. The desired DC bus Voltage Vbus is shown in the Figure 5.The switches in four cells will operate at twice of the fundamental frequency of the output voltage.

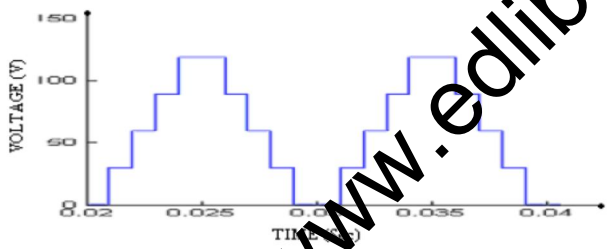

Fig 5.Desired DC bus voltage Vbus of cascaded H-bridge MLDCLI

Principle of Operation of Nine Level Cascaded H-bridge MLDCL Inverter

The principle of operation of nine level cascaded multilevel DC-link inverter is explained by explaining the operating principles of multilevel DC link voltage source and single phase full bridge inverter. To produce nine level AC output voltage, the multilevel DC-link source is formed by connecting four H-bridge cells in series with each cell having a separate voltage source controlled by two switches Sak and Sbk which will operate in a toggle fashion. The cell source is bypassed with Sak on and Sbk off, or adds to the DC link bus voltage by reversing the switches. The DC bus voltage Vbus is fed to the SPFB inverter. The switching signals are given to the SPFB inverter in turn to alternate the voltage polarity of the DC bus voltage Vbus for producing an AC output voltage Van of a stair case shape with (2n+1)=9 levels, whose voltages are -(V1+V2+.....+Vn) , -(V1+V2+.....Vn-1).....,-V2, - V1 ,0, V1, V2,.....(V1+V2+....Vn-1), (V1+V2+....Vn). Where V1,V2.....Vn are voltages of cell sources. The desired AC output voltage Van of cascaded H-bridge is shown in the Figure 6

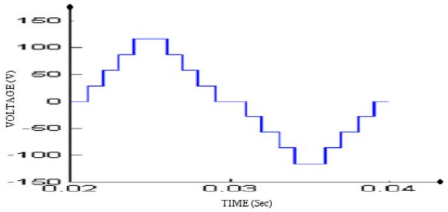

Fig.6 Desired AC output voltage Van of cascaded H-bridge MLDCL

4. Simulation Results

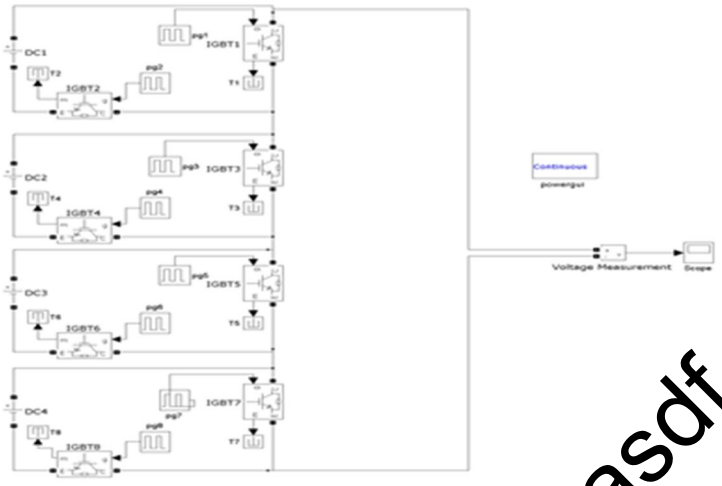

Fig.7 Proposed Nine level Cascaded H-Bridge MLDCL

Here demonstrated that the MLDCL inverters can significantly reduce the component count. As the number of voltage levels m grows, the number of active switches required is 2*(m-1) =16 for existing cascaded multilevel inverter and m+3 =12 switches are required for cascaded H bridge MLDCL inverter.
Here the simulation of conventional 9 level H bridge MLI and new proposed 9 level Cascaded H bridge MLDCL had done with RL load and Induction Motor (IM), and both the results are shown here

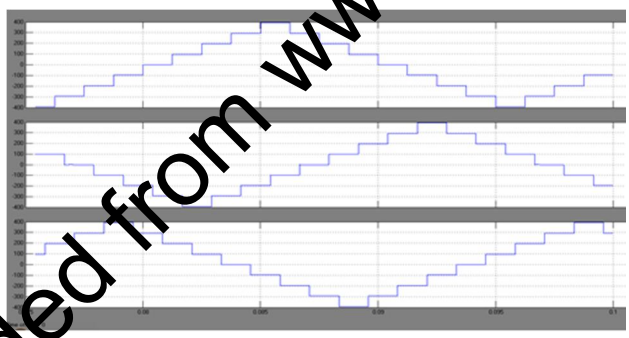

Fig.8 Simulation results of 9 level Cascaded H-Bridge MLI

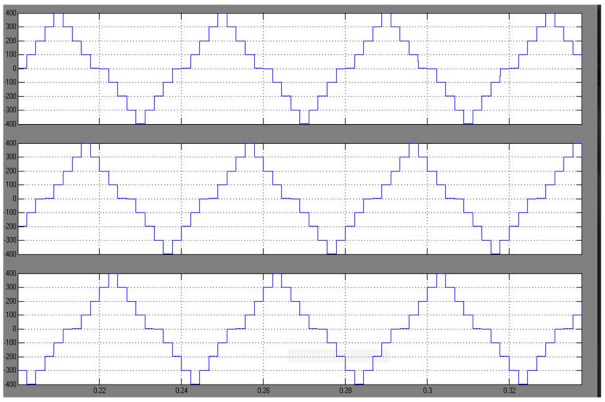

Fig.9 New proposed 3 phase Cascaded H-Bridge MLI output waveforms

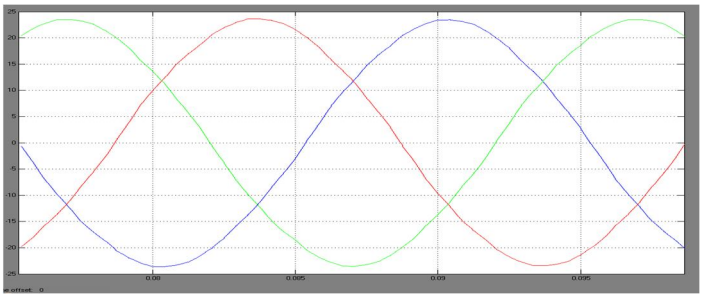

Fig.10 3-phase output current wave forms of 9 level conventional MLI fed IM

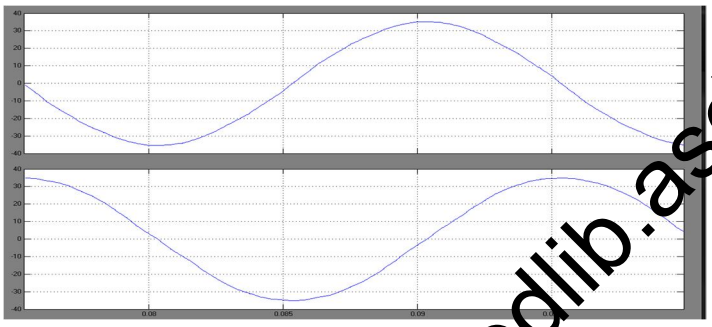

Fig.11 Currents I_{ds} & I_{qa} waveforms of 9 level conventional MLI fed IM

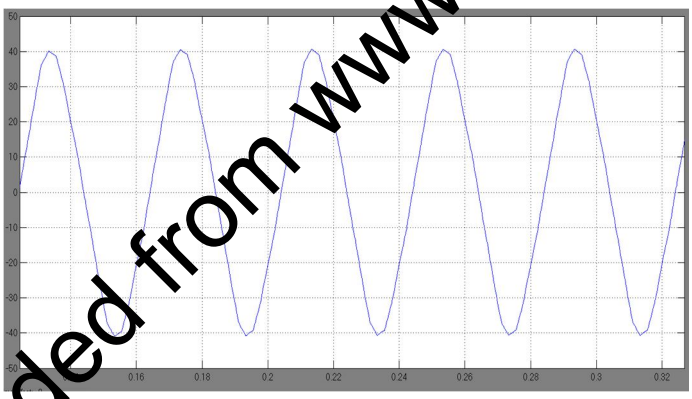

Fig.12 Output current of new proposed Three phase Cascaded H-Bridge MLI fed IM

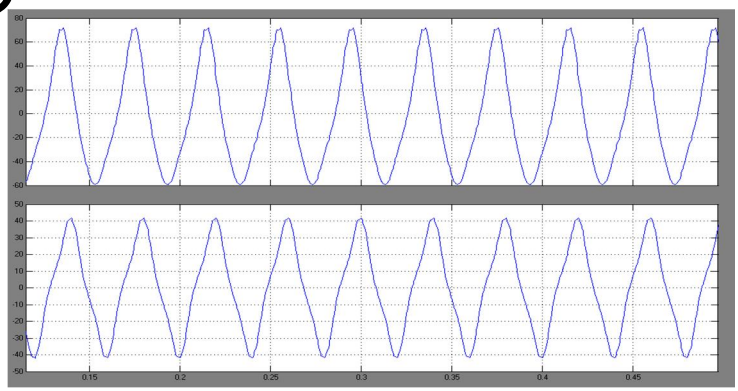

Fig.13 Currents I_{ds} & I_{qa} waveforms of new proposed 9 level conventional MLI fed IM

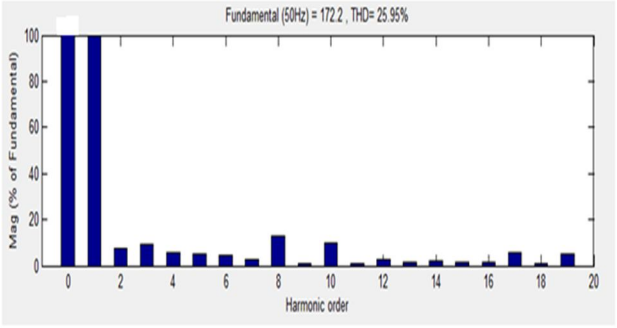

Fig.14 THD waveform for 9 Level conventional Cascaded H-Bridge MLI

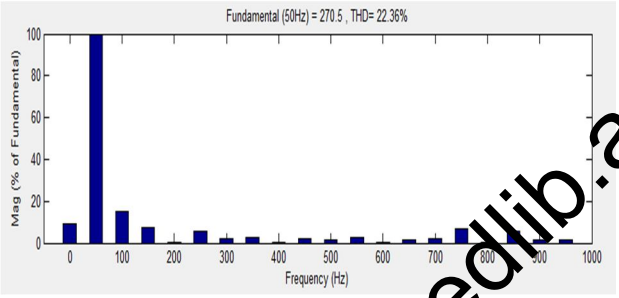

Fig.15 THD waveform for New proposed 9 Level Cascaded H-Bridge MLI

Fig 14 & Fig 15 are shown the Total Harmonic Distortion of 9 Level conventional Cascaded H-Bridge MLI and for New proposed 9 Level Cascaded H-Bridge MLI, from the above THD values we can observe that the THD value of New proposed 9 Level Cascaded H-Bridge MLI got less value compared to 9 Level conventional Cascaded H-Bridge MLI

Conclusion

Despite a higher total VA rating of the switches, the cascaded MLDCL inverters are cost less due to the savings from the eliminated gate drivers and from fewer assembly steps because of the substantially reduced number of components, which also leads to a smaller size and volume. One application area in the low-power range (100 kW) for the MLDCL inverters is in permanent-magnet (PM) motor drives employing a PM motor of very low inductance. The MLDCL inverter can utilize the fast-switching low-cost low voltage MOSFETs in the half-bridge cells, and the IGBT's in the single-phase bridges to dramatically reduce current and torque ripples and to improve motor efficiency by reducing the associated copper and iron losses resulting from the current ripple. These configurations may also be applied in distributed power generation involving fuel cells and photovoltaic cells.

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Internet-Marketing (Online Marketing): A New Trend in Marketing in India – Scope and Development

Kiran Kumar N

Abstract: The technological development with respect to internet has given a new dimension to marketing. Online customers are increasing and the virtual marketers realize the importance of customer oriented approach. This online facility benefits the users to gain in-depth information about the products and to compare and evaluate the products offered by various suppliers. This paper helps to understand the trend of Internet Marketing in India, its Scope and Development.

Introduction

At the beginning of the century, social life was mostly local. It was followed by a period in which commodities were produced on a mass scale .Consumer marketing operated on mass marketing principals and business primarily concerned itself with how to build the best sales force. At the end of the century, there is a emerging global culture .the major driver of these changes is technology. Technological change has moved steadily back focusing on the individual. These changes shape the possibility and conduct of business. Marketing is specially tied to communication and transportation revolution. As the tool and research of marketing increases the job and responsibilities of marketers have evolved with them. Meanwhile internet used as a big tool for market the products. At a glance this paper evaluates the emerging trends and the future of internet marketing. In today technology driven world, a new fast paced digital economy is emerging. In the near future, it would not be surprising to see that there are companies that exist only inside computer network.

To understand the Internet Marketing we need to examine the basic concept of marketing and the types of marketing.

Marketing

Marketing is defined by the AMA as "the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large."It can also be defined for business to consumer marketing as "the process by which companies create value for customers and build strong customer relationships, in order to capture value from customers in return". For business to business marketing, it can be defined as creating value, solutions, and relationships either short term or long term with a company or brand.

Types of Marketing

B2B: Business is the seller, Business is the buyer

B2C: Business is the seller, Consumer the buyer

C2B: Consumer is seller, Business is the buyer

C2C: Consumer is the buyer, Consumer is the seller

Business-to-business (B2B)

In Business-to-business Business is the seller, Business is the buyer. (B2B) describes commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer. Contrasting terms are business-to-consumer(B2C)and business-to-government(B2G).The volume of B2B (Business-to-Business) transactions is much higher than the volume of B2Ctransactions.The primary reason for this is that in a typical supply chain there will be many B2Btransactions involving sub components or raw materials, and only one B2C transaction, specifically sale of the finished product to the end customer. For example, an automobile manufacturer makes several B2B transactions such as buying tires, glass for windscreens, and rubber hoses for its vehicles. The final transaction, a finished vehicle sold to the consumer, is a single (B2C)transaction.B2B is also used in the context of communication and collaboration. Many businesses are now using social media to connect with their consumers (B2C); however, they are now using similar tools within the business so employees can connect with one another. When communication is taking place amongst employees, this can be referred to as "B2B" communication.

Business-to-Customer (B2B)

Retail or by mall, in small or individual lots for direct consumption by the purchaser. Retailing may include subordinated services, such as delivery. Purchasers maybe individuals or businesses. In commerce, a "retailer" buys goods or products in large quantities from manufacturers or directly or through a wholesaler, and then sells smaller quantities to the end-user. Retail establishments are often called shops or stores. Retailers are at the end of the supply chain. Manufacturing marketers see the process of retailing as a necessary part of their overall distribution strategy. The term "retailer" is also applied where a service provider services the needs of a large number of individuals, such as a public utility, like electric power. Shops may be on residential streets, shopping streets with few or no houses or in a shopping mall. Shopping streets may be for pedestrians only. Sometimes a shopping street has a partial or full roof to protect customers from precipitation. Online retailing, a type of electronic commerce used for business-to-consumer (B2C) transactions and mail order, are forms of non-shop retailing. Shopping generally refers to the act of buying products. Sometimes this is done to obtain necessities such as food and clothing; sometimes it is done as a recreational activity. Recreational shopping often involves window shopping (just looking, not buying) and browsing and does not always result in a purchase.

What is Business-to-Consumer?

To define Business-to-Consumer (B2C), often referred to as B2C, we need to understand electronic commerce. E-commerce or e-business is trade that occurs over the Internet. E-commerce is often used when referring to consumer trade, whereas e-business is reserved for business trade. Trade can occur either between businesses (B2B), between consumers (C2C), between businesses and consumers (B2C) or consumers and businesses (C2B). Thus, when we discuss Business-to-consumer we are referring to a type of e-commerce that occurs between a business and the consumer.

Benefits to B2C

B2C type of marketing reduces Intermediaries, Labor Costs, has Shorter Transaction Times, Improved Customer Service and Expanded Market

Challenges

It is costly, requires organization wide commitment, continuous change, new intermediaries, scaleable & flexible supply chain. The b2c customer is empowered by technology. The issues like consumer concerns,

privacy, security, consumer frustrations are difficult to handle and limitations like lengthy web forms, complicated sites, minimal assistance, and undisclosed expenses could be unavoidable.

Internet marketing (Online Marketing)

Internet marketing, also known as web marketing, online marketing, webvertising, or e-marketing, is referred to as the marketing(generally promotion) of products or services over the Internet. It is essentially any marketing activity that is conducted online through the use of internet technologies. It comprises not only advertising that is shown on websites, but also other kinds of online activities like email and social networking. Every aspect of internet marketing is digital, meaning that it is electronic information that is transmitted on a computer or similar device, though naturally it can tie in with traditional offline advertising and sales too. Internet marketing is considered to be broad in scope because it not only refers to marketing on the Internet, but also includes marketing done via e-mail and wireless media. Digital customer data and electronic customer relationship management (ECRM)systems are also often grouped together under internet marketing. Internet marketing ties together the creative and technical aspects of the Internet, including design, development, advertising and sales. Internet marketing also refers to the placement of media along many different stages of the customer engagement cycle through search engine marketing(SEM), search engine optimization(SEO), banner ads on specific websites, email marketing, mobile advertising, and Web 2.0 strategies.

Online marketing involves the marketing of products or services on the internet. Successful online marketing requires good search engine marketing strategies. Good online marketing strategies keep the web user returning to the website. Such strategies prevent the build-up of unsold inventory. They guarantee good monetary rewards for any individual who has channeled his or her efforts into internet marketing.

The Purpose of Online Marketing

The primary purpose of marketing an online business is the promotion of a good or service. Online marketing makes extensive use of the available tools for getting web users to purchase a product or service from a website. The website owner who wants to become acquainted with those tools should consider contacting an online marketing agency. Such an agency understands the purpose of online marketing and appreciates the value of an online marketing promotion. It can prepare the website owner for lucrative participation in online marketing activities.

Examples of Online Marketing Activities

In marketing an online business one needs to use good online search marketing activities. A wise website owner places priority on one particular activity, the creation of strong advertising copy. The website owner learns how to write or pays someone else to write, a strong advertising copy. Such strong advertising copy should contain lots of action verbs and should also appeal to the emotions of the potential buyer. Copy that achieves inclusion of these two elements represents the promotional value of powerful marketing activities. The use of online marketing activities unleashes the power of online marketing strategies. One very powerful activity allows the website owner to strategize by making skillful use of the resources on the internet. Use of the reverse search engine can be an important marketing activity. By using the reverse search engine, the website owner can estimate the demand for the product or service offered on the website. The reverse search engine also provides the keywords that the customer would be apt to use when searching for a particular product or service. The wise website owner then places those words in the content available on the website. Information that can help with the location of a reverse search engine might be obtained from an online marketing service. Such service could also assist with the identification of the target markets. Efforts directed at that identification would explain the utilization of the most useful marketing activities. The identification of target markets also creates a sure route to optimization of other

marketing activities. Identification of target markets adds strength to the use of e-mail. In addition, it assists with the identification of locations where a link would help to bring in more customers.

Internet use in India:

Internet access growth started accelerating in 2002 and both the web and email have now mainstreamed as both a consumer and business tool. Use is skewed massively towards specific up-market demographics and professional classes that have access as part of their working lives. The twenty something professionals are graduating college with internet access part of their personal landscape so a clear cohort effect is in play – as this group ages they replace the older generation where internet access is more patchy and the behavior, on the whole, less engrained. Email has become an important business tool for both domestic and international firms, and the ability to overcome the geographic challenges of such a large country have made it a quick replacement for fax services. However it's not just about work, the web is proving itself as both an entertainment and business media platform with many strong entertainment sites in sport and news traceable back to origins in the mid nineties. The strong home-grown content industry in India, complemented by a strong IT sectors in Bangalore, Mumbai and Delhi have fuelled internet development. In terms of international access, there is strong use of UK and US websites as well as international sports websites.

Mobile marketing in India:

While ownership of Internet-connected PCs might still be relatively low across the country – and reserved mainly for the more affluent city-dweller – mobile phone ownership is more wide spread and growing rapidly. The mobile device offers a great way for marketers to bridge the gap between the physical and digital world and you don't have to rely on the latest, most sophisticated smart-phones to engage your audience. Why not think about the options that can be offered by short codes text back response, SMS, Interactive Voice Response and automated outbound dialing?

Social marketing in India:

As more and more people connect to the internet in India, time spent social networking is exploding (on sites like Facebook and Orkut). It's one of the primary motivations for going online. As they do, marketers have the opportunity to reach and engage an interconnected audience and build brand reputation through the spread of positive word of mouth. But in order to be successful in social marketing you need to listen first, and then plan before jumping into the conversation. Once you are engaged in a dialogue, manage the responses carefully so you can maximize the benefits of brand advocates and minimize the risk of negative PR.

Online advertising in India:

The internet advertising industry remains young in India and behaves in a similar way to the Western European internet advertising industry 5-8 years earlier. The sector is dominated by financial services, IT/mobile and recruitment, with consumer package goods and motoring accounting for only small shares of the national online advertising market. However Indian consumers have experienced web advertising from the start of their use of the web so there is greater acceptance than in some of the Western European markets at a similar stage in their growth. The market is nationally driven with extra campaigns coming from global brands, but most of the budget confined to national businesses. However, negative perceptions about advertising remain and on the whole national media have been sluggish to provide online services comparable in quality to those in the UK and USA.

Types of Internet marketing

Internet marketing is broadly divided in to the following types:

Display advertising: the use of web banners or banner ads placed on a third-party website or blog to drive traffic to a company's own website and increase product awareness.

Search engine marketing (SEM): a form of marketing that seeks to promote websites by increasing their visibility in search engine result pages (SERPs) through the use of either paid placement, contextual advertising, and paid inclusion, or through the use of free search engine optimization techniques.

Search engine optimization (SEO): the process of improving the visibility of a website or a web page in search engines via the "natural" or un-paid ("organic" or "algorithmic") search results.

Social media marketing: the process of gaining traffic or attention through social media websites such as Facebook, Twitter and LinkedIn.

Email marketing: involves directly marketing a commercial message to a group of people using electronic mail.

Referral marketing: a method of promoting products or services to new customers through referrals, usually word of mouth.

Affiliate marketing: a marketing practice in which a business rewards one or more affiliates for each visitor or customer brought about by the affiliate's own marketing efforts.

Inbound marketing: involves creating and freely sharing informative content as a means of converting prospects into customers and customers into repeat buyers.

Advantages and limitations of Internet marketing

Internet marketing is inexpensive when examining the ratio of cost to the reach of the target audience. Companies can reach a wide audience for a small fraction of traditional advertising budgets. The nature of the medium allows consumers to research and to purchase products and services conveniently. Therefore, businesses have the advantage of appealing to consumers in a medium that can bring results quickly. The strategy and overall effectiveness of marketing campaigns depend on business goals and cost-volume-profit (CVP) analysis. Internet marketers also have the advantage of measuring statistics easily and inexpensively; almost all aspects of an Internet marketing campaign can be traced, measured, and tested, in many cases through the use of an ad server. The advertisers can use a variety of methods, such as pay per impression, pay per click, pay per play, and pay per action. Therefore, marketers can determine which messages or offerings are more appealing to the audience. The results of campaigns can be measured and tracked immediately because online marketing initiatives usually require users to click on an advertisement, to visit a website, and to perform a targeted action. Unlike an expensive advertisement on TV or in a magazine, much online marketing costs nothing. The website owner only needs to create a headline that will catch the attention of someone who is surfing the internet. With online marketing the website owner has total control over the content on the website. Thus the website owner has greater control over the information that is provided by the potential customers. Moreover, it is easy to watch for customer feedback and to change any information posted on the website.

Limitations

One of the challenges that internet markets face (as does the general public) is that many internet products are outright scams or promoted with deception making it difficult to know what one is buying. This is especially the case with products that are supposed to train or aid internet marketers in making money. While the quality of products has improved in the past few years, ethics is still often missing in internet

marketing. Many so-called money making products are "empty boxes" in which there is essentially nothing there yet a buyer is to make money by reselling this empty box to others. Pyramid schemes are also still prevalent.

Marketer will not be able to use the x-factor/personal touch factor/human touch factor to influence the audience as the marketing is completely based on the advertisement and the information that the advertisement might lead to [websites, blogs and other channels].

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Retrieval of Remote Sensing Images based on Color Moment and GLCM

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Abstract: The remote sensing image archive is increasing day by day. The storage, organization and retrieval of these images poses a challenge to the scienitific community. In this paper we have developed a system for retrieval of remote sensing images on the basis of color moment and gray level co-occurrence matrix feature extractor. The results obtained through prototype system is encouraging.

Keywords: Remote Sensing Image Retrieval, Color Moment, Gray Level Co-occurrence Matrix, Clustering index.

I. Introduction

Content-based image retrieval (CBIR) technology was proposed in 1990s and it is an image retrieval technology using image vision contents such as color, texture, shape, spatial relationship, not using image notation to search images. It resolves some traditional image retrieval problems, for example, manual notations for images bring users a large amount of workload and inaccurate subjective description. After more than one decade, it has been developed as content-based vision information retrieval technology including image information and video information. Great progress has been made in theory and applications.

At present, CBIR technology obtains successful applications in face reorganization fields, fingerprint reorganization fields, medical image database fields, trademark registration fields, etc., such as QBIC system of IBM Corporation, Photobook system of MIT Media Laboratory and Virage system of Virage Corporation. It is difficult to apply these systems in massive remote sensing image archive because remote sensing image has many features including various data types, a mass of data, different resolution scales and different data sources, which restrict the application of CBIR technology in remote sensing image field. In order to change the current situation, we must resolve some problems as follows.

1. Storing massive remote sensing image data.
2. Designing reasonable physical and logical pattern of remote sensing image database.
3. Adopting adaptive image feature extraction algorithms.
4. Adopting indexing structure for search.
5. Designing reasonable content based searching system of massive remote sensing image database.

The rest of the paper is arranged as follows. In Sec. 2, we discuss the methodology. In Sec. 3, the experimental setup and the results obtained are discussed. We conclude in Sec. 4.

II. Methodology

For practical applications, users are often interested in the partial region or targets, such as military target, public targets and ground resource targets in remote sensing image instead of the entire image. For example, the small scale important targets and regions of remote sensing image arrest more attention than the entire remote sensing image in application. These image slice features of important targets and regions extracted by color, texture, shape, spatial relationship, etc. are stored in feature database. Efficient indexing

technology is a key factor for applying the content-based image retrieval in massive image database successfully. Indexing technology developed from traditional database and has been applied in content-based image retrieval field subsequently. Fig.1 shows an architecture frame of content-based remote sensing image.

Traditionally, satellite image classification has been done at the pixel level. For a typical LISS III image has 23.5m resolution, a 100 × 100 sized image patch covers roughly 7.2 Km^2. This is too large an area to represent precise ground segmentation, but our focus is more on building a querying and browsing system than showing exact boundaries between classes. Dividing the image into rectangular patches makes it very convenient for training as well as browsing. Since users of such systems are generally more interested in getting an overview of the location, zooming and panning is allowed optionally as part of the interface.

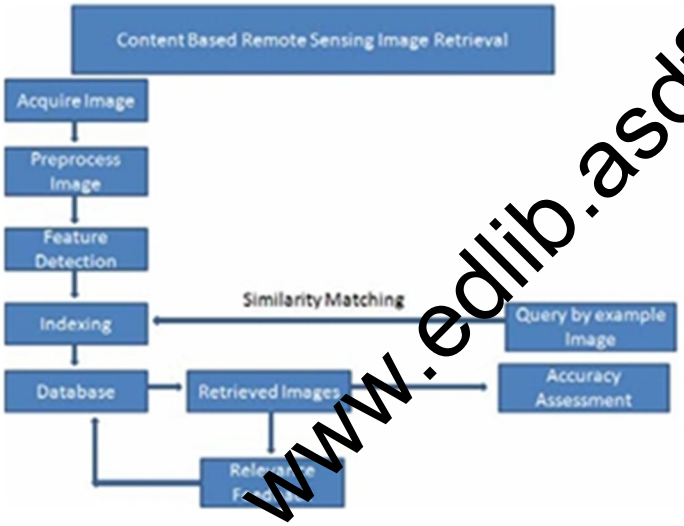

Figure 1: Architectural Framework of CBIR system

We have developed a prototype system for image retrieval. In this a query image is taken and images similar to the query images are found on the basis of color and texture similarity. The three main tasks of the system are:

1. Color Moment Feature Extraction
2. GLCM Texture Feature Extraction.
3. K-means clustering to form index.
4. Retrieval between the query image and database.

2.1 Color Moment

We will define the i^{th} color channel at the j^{th} image pixel as p_{ij}. The three color moments can then be defined as:

Moment 1 - Mean:

$$E_i = \sum_{N}^{j=1} \frac{1}{N} p_{ij}$$

Mean can be understood as the average color value in the image.

Moment 2 -Standard Deviation:

$$\sigma_i = \sqrt{\left(\frac{1}{N}\sum_{N}^{j=1}(p_{ij} - E_i)^2\right)}$$

The standard deviation is the square root of the variance of the distribution.

Moment 3 - Skewness:

$$s_i = \sqrt[3]{\left(\frac{1}{N}\sum_{N}^{j=1}(p_{ij} - E_i)^3\right)}$$

Skewness can be understood as a measure of the degree of asymmetry in the distribution.

2.2 Grey-Level Co-Occurrence Matrix Texture

Grey-Level Co-occurrence Matrix texture measurements have been the workhorse of image texture since they were proposed by Haralick in the 1970s. To many image analysts, they are a button you push in the software that yields a band whose use improves classification - or not. The original works are necessarily condensed and mathematical, making the process difficult to understand for the student or front-line image analyst.

Calculate the selected Feature. This calculation uses only the values in the GLCM. See:

i. Contrast
ii. Correlation
iii. Energy
iv. Homogeneity

$$Contrast = \sum_{i,j=0}^{N-1} P_{ij}(i-j)^2$$

$$Correlation = \sum_{i,j=0}^{N-1} P_{ij}\frac{(i-\mu)(j-\mu)}{\sigma^2}$$

$$Energy = \sum_{i,j=0}^{N-1}\left(P_{ij}\right)^2$$

$$Homogeneity = \sum_{i,j=0}^{N-1}\frac{P_{ij}}{1+(i-j)^2}$$

These features are calculated with distance 1 and angle 0, 45 and 90 degrees.

2.3 K-Means Clustering

A cluster is a collection of data objects that are similar to one another with in the same cluster and are dissimilar to the objects in the other clusters. It is the best suited for data mining because of its efficiency in processing large data sets. It is defined as follows:

The k-means algorithm is built upon four basic operations:

1. Selection of the initial k-means for k-clusters.
2. Calculation of the dissimilarity between an object and the mean of a cluster.
3. Allocation of an object of the cluster whose mean is nearest to the object.
4. Re-calculation of the mean of a cluster from the object allocated to it so that the intra cluster dissimilarity is minimized.

The advantage of K-means algorithm is that it works well when clusters are not well separated from each other, which is frequently encountered in images. The cluster number allotted to each image is considered its class or group.

2.4 Similarity Matching:

Many similarity measures have been developed for image retrieval based on empirical estimates of the feature extraction. We have used Euclidean Distance for similarity matching.

The Euclidean distance between two points $P = (p_1, p_2, \ldots, pn)$ and $Q = (q_1, q_2, \ldots, q_n)$, in Euclidean n-space defined as:

Now for the retrieval purpose the user select the query patch and on the basis of its class number the distance between the query patch with the other images of that class is calculated and images are retrieved.

III. Experimental Plan

For our experiments, we use 3 LISS III + multi-spectral satellite images with 23.5m resolution. We choose to support 4 semantic categories in our experimental system, namely mountain, water bodies, vegetation, and residential area. In consultation with an expert in satellite image analysis, we choose near-IR (infra-red), red and green bands as the three spectral channels for classification as well as display. The reasons for this choice are as follows. Near-IR band is selected over blue band because of a somewhat inverse relationship between a healthy plant's reflectivity in near-IR and red, i.e., healthy vegetation reflects high in near-IR and low in red. Near-IR and red bands are key to differentiating between vegetation types and states. Blue light is very abundant in the atmosphere and is diffracted all over the place. It therefore is very noisy. Hence use of blue band is often avoided. Visible green is used because it is less noisy and provides unique information compared to Near IR and red. The pixel dimensions of each satellite image are used in our experiments are 720x540, with geographic dimensions being approximately 51.84Km×38.88Km. The choice patch size is critical. A patch should be large enough to encapsulate the visual features of a semantic category, while being small enough to include only one semantic category in most cases. We choose patch size 100×100 pixels. We obtain 80 patches from all the images in this manner. These patches are stored in a database along with the identity of their parent images and the relative location within them. Ground truth categorization is not available readily for our patches.

The four major classifications of images are shown in figure 2 to 5. Figure 6 and 7 shows the content based retrieval system. We get 80% to 83% accuracy in our results.

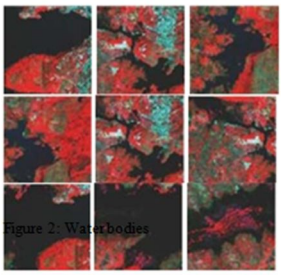

Figure 2: Water bodies

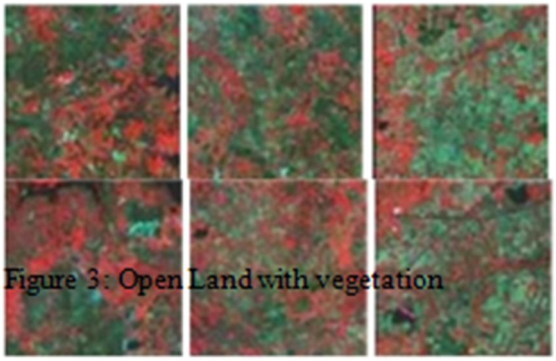

Figure 3: Open Land with vegetation

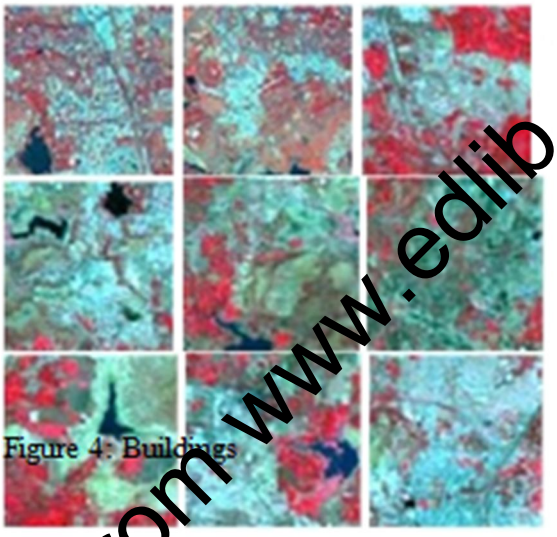

Figure 4: Buildings

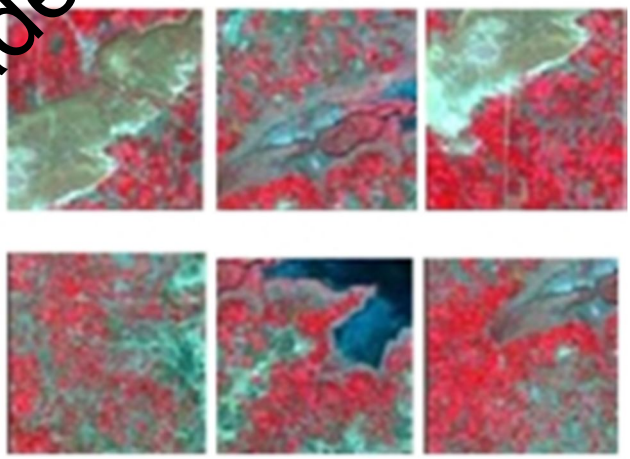

Figure 5: Vegetation and Mountain

Figure 6: CBIR System

Figure 7: Screen 2 of CBIR System

IV. Conclusions

For retrieving similar images to a given query image we have developed a prototype system. We get fruitful results on the example images used in the experiments. We can use this technique for mining similar images based on content and knowledge base for finding vegetation or water or building areas.

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Security Issues and Challenges in Cloud Computing

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Abstract: Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources such as networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider Interaction. Despite the potential gains achieved from the cloud computing, the organizations are slow in accepting it due to security issues and challenges associated with it. Security is one of the major issues which hamper the growth of cloud. The idea of handing over important data to another company is worrisome; such that the consumers need to be vigilant in understanding the risks of data breaches in this new environment. This paper introduces a detailed analysis of the cloud computing security issues and challenges focusing on the cloud computing types and the service delivery types.

Keywords: Cloud computing, on-demand network access, security.

1. Introduction

The "Cloud" is the default symbol of the internet in diagrams. The broader term of "Computing" encompasses Computation, Coordination logic and Storage. Cloud computing is a way to increase the capacity or add capabilities dynamically without investing in new infrastructure, training new personnel, or licensing new software. It extends Information Technology's (IT) existing capabilities. Cloud computing is the delivery of computing services over the Internet. Cloud services allow individuals and businesses to use software and hardware that are managed by third parties at remote locations. Examples of cloud services include online file storage, social networking sites, webmail, and online business applications.

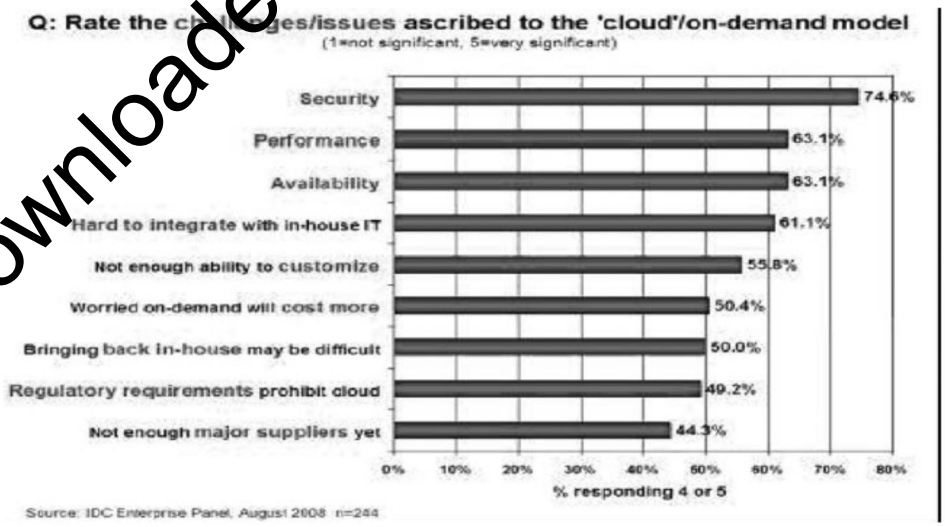

FIGURE 1: Results of IDC survey ranking security challenges, 2008 [1]

Despite of all the hype surrounding the cloud, customers are still reluctant to deploy their business in the cloud. Security issues in cloud computing has played a major role in slowing down its acceptance, in fact security ranked first as the greatest challenge issue of cloud computing as depicted in figure1

From one point of view, security could improve due to centralization of data and increased security-focused resources. On the other hand concerns persist about loss of control over certain sensitive data, and the lack of security for stored kernels entrusted to cloud providers. If those providers have not done good jobs securing their own environments, the consumers could be in trouble. Measuring the quality of cloud providers' approach to security is difficult because many cloud providers will not expose their infrastructure to customers. This work is a survey more specific to the different security issues and the associated challenges that has emanated in the cloud computing system.

2. Related Works

Gartner 2008 identified seven security issues that need to be addressed before enterprises consider switching to the cloud computing model. They are as follows: (1) privileged user access - information transmitted from the client through the Internet poses a certain degree of risk, because of issues of data ownership; enterprises should spend time getting to know their providers and their regulations as much as possible before assigning some trivial applications first to test the water, (2) regulatory compliance - clients are accountable for the security of their solution, as they can choose between providers that allow to be audited by 3rd party organizations that check levels of security and providers that don't (3) data location – depending on contracts, some clients might never know what country or what jurisdiction their data is located (4) data segregation - encrypted information from multiple companies may be stored on the same hard disk, so a mechanism to separate data should be deployed by the provider. (5) recovery - every provider should have a disaster recovery protocol to protect user data (6) investigative support - if a client suspects faulty activity from the provider, it may not have many legal ways pursue an investigation (7) long-term viability - refers to the ability to retract a contract and all data if the current provider is bought out by another firm.[2] The Cloud Computing Use Case Discussion Group discusses the different Use Case scenarios and related requirements that may exist in the cloud model. They consider use cases from different perspectives including customers, developers and security engineers.[3] ENISA investigated the different security risks related to adopting cloud computing along with the affected assets, the risks likelihood, impacts, and vulnerabilities in the cloud computing may lead to such risks.[4] Balachandra et al, 2009 discussed the security SLA's specification and objectives related to data locations, segregation and data recovery.[5] Kresimir et al, 2010 discussed high level security concerns in the cloud computing model such as data integrity, payment and privacy of sensitive information.[6] Bernd et al, 2010 discuss the security vulnerabilities existing in the cloud platform. The authors grouped the possible vulnerabilities into technology-related, cloud characteristics-related, security controls related.[7] Subashini et al discuss the security challenges of the cloud service delivery model, focusing on the SaaS model.[8] Ragovind et al, (2010) discussed the management of security in Cloud computing focusing on Gartner's list on cloud security issues and the findings from the International Data Corporation enterprise.[9] Morsy et al, 2010 investigated cloud computing problems from the cloud architecture, cloud offered characteristics, cloud stakeholders, and cloud service delivery models perspectives.[10] A recent survey by Cloud Security Alliance (CSA)&IEEE indicates that enterprises across sectors are eager to adopt cloud computing but that security are needed both to accelerate cloud adoption on a wide scale and to respond to regulatory drivers. It also details that cloud computing is shaping the future of IT but the absence of a compliance environment is

having dramatic impact on cloud computing growth.[11] Several studies have been carried out relating to security issues in cloud computing but this work presents a detailed analysis of the cloud computing security issues and challenges focusing on the cloud computing deployment types and the service delivery types.

3. Security Issues in Cloud Computing

A. Deployment of cloud services:

Cloud services are typically made available via a private cloud, community cloud, public cloud or hybrid cloud as shown fig2.

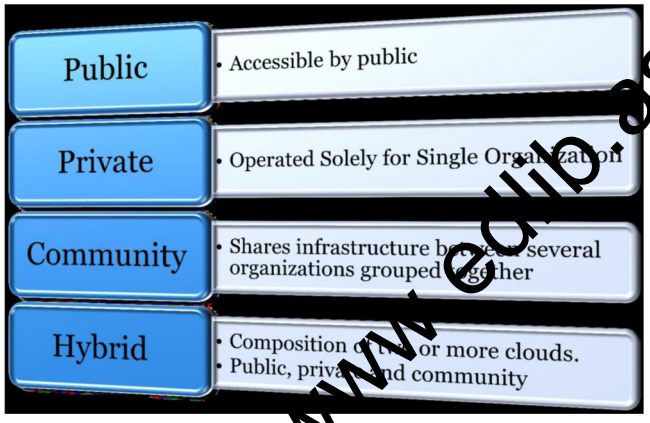

Figure 2: Cloud deployment model [13]

B. Private cloud

It is set up within an organization's internal enterprise datacenter. In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. Utilization on the private cloud can be much more secure than that of the public cloud because of its specified internal exposure. Only the Organization and designated stakeholders may have access to operate on a specific Private cloud.

C. Public cloud

The deployment of a public cloud computing system is characterized on the one hand by the public availability of the cloud service offering and on the other hand by the public network that is used to communicate with the cloud service. In addition, public cloud portfolios employ techniques for resource optimization; however, these are transparent for end users and represent a potential threat to the security of the system.

D. Hybrid cloud

A hybrid cloud service deployment model implements the required processes by combining the cloud services of different cloud computing systems, e.g. private and public cloud services. The hybrid model is also suitable for enterprises in which the transition to full outsourcing has already been completed, for instance, to combine community cloud services with public cloud services.

E. Cloud Service Models

Following on the cloud deployment models, the next security consideration relates to the various Cloud computing service delivery models. The three main cloud service delivery models are: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

(i) Infrastructure as a Service (IaaS)

Infrastructure as a Service is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components. The service provider owns the equipment and is responsible for housing, running and maintaining it. The client typically pays on a per-use basis.IaaS has many characteristics and components such as Utility service and billing model, Automation of administrative tasks, Dynamic scaling, Desktop, policy-based services, Internet connectivity.

(ii) Platform as a Service (PaaS)

Platform as a Service (PaaS) is a way to rent hardware, operating systems, storage and network capacity over the Internet. The service delivery model allows the customer to rent virtualized servers and associated services for running existing applications or developing and testing new ones.

Platform as a Service (PaaS) is an outgrowth of Software as a Service (SaaS), a software distribution model in which hosted software applications are made available to customers over the Internet. PaaS has several advantages for developers. With PaaS, operating system features can be changed and upgraded frequently.

(iii) Software as a Service

Software as a Service (SaaS) is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet.SaaS is becoming an increasingly prevalent delivery model as underlying technologies that support Web services and service-oriented architecture (SOA) mature and new developmental approaches, such as Ajax, become popular. Meanwhile, broadband service has become increasingly available to support user access from more areas around the world.

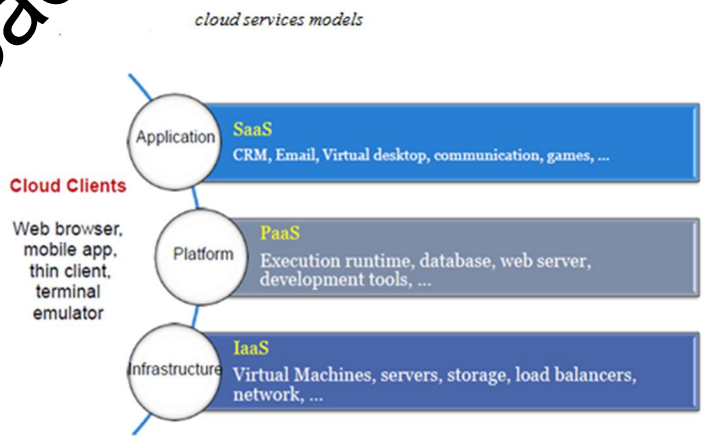

Fig.2 The following are the additional services provided by the cloud.

4. Computing Challenges in Cloud

A. Security: The current adoption of cloud computing is associated with numerous challenges because users are still skeptical about its authenticity. The cloud acts as a big black box, nothing inside the cloud is visible to the clients and Clients have no idea or control over what happens inside a cloud Even if the cloud provider is honest, it can have malicious system admins who can tamper with the VMs and violate confidentiality and integrity Clouds are still subject to traditional data confidentiality, integrity, availability, and privacy issues, plus some additional attacks.

B. Costing Model: Pricing is the process of determining what a service provider will receive from an end user in exchange for their services. The pricing process can be as follows: fixed in which the customer is charged the same amount all the time dynamic, in which the price charged changes dynamically or market dependent in which the customer is charged based on the real time market conditions.

C. Service Level Agreement (SLA): Although cloud consumers do not have control Over the underlying computing resources, they do need to ensure the quality, availability, reliability, and performance of these resources when consumers have migrated their core business functions onto their entrusted cloud. In other words, it is vital for consumers to obtain guarantees from providers on service delivery. Typically, these are provided through Service Level Agreements (SLAs) negotiated between the providers and consumers. The very first issue is the definition of SLA specifications in such a way that has an appropriate level of granularity, namely the tradeoffs between expressiveness and complicatedness, so that they can cover most of the consumer expectations and is relatively simple to be weighted, verified, evaluated, and enforced by the resource allocation mechanism on the cloud. In addition, different cloud offerings (IaaS, PaaS, and SaaS) will need to define different SLA meta specifications. This also raises a number of implementation problems for the cloud providers. Furthermore, advanced SLA mechanisms need to constantly incorporate user feedback and customization features into the SLA evaluation framework.

D. What to migrate: Based on a survey (Sample size = 244) conducted by IDC in 2008, the seven IT systems/applications being migrated to the cloud are: IT Management Applications (26.2%),Collaborative Applications (25.4%), Personal Applications (25%), Business Applications (23.4%),Applications Development and Deployment (16.8%), Server Capacity (15.6%), and Storage Capacity (15.5%). This result reveals that organizations still have security/privacy concerns in moving their data on to the Cloud. Currently, peripheral functions such as IT management and personal applications are the easiest IT systems to move. Organizations are conservative in employing IaaS compared to SaaS. This is partly because marginal functions are often outsourced to the Cloud, and core activities are kept in-house. The survey also shows that in three years' time, 31.5% of the organization will move their Storage Capacity to the cloud. However this number is still relatively low compared to Collaborative Applications (46.3%) at that time.

Conclusion

Although Cloud computing can be seen as a new phenomenon which is set to revolutionize the way we use the Internet, there is much to be cautious about. There are many new technologies emerging at a rapid rate, each with technological advancements and with the potential of making human's lives easier. However, one must be very careful to understand the security risks and challenges posed in utilizing these technologies. Cloud computing is no exception. In this paper key security considerations and challenges which are currently faced in the Cloud computing are highlighted. Cloud computing has the potential to become a frontrunner in promoting a secure, virtual and economically viable IT solution in the future.

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Power Quality and System Level Control at Three-Phase Bidirectional Converter Interfaced with Micro Grid Systems

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Abstract— This paper describes the renewable based combined design of a solar tracking Photo- Voltaic (PV) array system and Wind Hybrid Electric Power System (HEPS) interface to Grid System. In this paper the combined generation of electricity improved the power quality of the system. Generally in low radiation PV array system inverter gives the lower voltage then the rated voltage which affects the power quality. So, in this paper we are considering the combined generation of electricity by wind and solar energy taking into account all radiation, temperature, wing speed and variation of the load demand during the day. The paper presents the design and analysis PV/Wind Hybrid Electric Power System in MATLAB.

Index Terms— Grid, Power Quality, Photovoltaic, Wind Turbine Generator.

Introduction

Day by day energy demand increases all over the world. Presently 80% contribution to world energy supplied from the conventional energy sources which will harm the environment. So there is a need for renewable energy sources that will not harm the environment. Some surveys indicate that the demand will increase by three times in the world by 2050 [1].

PV and wind energy system are the most promising as future energy technology. D. Hansen et. al. [2] presented a number of models for modeling and simulation of stand-alone PV system with battery bank verified against a system installed at Risoe national laboratory. The implementation has been done using Matalb/simulink.

Generally all the researches haven't modeling and simulation of PV/Wind Hybrid Electric Power Systems. So, the objective of this paper is to present modeling, simulation, design and analysis DC/AC converter and its controller for PV/Wind Hybrid Electric Power System.

In this paper we are considering combined PV-array System and Wind energy system because Solar and wind energy are nondepletable, site-dependent, non-polluting, and potential sources of alternative energy options. Many countries are pursuing the option of wind energy conversion systems; in an effort to minimize their dependence on fossil-based non-renewable fuels. Also, presently thousands of photovoltaic (PV) deployments exist worldwide, providing power to small, remote, grid-independent or stand-alone applications.

The proposed PV/WES HEPS composed of four design variables: (WTG's), PV arrays, batteries and grid-linked substations. The design of a PV/WES HEPS based on political and social conditions and uses trade-off /risk method. O. Omari1, et. al. [3] the DC coupled PV/WES HEPS discussed, control and management strategies that applied to a simulation model of an example of this type presented. Yarú Najem and Méndez Hernández [4] simulation models of the PV/WES HEPS verified with measured data in a real system located near the department efficient energy conversion of the Kassel University. But most of the researches haven't

modeling and simulation of PV/Wind HEPS at the point of connection of operation in details. So, the objective of this paper is to present modeling, simulation, design and analysis DC/AC converter and its controller for PV/Wind HEPS.

I. Description of The Scheme

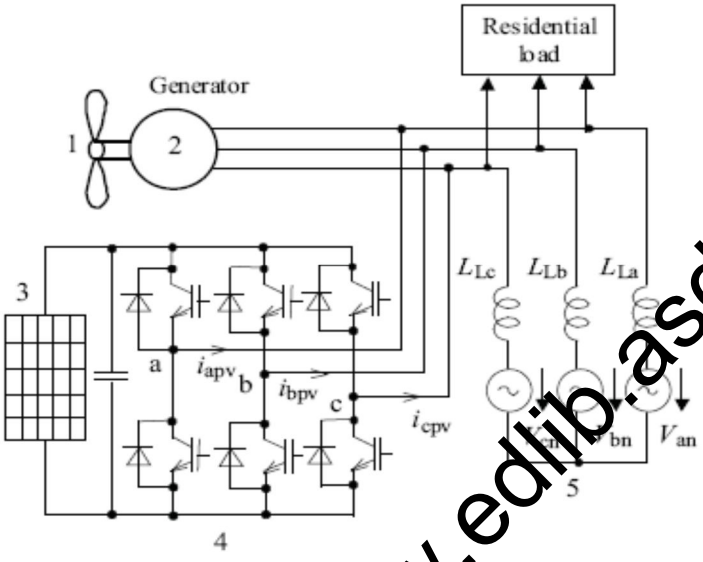

Fig. 1. Schematic diagram Grid connected Hybrid Scheme 1- Wind Turbine, 2- Induction Generator, 3- PV Array, 4-Three Phase VSI, 5-Grid

The Proposed schematic diagram is shown in Fig.1 where the wind-driven Induction generator is integrated with the grid when the wind-speed is greater than cut-in wind speed. The three-phase currents of the inverter are detected and compared with the corresponding phase current references individually. The PV array voltage is fed to a three-phase six-step Current-Controlled Voltage Source Inverter (CC-VSI). This CC-VSI is connected to the grid through an inductor. The controller for the inverter varies the inverter current to follow a reference current.

The resulting current errors are directly used to generate the desired firing pulses for the inverter through an Average Current Mode Controller (ACMC). This is a current control technique that has fast response time and is capable of supporting wide range of power circuit topologies. The wind and PV generators can individually supply power to the grid and the control of the inverter meets the reactive power requirement of the induction generator. It should be noted that in the absence of the grid, the proposed scheme can supply power to consumer by altering the current control of the inverter to simple SPWM operation. In such operation a three- phase fixed amplitude, fixed frequency supply obtained from the simple SPWM inverter forms the local grid to which the IG is kept integrated.

A. Proposed System Model

The proposed system model is shown in Fig.2 represents the PV array and Wind Hybrid Electric Power System connected to 50 Hz, 22kV Electric Utility Grid. In this the PV array is connected to DC/DC Boost converter, DC/AC Inverter, LC filter and 400/2000V, 5000kVA transformer [5].Wind Turbine Generator is connected to Electric Utility through a variable frequency PWM boost rectifier, DC link, constant frequency PWM Inverter, LC filter and 400/2000kV, 500kVA transformer [6]. Load is connected to 22kV bus bar through a step down transformer.

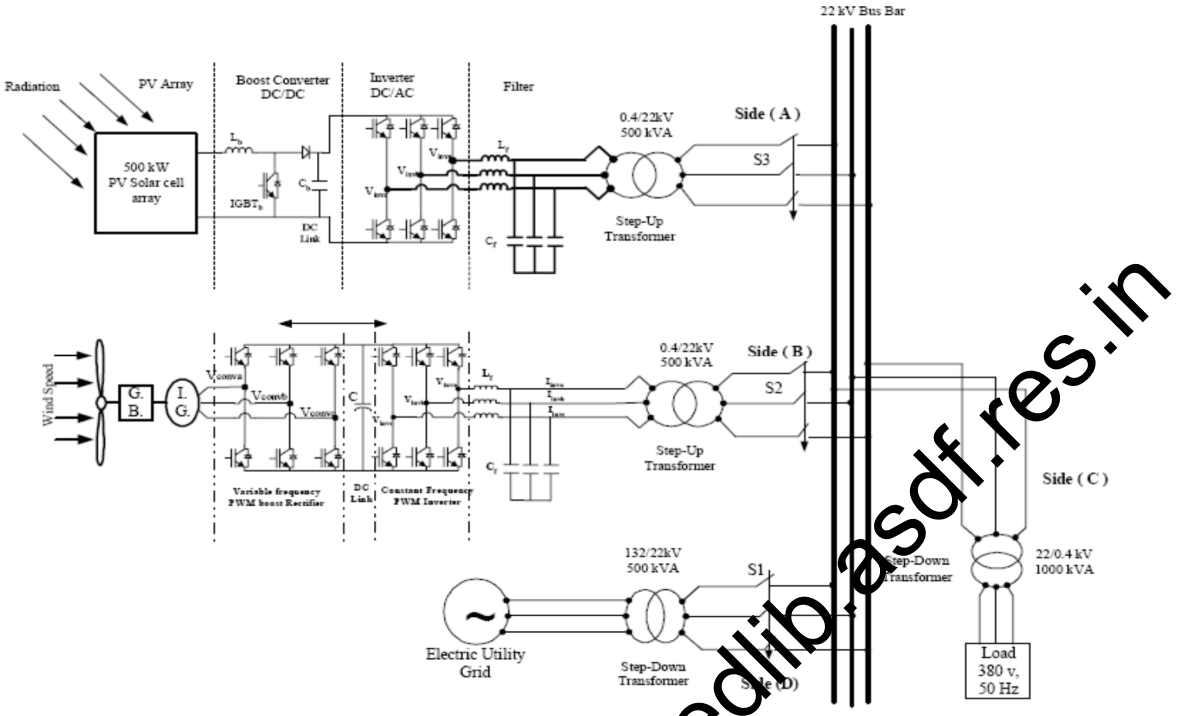

Fig. 2. Proposed System Model of PV/WTG HEPS connected to Grid

B. Model Description

The proposed model description is explained below. The power obtained by the PV system is applied to DC/DC Boost Converter. This feed the DC capacitor link with a maximum power point tracker. The variables which will be sensed for the controller of PV system are PV solar cell array current IPV, DC link voltage, Vdcpv, inverter filter output currents Ifpva, Ifpvb, Ifpvc, load phase currents ILa, ILb, ILc and load phase voltages Va, Vb, Vc. The variables which will be sensed for the controller of

WTG are DC link voltage, Vdcw, inverter filter output currents Iinvaw, Iinvbw, Iinvcw, load currents ILa, ILb, ILc and load phase voltages Va, Vb, Vc. To provide the active filtering function, the filter output currents are controlled to ensure that the utility line currents and load current are sinusoidal and in phase with the phase voltage. The filter output currents are also controlled to pass power from the PV/Wind HEPS to the load and/or EU. The DC link voltage, Vdcpv and Vdcpw must be controlled to be higher than the peak line voltage of the EU. The proposed system control scheme for the system under study usually uses the Instantaneous Reactive Power Theory, IRPT. The load currents and load voltages are sampled and transformed into the two-axis αβ-coordinate system and then into the rotating dq-coordinate system. IRPT uses the park transformation, as in (1) to generate two orthogonal rotating vectors α and β from the three-phase vectors a, b and c. This transformation is applied to the voltages and currents and so the symbol x is used to represent volt or current. IRPT assumes balanced three-phase loads and does not use the x0 term [5], [6], [7].

$$\begin{bmatrix} x_o \\ x_\alpha \\ x_\beta \end{bmatrix} = \sqrt{\frac{2}{3}} \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 1/\sqrt{2} \\ 1 & -1/2 & -1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \end{bmatrix} \begin{bmatrix} x_a \\ x_b \\ x_c \end{bmatrix} \qquad (1)$$

The instantaneous active and reactive powers p and q are calculated from the transformed voltage and current. Then the reference compensating currents have been determined as in (2).

$$\begin{bmatrix} i_\alpha^* \\ i_\beta^* \end{bmatrix} = \frac{1}{V_\alpha^2 + V_\beta^2} \begin{bmatrix} V_\alpha & -V_\beta \\ V_\beta & V_\alpha \end{bmatrix} \begin{bmatrix} P_{pv} + P_w \\ q_{pv} + q_w \end{bmatrix} \quad (2)$$

In a balanced three-phase system with linear loads, the instantaneous real power p and imaginary power q are constant and equal to the three-phase conventional active power $P_{3\Phi}$ and reactive power $Q_{3\Phi}$ respectively. So, the inverse park transformation is applied to iα * and iβ* and this gives the output currents in standard three-phase form, as in (3) [5], [6], [7].

$$\begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} = \sqrt{\frac{2}{3}} \begin{bmatrix} 1 & 0 \\ -1/2 & \sqrt{3}/2 \\ -1/2 & -\sqrt{3}/2 \end{bmatrix} \begin{bmatrix} i_\alpha^* \\ i_\beta^* \end{bmatrix} \quad (3)$$

II. Simulink Model

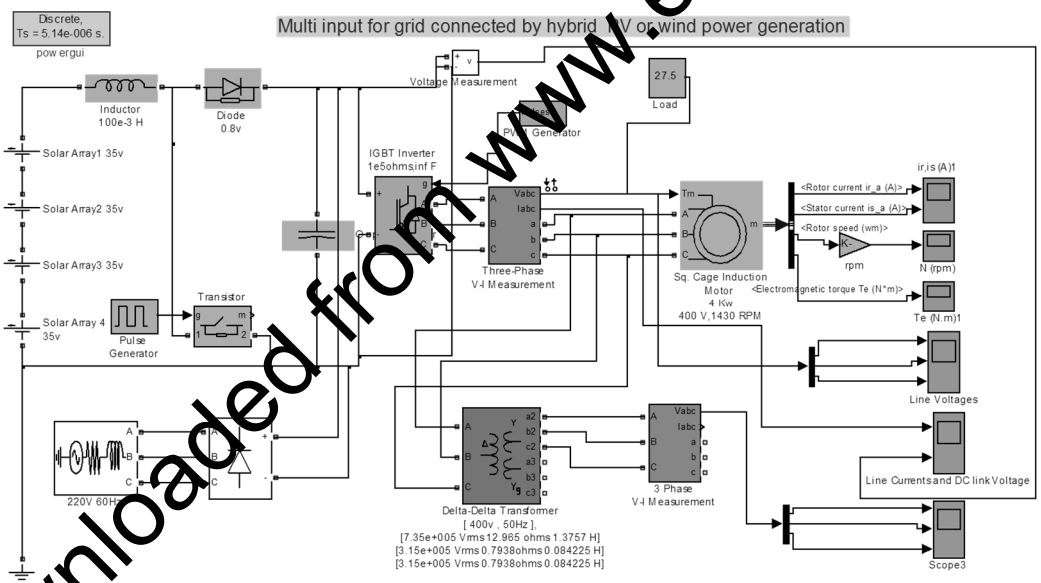

Fig. 3. Simulink diagram of PV/WTG HEPS connected to Grid

Figure 3 shows the Simulink diagram of PV/WTG Hybrid Electric Power System.

The total power load level is 4 kw. A per phase load current for a duration 0.4 sec. The variation of the generated voltage from hybrid PV/WGT according to radiation and wind speed variation is shown in figure 4. The proposed model has a purely sinusoidal controlled ideal voltage source at the inverter terminals. Figure 5 shows the line currents and DC link voltage of PV.WTG System. Figure 6 shows the rotor and stator currents of Induction motor which is acting as a load. Figure shows the electromagnetic torque of Induction Motor.

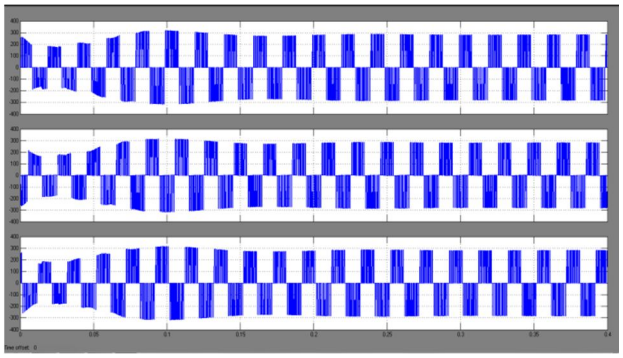

Fig. 4. Line voltages to Load of PV/WTG System

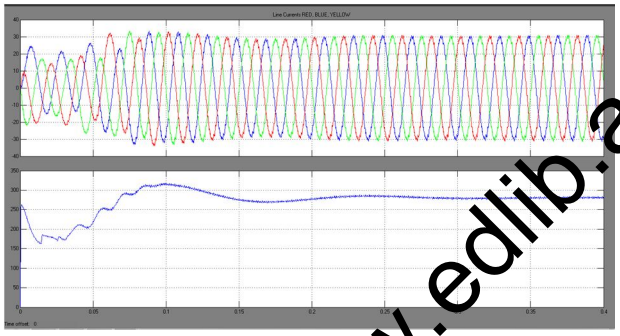

Fig. 5. The Line Currents & DC link voltage of PV/WTG System

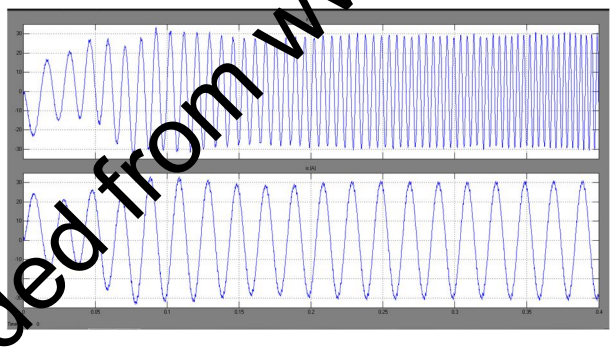

Fig. 6. The Rotor & Stator current of Load to PV/WTG System

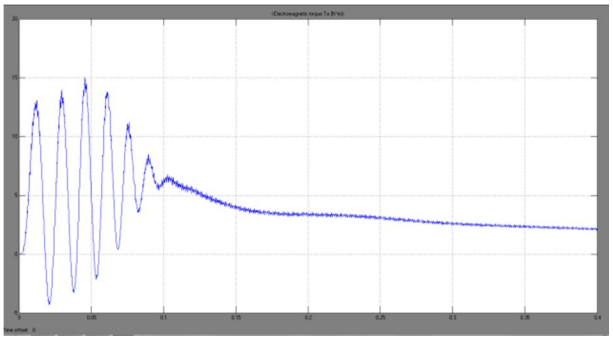

Fig. 7. Electromagnetic Torque of Motor as load to PV/WTG System

III. Experimental Results

A. Prototype Model Circuit

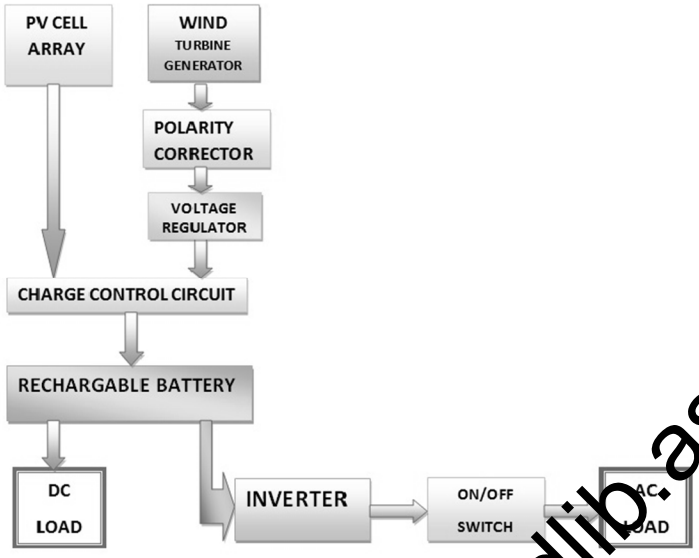

Fig. 8. Prototype Model Circuit of PV/WTG Hybrid Electric Power System

B. Circuit Description

Hardware system includes the following equipments. The function of each equipment is explained in below.

PV Array:

A number of PV panels connected in series and/or in parallel giving a DC output out of the incident irradiance. Orientation and tilt of these panels are important design parameters, as well as shading from surrounding obstructions.

Wind Turbine Generator:

This is installed on top of a tall tower, collects kinetic energy from the wind and converts it to electricity that is compatible with a home's electrical system.

Charge controller:

It controls battery bank charge and discharge reasonable and safety.

Battery bank:

It can be a single battery or multiple batteries connected together to create essentially one large battery of the required voltage and amp-hour capacity. In some ways the battery configuration and capacity are the most important electrical power decision to make, and a wise choice can help guarantee a steady supply of electrical power as well as a system that is simple to operate and maintain.

Inverter:

A power converter that inverts the DC power from the panels into AC power.

Loads:

Stands for the network connected appliances in the building that are fed from the inverter (AC loads), or from the battery bank (DC loads).

Battery Level Indicator Circuit:

A Battery Level Indicator is used for the battery for purpose. A circuit that lets you know the battery level of a device from the number of LEDs that are glowing. It uses ten LEDs in all. So if three LEDs glow, it indicates battery capacity of 30 per cent. the battery-level indicator function is integrated with other functions, here only one comparator IC (LM3914) does it all.

The LM3914 uses ten comparators, which are internally assembled in the voltage divider network based on the current-division rule. So it divides the battery level into ten parts. The circuit derives the power supply for its operation from the battery of the device itself. It uses ten LEDs wired in a 10-dot mode. The use of different colored LEDs makes it easier to recognize the voltage level on the basis of the calibration made. Red LEDs (LED1 through LED3) indicate battery capacity of less than 40 per cent. Orange LEDs (LED4 through LED6) indicate battery capacity of 40 to less than 70 per cent and green LEDs (LED7 through LED10) indicate battery capacity of 70 to under 100 per cent.

The brightness of the LEDs can be adjusted by varying the value of preset VR2 between pins 6 and 7. Diode D1 prevents the circuit from reverse-polarity battery connection. The tenth LED glows only when the battery capacity is full, i.e., the battery is fully charged. When the battery is fully charged, relay-driver transistor T1 conducts to energies relay RL1. This stops the charging through normally-open (N/O) contacts of relay RL1. For calibration, connect 15V variable, regulated power supply and initially set it at 3V. Slowly adjust VR1 until LED1 glows. Now, increase the input voltage to 15V in steps of 1.2V until the corresponding LED (LED2 through LED10) lights up.

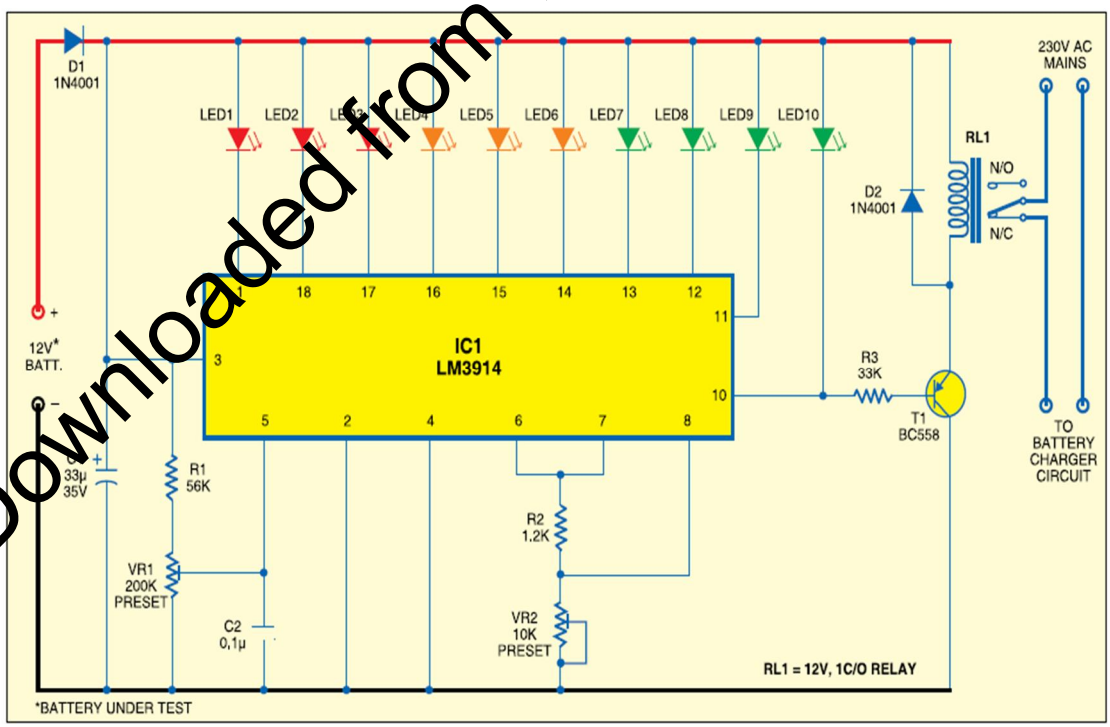

Fig. 9.Battery Level Indicator Circuit

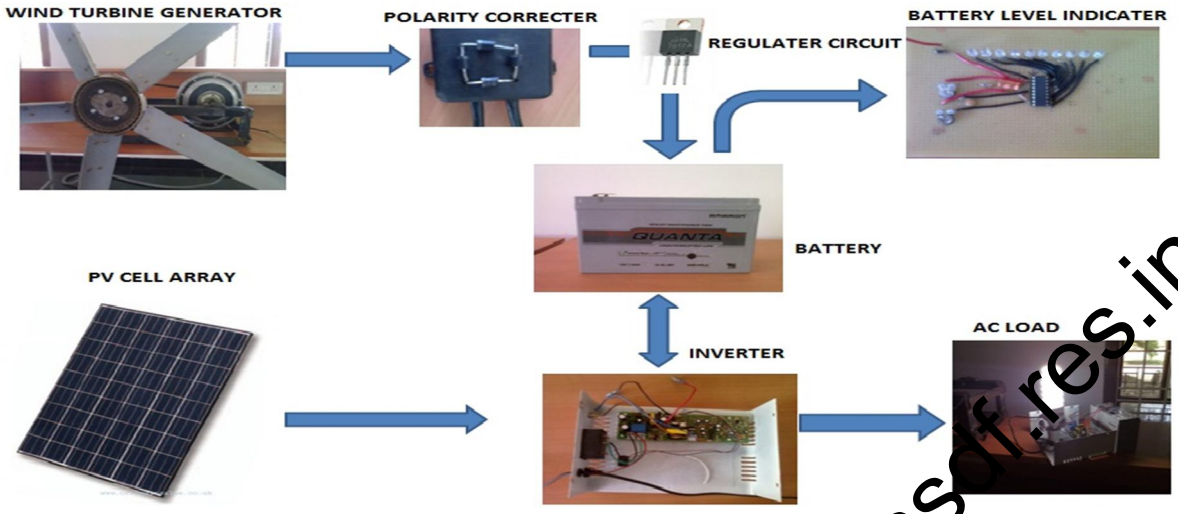

Fig. 10. Experimental setup of PV/WGT Hybrid Electric Power System

Figure 10 shows the experimental setup of combined PV array and Wind Turbine Generator Hybrid Electric Power System. The power obtained from the PV array is given to the inverter to convert into AC power. The power obtained from the wind turbine generator is AC. These both powers are combined to drive the AC Load.

Power from Wind Turbine Generator:

The wind fan may rotate in clockwise or anti clockwise direction. So the power generated from wind generator may be positive or negative, in order to get the positive power polarity corrector is connected to the wind turbine. This converts the AC power into DC power. Wind power may not be constant so a regulator circuit is connected and this regulated power is given to charge the battery.

PV Array:

The power from the PV array is DC. This DC power is given to charge the battery. So the power from both the sources is in DC this DC power is given to the charge the battery. Here the battery is acting ac Electric grid. The power from the charged battery is given to the inverter to convert the power into AC.

Conclusions

We conclude that the combination of PV/Wind Hybrid Electric Power System interface to grid was modeled and simulated in Mat lab/Simulink. Designed the DC/AC converter, designed the control circuit for the converter for all radiation and wind speed have been studied and proposed. From the above results we conclude the total harmonic distortion at local bus was within acceptable limits.

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Effects of Combined Addition of Aluminum Oxide, Fly Ash, Carbon and Yttrium on Density and Hardness of ZA27 Zinc Alloy

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Abstract: ZA-27 alloy plays a vital role in ZA family of alloys with a high strength and pinnacle applications in manufacturing. The research papers emphasized to enhance hardness and minimize the density of the aforesaid alloy with combined addition of Al_20_3, fly ash, carbon and yttrium as reinforcements. Hence we observed that with density was gradually decreased at 7% with 5% Al_2O_3, 0.15% carbon and 0.01% Yttrium addition. Similarly, further decreased density at 10% with 7.5% Al_2O3, 0.25% carbon and 0.05% Yttrium. However, hardness was initial increased more than 11% with 5% Al_2O_3, 0.15% carbon and 0.01% Yttrium. Conversely, hardness was slightly decreased at 5% with 7.5% Al_2O_3, 0.25% carbon and 0.05% Yttrium.

Keywords: Aluminum oxide; Flyash; Carbon; Yttrium; Density; Hardness.

1. Introduction

Zinc alloys with higher aluminium content (25-27 wt. %) obtained by conventional processes of melting and casting, are applied in various fields, particularly in automobile industry, because of their good mechanical, technological and economical properties. Lim Ying Pin et al. [1] conducted the experimentation of LM6 Al-Si alloy on a sand casting of different modulus, the addition level of Al5Ti1B into the melt ranges from 0 wt. % to 1 wt. % with the increment of 0.25 wt. %. The experimental results shown that the mechanical properties of LM6 sand casting can be optimally improved by grain refinement of 0.5 wt. % AL5Ti1B. Christian et al. [2] The effects of various heat treatments upon the microstructure and mechanical properties of a rolled 5754 aluminium alloy modified with 0.23 wt.% Sc and 0.22 wt.% Zr were investigated. Found that large incoherent precipitates formed during solidification and hot-rolling, and fine coherent precipitates formed from secondary precipitation, which improved alloy strength, as shown by hardness. Rajakumar et al. [3] studied the AA6061-T6 aluminium alloy (Al–Mg–Si) alloy hardness along with the welded joints. It was observed that parameters like rotational speed, welding speed, axial force, shoulder diameter, pin diameter and tool hardness was influenced the hardness. Among them tool rotational speed between 1155 and 1157 rpm is an optimum input to obtain an excellent welded component produced from aforesaid aluminium alloy. Li Hui-zhong [4] studied that effects of yttrium (Y) content on precipitation hardening, elevated temperature mechanical properties and morphologies of 2519 aluminium alloy were investigated by means of micro hardness test, The results shown that the by increased Y content from 0 to 0.10% (mass fraction) at room temperature, and from 155 MPa to 205 MPa by increasing Y content from 0 to 0.20% at 300 °C. The high strength of 2519 aluminium alloy is attributed to the high density of fine precipitates and intermetallic compound AlCuY with high thermal stability was obtained.

Mahmudi et al. [5] studied the effects of 0.15 wt. % Zr addition on mechanical properties and wear resistance of A319 aluminium casting alloy were investigated. The cast alloys were given a solutionizing treatment followed by artificial aging in the temperature range 175 to 235 °C for different period of times. It was found that the minor addition of Zr results in the precipitation of Al_3Zr particles in the aluminium matrix. These particles are stable upon heating due to the low solubility of zirconium in aluminium matrix. The main effects of such particles are an increase in hardness, strength, quality index and wear resistance. This is very promising where these aluminium cast alloys are to be used at relatively high temperatures. Sanjib Banerjee [6] the work is aimed at investigating the influence of trace additions of Tin (Sn) on the microstructure, mechanical properties and age-hardening behaviour of Al–6.2%Cu–0.6%Mg alloy system.

Al–6.2%Cu– 0.6%Mg alloys containing varying weight percentages (from 0 to 0.1 wt. %) of Sn were prepared by casting technique. The mechanical properties and microstructure of these alloys were investigated in the as-cast as well as different heat treated conditions. The hardness and strength of the alloy increased but the ductility reduced with increase in Sn content up to 0.06 wt. %. precipitation hardening behaviour of the alloys was investigated by analyzing the aging time required to attain the peak hardness value. Addition of trace percentage of Sn was observed to have no significant influence on the peak ageing time of the investigated alloy system.

Wen-tao Wang [7] investigated the precipitation hardening response, microstructures and mechanical properties of 2519A aluminum alloy plates with additions of 0, 0.2 and 0.4 wt.% Ce were investigated. The results shown that 0.2 wt. % Ce promotes the precipitation of denser and finer phase, which improves the tensile strength of the alloy at both room and elevated temperatures. High melting point Al8Cu4Ce phase particles are found in alloys with additions of Ce up to 0.4 wt. %, which contributes to the mechanical properties at elevated temperature. Wang Feng [8] studied the series of die casting heat-resistant magnesium alloys based on Mg-Al system were developed for automotive application by adding Y and various amounts of Ca. The mechanical properties and microstructures of die casting AZ91 alloy with combined addition of Y and Ca were investigated. It was found that for AZ91-1Y-*x*Ca alloy, the hardness and the elevated temperature tensile strength increase, while the elongation decreases with increasing the addition of Ca. The mechanism of mechanical properties improvement caused by the combined addition of Y and Ca was also discussed. Karthikeyan [9] studied the effects of FSP (Friction Stir process) on microstructure and mechanical properties of cast aluminium alloy of 2285 grade at three different feed rates viz. 10 mm/min, 12 mm/min and 15 mm/min under two different speeds 1400 and 1800 rpm. The observations have been elaborated in detail along with the microstructures of parent and processed specimens. Wuhua Yuan [10] The effects of Zr addition on mechanical property in the aged Al–Mg–Si alloy exposed to thermal-resistant treatment (180 to 250 ^{O}C) have been studied by using both Brinell Hardness tests and tensile tests. The softening process at 180 ^{O}C and 230 ^{O}C has been investigated. The results shown that with improved addition of Zr the Brinell hardness could maintain no *less* than 90% of their initial values when the alloy is exposed to heat treatment at 180 ^{O}C for 400 h and 230 ^{O}C for 2 h. Yet, no work was found in ZA27 Zinc alloys particularly in combined addition of Alumina, Flyash, Carbon and Yttrium addition. Hence present work emphasised to find the density and hardness of aforesaid alloys.

2. Experimental Procedure

The investigations were carried out on ZA27 alloys using die casting, present investigations was aimed to enhance the hardness and evaluate the density respectively, with combined addition Aluminum oxide, Fly ash, Carbon and Yttrium as shown in the Table 1. The metallic moulds were used for preparing metal casting is of rectangular cross-section of dimensions 30 x 4 cm, as shown in Figure 1. For all the alloys molten metal was poured manually from the ladle in to the metal moulds before the molten metal was poured metallic moulds was preheated at 200 ^{O}C for all the aforesaid alloys.

Table 1 Composition of ZA 27 alloy with addition of reinforcement elements

Alloy	Aluminum oxide %	Fly ash %	Carbon %	Yttrium %
ZA 27	0.0	0.0	0.0	0.0
Modified -1 ZA 27	5.0	2.0	0.15	0.01
Modified -2 ZA 27	7.5	2.0	0.25	0.05

Figure 1 Shows Metallic mould with ZA27 Casted alloy.

2.1 Density Test

In present investigation density of specimen is calculated using Archimedes principle. It states that, for practical purposes water is incompressible, so the submerged body would displace an amount of water equal to its own volume. By dividing the mass of the body by the volume of water displaced, the density of the submerged body was obtained for the said principal as shown in the Figure 2. The density of the specimen is calculated and depicted in the Table 2.

Table 2 Density of unmodified and modified alloys using Archimedes principle

Alloy	Mass (kg)	Volume displaced (m^3)	Density (kg/m^3)
ZA-27 base alloy	0.315	62×10^{-6}	5081
Modified -1 ZA-27	0.380	80×10^{-6}	4750
Modified -2 ZA-27	0.690	150×10^{-6}	4600

Figure 2 shows ZA27 Alloy dipped in the water beaker.

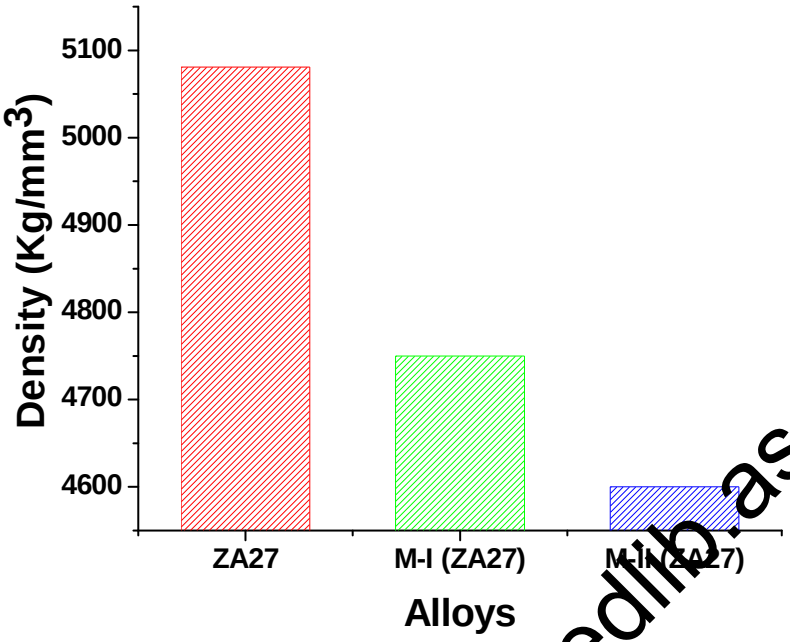

Figure 3 shows density of unmodified and modified ZA-27 alloys.

2.2 Hardness Test

In present investigation Brinell hardness test was investigated with carbide ball indenter. The indenter is pressed into the specimen by an accurately controlled test force. The force is maintained for a specific dwell time, normally 10-15 seconds. After the dwell time is complete, the indenter is removed leaving a round indent in the sample. The size of the indent is determined optically by measuring two diagonals of the round indent using a portable microscope. The Brinell hardness number is function of the test force divided by the curved surface area of the indent. The indentation is considered to be spherical with radius equal to half the diameter of the ball. The average of the two diagonals is used in the following formula to calculate the Brinell hardness and is depicted in the Table 3, 4 and 5 respectively.

$$HB = \frac{2P}{\pi D\left(D - \sqrt{D^2 - d^2}\right)}$$

Table- 3 Hardness test for ZA 27 alloy by Brinell hardness test

Load P (N/mm²)	Indenter diameter D (mm)	Indentation diameter d (mm)	Brinell hardness number (HB)
500	5	2.2	125
750	5	2.6	131
1000	5	3.1	118
1000	10	3.3	114
1500	10	3.7	135
2000	10	4.2	138
2500	10	5.0	119
3000	10	5.2	131

Table 4 Hardness test for Modified -1 ZA 27 alloy by Brinell hardness test

Load P (N/mm^2)	Indenter diameter D (mm)	Indentation diameter d (mm)	Brinell hardness number (HB)
500	5	2.1	138
750	5	2.5	143
1000	5	3.1	119
1000	10	3.5	134
1500	10	3.5	151
2000	10	4.1	145
2500	10	4.5	149
3000	10	5.0	143

Table 5 Hardness test for Modified -2 ZA 27 alloy by Brinell hardness test

Load P (N/mm^2)	Indenter diameter D (mm)	Indentation diameter d (mm)	Brinell hardness number (HB)
500	5	2.1	138
750	5	2.8	111
1000	5	3.3	102
1000	10	3.3	114
1500	10	3.75	131
2000	10	[illegible]	138
2500	10	[illegible]	119
3000	10	3.5	116

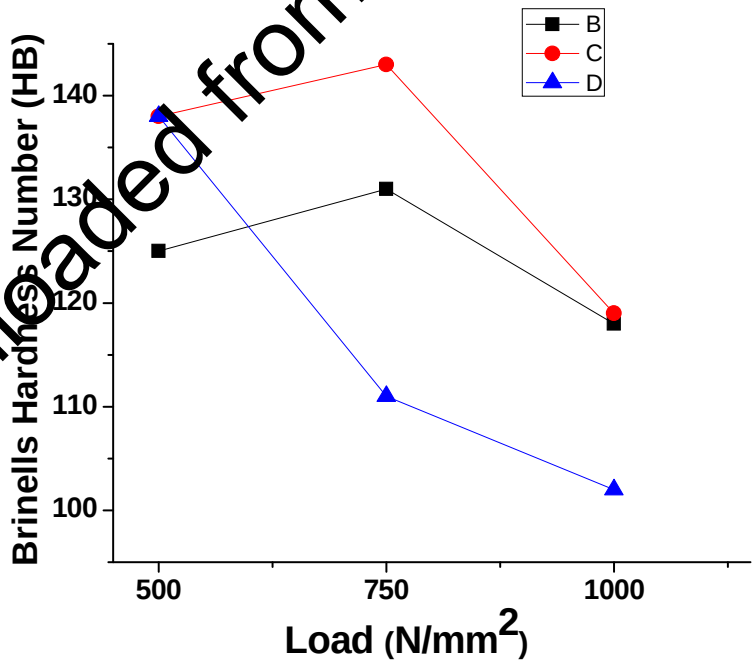

Figure 4 shows Brinell hardness number for 5mm carbide ball indenter.

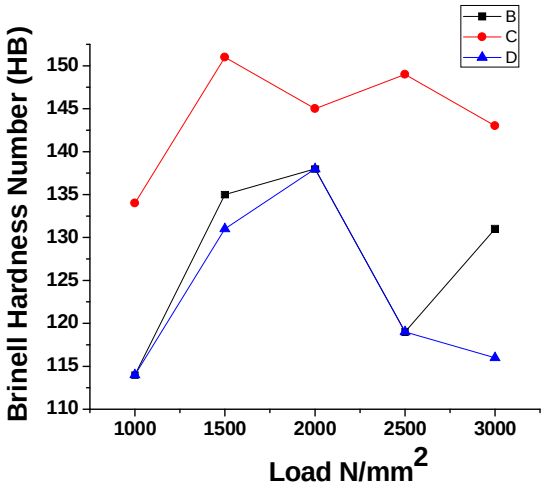

Figure 5 shows Brinell hardness number for 10mm carbide ball indenter.

3. Results and Discussion

The results of density and hardness of ZA-27 alloy for both Un-Modified and Modified alloys were discussed below

3.1 Influence of density on Un-modified and Modified of ZA-27 alloy

Density of both Modified -1 ZA-27 and Modified -2 ZA-27 was compared with ZA-27 base alloy. It clearly shows that the amount of mass occupied per unit volume are lower for both modified alloys as shown in the Figure 6.

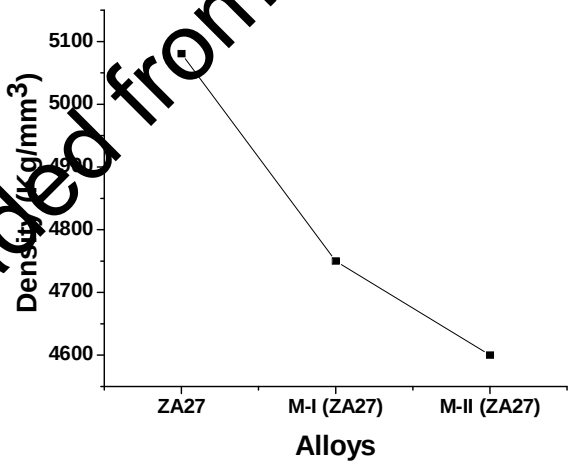

Figure 6 shows density of unmodified and modified ZA-27 alloys.

3.2 Influence of hardness on Un-modified and modified ZA 27 alloy

Hardness of both Modified -1 ZA-27 and Modified -2 ZA-27 was compared with ZA-27 base alloy. Hardness of investigated alloys is obtained by considering average of Brinell hardness numbers at different loads. It is clearly observed the increment hardness for Modified -2 ZA-27 it might be optimum addition of Aluminium oxide and carbon which is shown in the Figure 7.

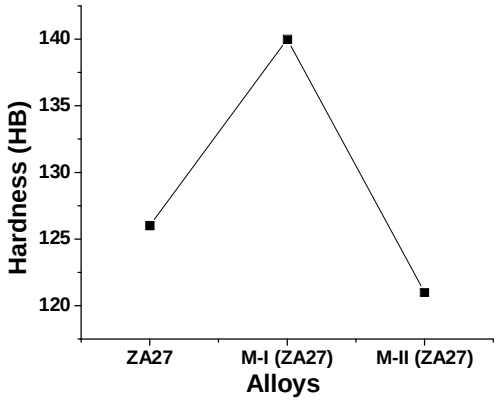

Figure 7 Hardness of unmodified and modified ZA-27 alloys

Case I: Density and hardness for modified -1 ZA-27 alloy and ZA-27 base alloy

From the present investigations it is observed that the density is lower and hardness is higher for modified -1 ZA-27 than ZA-27 base alloy, it might be due to influence of reinforcement of Al_2O_3 5%, Fly ash 2%, Carbon 0.15%,Yttrium 0.01% mass share in Modified -1 ZA-27 alloy.

Case II: Density and hardness for modified -2 ZA-27 alloy and ZA-27 base alloy

From the present investigation it is observed that both the density and hardness is lower for modified -2 ZA-27 alloy when compared with ZA-27 base alloy, it might be due to influence of reinforcement of Al_2O_3 7.5%, Fly ash 2%, Carbon 0.25%,Yttrium 0.05% mass share in Modified -2 ZA-27 alloy.

4. Conclusions

Based on experimental investigations following conclusion were drawn:

- All modified alloys have significantly lower density compared to ZA-27 base alloy.
- Density of aforesaid alloys was decreased from 7% to10% from Modified -1 ZA-27 alloy and Modified -2 ZA-27 alloys when compared with ZA-27 base alloy.
- Hardness of aforesaid alloys was increased by 11% and 16% for Modified -1 ZA-27 alloy and Modified -2 respectively in comparison with ZA-27 base alloy

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Comparative Study of Gray cast Iron and Aluminum Material of Connecting Rod for Four Stroke Single Cylinder Engine

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Abstract: The connecting rod is the intermediate member between the piston and the crankshaft. Its primary function is to transmit the push and pull from the piston pin to the crank pin and thus convert the reciprocating motion of the piston into rotary motion of the crankpin our project we design a connecting rod for a four stroke single cylinder engine for three different materials like Gray cast iron and Aluminum alloy. Both the designs are modeled in 3D modeling software catiya v5 /Engineer. Structural analysis is done on the connecting rod to verify the strength of the connecting rod by using Structural steel and Aluminum alloy by applying the loads finding out stress strain and total deformation for the two different materials. The analysis is done to verify the better material for connecting rod to reduce the cost.

Key words: 3D-Modeling, Connecting rod, Ansys and Alloy.

1. Introduction

The automobile engine connecting rod is a high volume production, critical component. It connects reciprocating piston to rotating crankshaft, transmitting the thrust of the piston to the crankshaft. Every vehicle that uses an internal combustion engine requires at least one connecting rod depending upon the number of cylinders in the engine. This current thesis deals with the off study, the optimization part. Due to its large volume production, it is only logical that optimization of the connecting rod for its weight or volume will result in large-scale savings. It can also achieve the objective of reducing the weight of the engine component, thus reducing inertia loads, such as stress strain and total deformation of three different materials are taken and the comparative study is conducted for reducing engine weight and improving engine performance and fuel economy.

2. Pressure Calculations for 150cc Petrol Engine

Suzuki gs 150 r specifications

Engine type: air cooled 4-stroke sohc

Bore × $stroke(mm)$ = 57 × 58.6

Displacement =149.5cc

Maximum power = 13.8bhp @8500rpm

Maximum torque = 13.4nm @ 6000 rpm

Compression ratio =9.35/1

Density of petrol C_8H_{18} = 737.22 $\frac{kg}{m^3}$ at 60F

= 0.00073722 kg/cm^3

=0.00000073722kg/mm^3

T = 60f =288.855k =15.55^{0}c

Mass = density × $volume$

M = 0.00000073722× 149500

M = 0.11kg

Molecular wt. For petrol = 144.2285 g/mole

Pv = mrt

P = $\frac{mRT}{V}$ = $\frac{0.11\times8.3143\times288.555}{0.11422\times0.0001495}$ = $\frac{263.9}{0.00001707}$

P = 15454538.533 j/m^3 = n/m^2

P =15.454 n/mm^2

Table 1 Properties of materials.

Materials selected	**Aluminum**	**Structural steel**
Young's Modulus	7.1e10	2e11
Poisson's Ratio	0.33	0.3
Tensile Ultimate strength	3.1e8	4.6e8
Tensile Yield strength	2.8E8	2.5E8
Density	2770	7850

Model of connecting rod

The following Fig.no.1 shows

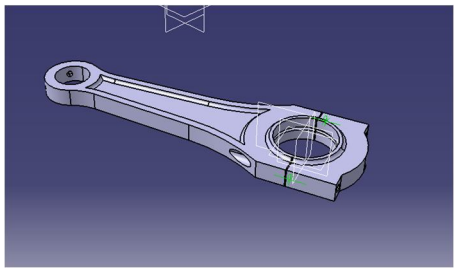

Fig.no.1 the catiya model of connecting rod

Choosing Material for Structural Steel

Structural Analysis For Structural Steel Total Deformation When 500n Of Load Applied Fig.No.2

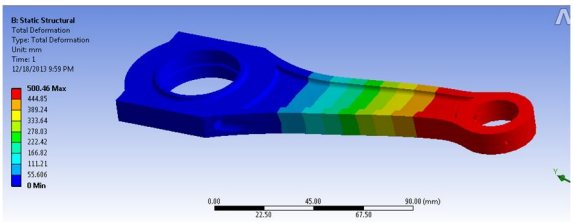

Fig.no.2 Total deformation

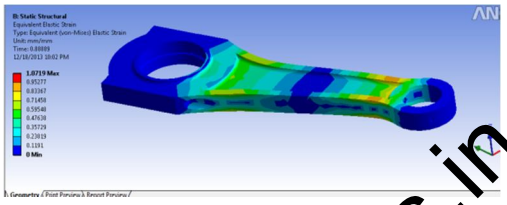

Fig.No.3 Voimic Strain energy

Equivalent voimic strain when 500n of load applied fig.no.3

Equivalent von-mises stress when 500nof load applied fig .no.4

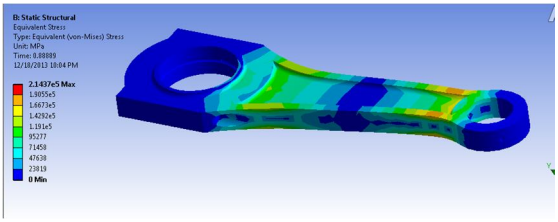

Fig .no.4 Von-Mises

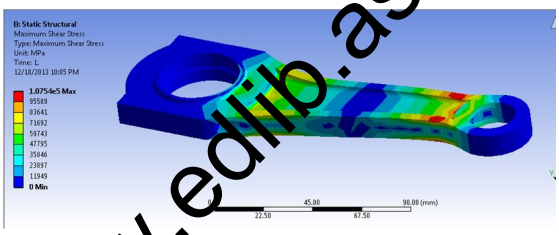

Fig.no.5 Shear Stress

Maximum Shear Stress When 500N of Load Applied Fig.No.5

Choosing Material for Aluminum

Total Deformation When 500N Of Load Applied Fig.No.6

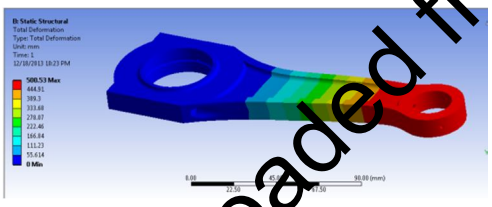

Fig.no.6 Total Deformation

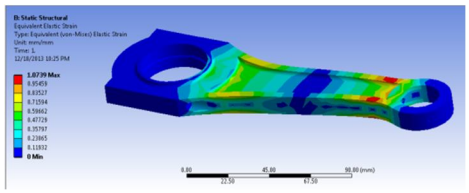

Fig.no.7 Strain Energy

Elastic strain when 500n of load applied fig.no.7

Von-mises stress when 500n of load applied fig.no.8

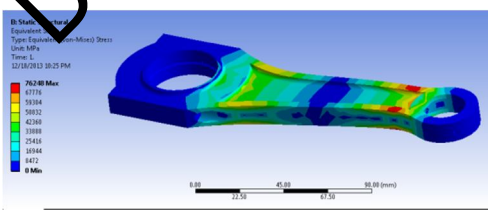

Fig.No.8 Von-Mises Stress

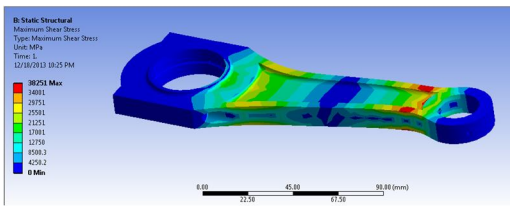

Fig.no. 9 shear stress

Maximum shear stress when 500n of load applied fig .no. 9

Table -2. Loads Distribution

Load/material	Von-mises Elastic strain	Von-mises Elastic stress	Maximum shear stress	Total deformation
GRAY CAST IRON				
500N	1.0719	1.074e5	1.074e5	500.46
1000N	2.1437	2.1437e5	2.1508e5	1000.9
1500N	3.215	3.219e5	3.219e5	1501.35
ALUMINUM				
500N	1.0739	38251	38251	500.53
1000N	2.1478	76503	76503	1001.1
1500N	3.2215	114753	114753	1501.59

4. Conclusion

In our project we have designed a connecting rod for a 150cc engine and modeled in 3D modeling software carina v5/Engineer. Actual cross section connecting rod is I – section, we have changed the cross section to H – section. By changing the cross section, the weight of connecting rod is reduced by 10gms.Present used material for connecting rod is Aluminum and structural steel. We are replacing with Aluminum alloy A360. By replacing it with Aluminum alloy A360, the weight of the connecting rod reduces about 4 times than using Carbon steel since density of Aluminum alloy A360 is very less as compared with structural steel. We have done structural and modal analysis on the connecting rod using two materials and Aluminum alloy. By observing the structural analysis results, the stress values obtained for both materials are less than their respective yield stress values. So using Aluminum alloy A360 is safe. By comparing the stress values for both materials, it is slightly less for Aluminum alloy A360 than structural steel. By observing the modal analysis results, we determined natural frequencies. So we can conclude that Aluminum alloy A360 is better for connecting rod.

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Fabrication of Glass Fiber Helmet

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Abstract: Fiberglass Industry over the years has been regarded as a versatile reinforcement material in imparting structural stability and strength to various components in a wide variety of markets such as Automobile, Aeronautics, and Wind Turbine etc. A high percentage of fiber glass produced in the world is used for reinforcement of plastics The main products marketed by the fiber glass plants are Mats, Roving's, Woven Roving's, Yarns etc. An attempt has been made to fabricate a fiberglass reinforced plastic helmet using an Industrial helmet as the mold. The Industrial helmet is essentially made up of Polyethylene thermoplastic. The construction of the fiberglass helmet is done using the fiberglass hand lay-up operation. Emphasis is laid in constructing the helmet with superior structural strength and stability over the polyethylene thermoplastic while also ensuring that the weight is kept as low as possible comparison with the polyethylene plastic helmet and also ensuring that the product is economical.

Keywords: Fiberglass, fabricate, helmet, polyethylene thermoplastic.

1. Introduction

One of composites' main advantages is how their components - glass fiber and resin matrix - complement each other. While thin glass fibers are quite strong, they are also susceptible to damage. Certain plastics are relatively weak, yet extremely versatile and tough. Combining these two components together, however, results in a material that is more useful than either is separately. With the right fiber, resin and manufacturing process, designers today can tailor composites to meet final product requirements that could not be met by using other materials. The key factors to consider are fiber, resin and filler. Glass-reinforced composites gain their strength from thin glass fibers set within their resin matrix. These strong, stiff fibers carry the load while the resin matrix spreads the load imposed on the composite. A wide variety of properties can be achieved by selecting the proper glass type, filament diameter, sizing chemistry and fiber forms (e.g., roving, fabric, etc.).

As temperatures increase, glass fibers lose tensile strength. C-glass performs poorly in high-temperature applications and should not be used for them. While E-glass and S-type glass lose about 50% of their tensile strength at 1000º F, their strength at high temperatures is still considered good. Another temperature-related property to consider is the coefficient of thermal expansion (CTE). Fibers with a high CTE expand more as temperatures increase. S-type glass has a much lower CTE than either E-glass or C-glass. Having a similar CTE in both the fiber and resin prevents problems due to different thermal expansion rates.

Matrix resins bind glass-reinforcing fibers together, protecting them from impact and the environment. Glass fiber properties such as strength dominate in continuously reinforced composites. When glass is used as a discontinuous reinforcement, resin properties dominate and are enhanced by the glass.

Polymer matrix resins fall into two categories: thermoset and thermoplastic. The difference is in their chemistry. Thermoset resin is chemically comprised of molecular chains that crosslink during the cure reaction (set off by heat, catalyst, or both) and "set" into a final rigid form. Molecular chains in thermoplastic resin are processed at higher temperatures and remain "plastic," or capable of being reheated and reshaped. While the tradeoffs between thermosets and thermoplastics have been debated extensively, engineers will find that material suppliers will tailor matrix resin formulations best for their application.

2. Industrial Plastic Helmet

High-density polyethylene (HDPE) or polyethylene high-density (PEHD) is a polyethylene thermoplastic made from petroleum. Known for its large strength to density ratio, HDPE is commonly used in the production of plastic bottles, corrosion-resistant piping, geo membranes, and plastic lumber. HDPE is commonly recycled, and has the number "2" as its recycling symbol. In 2007, the global HDPE market reached a volume of more than 30 million tons.

2.1. Properties

HDPE is known for its large strength to density ratio. The density of high-density polyethylene can range from 0.93 to 0.97 g/cm^3. Although the density of HDPE is only marginally higher than that of low-density polyethylene, HDPE has little branching, giving it stronger intermolecular forces and tensile strength than LDPE. The difference in strength exceeds the difference in density, giving HDPE a higher specific strength. It is also harder and more opaque and can withstand somewhat higher temperatures (120 °C/ 248 °F for short periods, 110 °C /230 °F continuously). High-density polyethylene, unlike polypropylene, cannot withstand normally required autoclaving conditions. The lack of branching is ensured by an appropriate choice of catalyst (e.g., Ziegler-Natta catalysts) and reaction conditions.

3. Manufacturing Process

1. The mould is first selected in order to give shape and dimension to the product. The mould chosen for this project was the plastic industrial helmet itself.

Figure 1. Industrial Helmet

2. The fiber glass cloth is cut into pieces which help in fabrication process.

Figure2. Cutting the Glass Fiber Cloth To Get the Desired Shape

3. The mold is thoroughly coated with releasing agent. This releasing agent helps the component to get detached from the mould easily. Wax is used as a releasing agent for the manufacturing of helmet.

Figure 3. Applying Wax on the Mould

4. The mould which is coated with the wax is kept idle for almost 20 minutes.

5. Mix Epoxy and hardener in the ratio of 2:1 and stir it thoroughly.

6. Apply this compound to the waxed helmet mould and wait for 30 minutes so that the fibre glass cloth can stick well onto the surface of the helmet.

Figure4. Applying the Mixture On To the Mould

7. Place the fiber glass cut piece clothes onto the helmet.

8. It is then kept for drying. A drier can be used to make the process faster.

9. Apply another layer of Epoxy hardener mixture onto the first layer and wait for 30minutes.

10. Continue this process till four layer of glass fiber is been kept on the mould.

11. Apply one more layer of Epoxy hardener layer on the fourth layer to give a smooth finish to the helmet.

12.Allow the layers to get dried for 12 hours.

13. When the layers becomes hard in the shape of the helmet detach the layer from the mould by gently heating the mould.

Figure 5. Fiber Glass Helmet after Removing From the Mould

14. Cut the unwanted glass fibre layer and a smooth finishing is given to the product.

Figure 6. Final Product after the Finishing

4. Test Results

Table 1. Plastic Helmet test results

Tensile Test	Hardness Test	Flexural Test
31.37 N/mm^2	65	63 N/mm^2

Table 2. Glass Fiber Helmet test results.

Tensile Test	Hardness Test	Flexural Test
49.815 N/mm^2	69	80.29 N/mm^2

Table 3. Cost analysis.

Material	Amount	Cost	Total
Fiber Glass	$1m^2$	240 per meter	240
Epoxy Resin	600ml	350 per liter	210
Hardener	300 ml	350 per liter	105
Wax	5 nos	5	25
Total			580

The price for a single unit helmet was Rs.200 while the cost for making glassfibre helmet costs Rs.580. The cost of making glassfibre helmet was more than the Plastic helmet that was produced by mass production. This was mainly because the materials used for making the glass fibre helmet was purchased in retail price. The cost of production could be further reduced to a large extent when the materials are bought in large amount and in wholesale.

5. Conclusion

The fiberglass cloth was chosen keeping in mind various parameters concerning the weight and cost of the fiberglass reinforced glass helmet and also ensuring that the mechanical properties were not compromised. The various parameters considered include weight, the weave pattern, strand direction and the cost effectiveness. The Hand Lay-up process was chosen to fabricate the Fiber Reinforced Glass Helmet while a HDPE Industrial Safety helmet was chosen to be the open mould. Four layered glass specimens were tested for tensile strength, hardness and flexural strength and have been compared alongside the standard mechanical properties of a HDPE Industrial helmet. While the FRP emerged as a clear winner over the HDPE Industrial helmet with respect to the structural properties, the study has also widened the areas of research for improvement in design and in its economy. A research on the fiber glass market both domestically and internationally has been studied and also on the future of the Fiber Glass Industry.

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Determination of Modulus of Elasticity of Hybrid composite material with reinforcement of Coconut coir

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Abstract: High performance demands on engineering material leads extensive research and developing engineering applications such as insulating walls, floors, ceilings and insulating covers by changing mixing proportions of ingredients to develop new material. The emerging trends of hybrid composite materials are cheap, eco-friendly and the resulting material will have improved properties when compared to individual fiber (coconut coir) and POP (Plaster of Paris).

This paper discusses about the elastic property of hybrid composite material consists of coconut coir reinforcing in Plaster of Paris as a base material and a binding resin supposed to be a good insulating material in both domestic and industrial applications. Coconut coir binds with POP transfer heat to the reinforcing fiber (coir). For the preparation hand layup process is used to develop the samples by a mold preparation consists of a flat straight molding boxes of confined dimensions and reinforcement fiber laid in the mold with its base material by proper mixing proportions up to the edges of molding box and after proper curing of material the samples are cut for testing to determine the mechanical properties with deflection of hybrid composite material beam samples. The mixing proportion of coconut coir is varied at 0 and 300 grams respectively with 1000 grams of POP and made two attempts for samples.

Keywords: POP (Plaster of Paris or Super fine), Coconut coir, Deflection, Modulus of elasticity.

Literature Review

D. Verma, et al**,** [1] review has been undertaken, with an objective to explore the potential of the Coir fiber polymer composites and to study the mechanical properties of composites. The present review reports the use of Coir fibers, as reinforcements in polymer matrix.

[2] Nikhilesh Chawla,* and Yu-Lin Shen,"Mechanical behavior of a particle "A journal of advanced engineering materials, Vol.6 (2001), ISSN: 1438-1656/01/0606-0357. Nikhilesh Chawla, determined Characterizing the matrix as an isotropic ally hardening elastic-plastic solid (following the experimental stress-strain curve of a peak-aged Al-3.5Cu alloy) and the SiC particles as an elastic solid, the calculated tensile stress-strain response of Al/Si-C/20$_p$ composites.

[3] Dyzia*, J. Œleziona**.** Aluminium matrix composites reinforced with AlN particles formed by in situ reaction", Vol.31 (2008), 17-20. International Scientific Journal of World Academy of Materials and Manufacturing Engineering. M. Dyzia found ultrafine reinforcement particles are formed as product of reaction between reactive components. Those kinds of materials have good mechanical properties (higher yield stress and creep resistance). Via in situ reaction between liquid metal and reacting substance (solid or gas) is possible to obtain aluminum matrix composites similar to SAP composites by casting methods. Presented results of researches concerning possibilities of obtaining ultrafine aluminum nitride particles via in situ reaction between aluminum alloys (with addition of Mg) and nitrogen. Using the in-situ reaction in order to form AlN dispersion reinforcement in the aluminum alloy matrix.

[4] G. Kranthi Kumar and B. Praveen Kumar, P. Vara Laxmi and Dr. Anil Kumar Birru," A Study on Thermal Conductivity of Hybrid Composite Material with Reinforcement of Coconut Coir" A journal of Advance Research and Innovations in Mechanical, Material Science, Industrial Engineering and

Management ,Vol-51(2014), ISBN 978-93-82338-970 © 2014 Bonfring. G. Kranthi Kumar, For the tests by pre-determined values of thermal conductivity(K), thermal resistance(R) and heat transfer rate(q) could be determined at NTP (normal temperature & pressure) conditions. As a result, it is found that the thermal resistance(R) obtained from developed material varied nearly 20-30% compare to the unmodified POP and it may suitable to the insulating walls for various applications.

[5] Khyati Tamta, A journal of Advance Research and Innovations ,material science, Industrial Engineering and management Icarmmiem-2014," Fabrication and Analysis of Almond Shell Based Composite Material Vol-1- ISBN 978-93-82338-97-0 © 2014 Bonfring.Khyati Tamta, in this paper, She noticed the mechanical behavior of Almond shell powder reinforced epoxy composite has been discussed. Four different samples containing 10%, 15%, 15.13% and 21.1% of Almond by weight mixed with CY 230 epoxy resin has been prepared and subjected to various mechanical tests viz. tensile strength, compressive strength, impact strength, flexural strength, fracture strength and mechanical properties were compared to the properties of wood. Similarly, [6, 7, 8] made an attempt on composites and hybrid composites by their mechanical properties of their indent physical and chemical structures.

1. Introduction

Since coconut is available in India in abundance, the second highest in the world after Philippines, the coir fibre has been investigated most extensively. Most importantly, coir fibre has been recognized as highly durable fibre in all types of matrices viz., polymer, bitumen, cement, gypsum. From centuries, and mankind has used the natural fiber for various types of application including building materials. In most of the countries, users have explored the possibilities of using the natural fibre from different plants, which includes bagasse, cereal straw, corn stalk, cotton stalk, kenaf, rice husk/rice straw etc. Most of the fiber was used mainly for the production of hard board and particle board. Emergence of polymers in the beginning of the 19th century has provided the researcher the new dimensions to use the natural fiber in more diversified fields. At the same time the necessity has also increased the interest in synthetic fiber like glass fiber which due to its superior dimensional and other properties seems to be gaining popularity and slowly replacing the natural fiber in different applications [1]. As a result of this change in the raw material and production process of synthetic fiber based composites, energy consumption has increased. For the present experiment, one of the simple molding processes like hand lay-up is applied to determine the toughness other than the costly molding equipments and also the mixture proportions revealed.

2. Applications

The natural fiber composites can be very effective material for following applications:

- Building and construction industry: panels for partition and false ceiling, partition boards, wall, floor, window and door frames, roof tiles, mobile or pre-fabricated building which can be used in time of natural calamities such as floods, cyclones, earthquakes, etc.
- Storage devices: post-boxes, grain storage silos, bio-gas containers, etc.
- Furniture: chair, table, shower, bath units, etc.
- Electric devices: electrical appliances, pipes. Etc.
- Everyday applications: lampshades, suitcases, helmets, etc.
- Transportation: automobile and railway coach interior, boat, etc.
- Toys

2.1. The reasons for the application of natural fibers in the automotive industry include:

- Low density: which may lead to a weight reduction of 10 to 30%
- Acceptable mechanical properties, good acoustic properties.

- Favorable processing properties, for instance low wear on tools, etc..
- Occupational health benefits compared to glass fibers during production.
- No off-gassing of toxic compounds (in contrast to phenol resin bonded wood and recycled Cotton fiber parts).
- Price advantages both for the fibers and the applied technologies.

3 -Experimental Procedures

Making of samples (**Hand lay-up process)-**Hand lay-up is a simple method for composite production. A mold must be used for hand Lay-up parts unless the composite is to be joined directly to another structure. The molds can bees simple as a flat sheet or have infinite curves and edges. Reinforcement fibers can be cut and laid in the mold. It is up to the designer to organize the type, amount and direction of the fibers being used. Resin must then be catalyzed and added to the fibers. A brush, roller or squeegee can be used to impregnate the fibers with the resin. The lay-up technician is responsible for controlling the amount of resin and the quality of saturation shows the basic process of hand lay-up. Other fabrication processes such as vacuum bagging, vacuum resin transfer molding and compression molding can be used with hand lay-up to improve the quality of the finished part or save time. To develop the samples by a mold preparation consists of flat straight molding boxes of confined dimensions and reinforcement fiber laid in the mold with its base material by proper mixing proportions up to the edges of molding box and after proper curing of material these samples are cut for testing to determine the mechanical properties such as modulus of elasticity [6], [7].

Fig: a) mixing of POP b) hand layup process

4. Material and Equipment

- Hybrid composite material beam,
- Super fine beam(PoP)
- Loading arrangement
- Supports dial
- Gauges
- Magnetic stand
- Vernier caliper
- Weights and scale

4.1. Description

The experimental set up consist of following two knife edge supporting stand for beam .the beam of different cross section material loading pan along with the different weights with magnetic standstill rule

4.2. Procedure

- Measure the dimensions of the given beam using the venire caliper, now place the beam horizontally on the two supports maintaining the require Span.
- Hang the loading pan at the mid-point of the beam fit the dial gauge and set it to zero now load the beam carefully without causing any disturbance.
- Corresponding deflection are noted with the help of dial gauge the loads are change each time the corresponding deflection are noted.
- The experiment repeated for different types of material of the beam.

a b

Fig.3Testing for deflection of a) Superfine (POP) composite beam b) Hybrid composite beam

Table: 1. Mixing Proportions.

Material	Amount of POP(grams)	Amount of coir(grams)	Resin(grams)
Unmodified POP	1000	-	-
Modified POP	1000	300	100

The mixing proportion of coconut coir is varied at 300 grams which is named hybrid composite material and alone pop of given proportion. After proper curing of these two materials the samples are cut for testing to determine mechanical properties.

Table: 2. PoP (Superfine) material observation

Load Applied (W) N	Deflection in mm dial gauge reading	Modulus of elasticity $E=WL^3/3I\partial$ IN N/MM^2
W	∂	E
1	10	$0.18*10^5$
2	15	$0.1*10^5$
3	20	$0.7*10^5$

Table: 3. Hybrid composite (POP+Coir) material observation

Load applied(W) IN Newton	Deflection in mm Dial gauge reading	Modulus of elasticity $E=WL^3/3I\partial$ IN N/mm^2
W	∂	E
1	6	$0.14*10^5$
2	12	$0.07*10^5$
3	15	$0.04*10^5$
4	20(break)	$0.02*10^5$

4.3. Calculations

Type of beam : Super fine (POP) material Beam
Dimensions : 20*1.5mm
Moment of inertia of beam,(I) : $bd^3/12$: $5625mm^4$
Effective span length of the beam : 500mm
Modulus elasticity of super fine composite beam (E) : $0.18*10^5 N/mm^2$

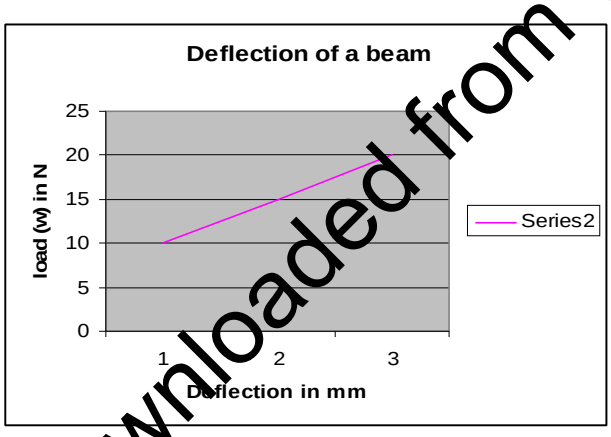

Fig: 4. Deflection vs. load of alone POP beam

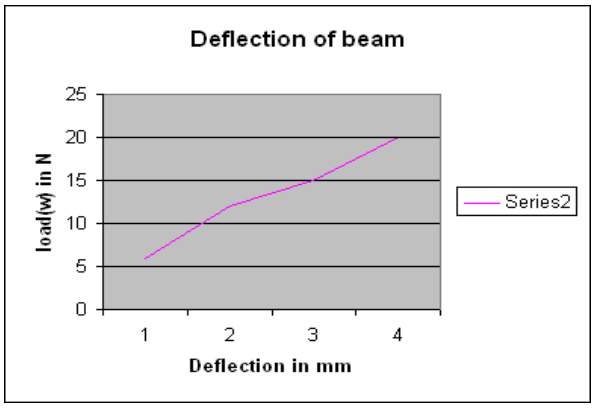

Fig: 5. Deflection vs. load of POP and Coconut coir beam

4.4. Calculations

Type of beam : hybrid composite material
Beam dimensions : 20*1.5mm
Moment of inertia of beam: $bd^3\backslash 12$: $5625mm^4$
Effective span length of the beam : 500mm
Modulus elasticity of hybrid composite beam (E) : $0.14*10^5 N/mm^2$

5. Results and Discussion

Compare to the Modulus of elasticity of alone POP composite bar, the hybrid composite bar got less elastic modulus

- Modulus elasticity of super fine composite beam (E) : $0.18*10^5 N/mm^2$
- Modulus elasticity of Hybrid composite beam (E) : $0.14*10^5 N/mm^2$

The mixing proportion of coconut coir is varied at 0 and 300 grams respectively with 1000 grams of POP and made two attempts for samples gives the less elastic modulus which denotes high strength in the hybrid composite beam compare to alone POP sample.

6. Conclusion

By these experimental attempts there is a wide scope of composites, especially preparing of hybrid composites from natural fibers.

The improved characteristics by these hybrid composites are

- Optional for new production technologies and materials.
- Favorable accident performance, high stability, less splintering.
- Favorable eco-balance for part production.
- Favorable eco-balance during vehicle operation due to weight saving.

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Comparative Design Analysis of Two Wheeler Shock Absorber

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Abstract- Shock absorbers are main part of a suspension system used in two wheelers. In this investigation a shock absorber is designed and a 3D model is created using software CREO. Structural analysis is done on the shock absorber spring in ANSYS by varying the material for spring as Stainless Steel (ASTM-A316), Inconel X750, Nickel 200. Static analysis is made on above materials to compare the stress values and displacements to verify the best material for spring in Shock absorber. Finally, after our analysis we investigated the best suited material for the spring of the shock absorber is Inconel X750. Therefore in this Paper the main focus is to develop new correlated methodologies that will allow us more effectively and improve the working conditions of shock absorber by using FEM based tool.

Keywords: Shock Absorber, CREO and ANSYS (FEA)

I. Introduction

A shock absorber or damper is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy. Shock absorbers reduce the effect of traveling over rough ground, leading to improved ride quality and vehicle handling. While shock absorbers serve the purpose of limiting excessive suspension movement, their intended sole purpose is to damp spring oscillations. Shock absorbers use valving of oil and gasses to absorb excess energy from the springs. Spring rates are chosen by the manufacturer based on the weight of the vehicle, loaded and unloaded. Some people use shocks to modify spring rates but this is not the correct use. Along with hysteresis in the tire itself, they damp the energy stored in the motion of the unsprung weight up and down. Effective wheel bounce damping may require tuning shocks to an optimal resistance These devices are similar to the hydraulic dashpot type except that a number of orifices are provided allowing different degrees of restriction throughout the stroke. These devices are engineered to bring the moving load is smoothly and gently to rest by a constant resisting force throughout the entire shock absorber stroke. The load is decelerated with the lowest possible force in the shortest possible time eliminating damaging force peaks and shock damage to machines and equipment

A. Creo: formerly known as Pro/ENGINEER is a parametric, integrated3D CAD/CAM/CAE solution created by Parametric Technology Corporation (PTC). CREO is a feature based, parametric solid modeling program. As such, its use is significantly different from conventional drafting programs. In conventional drafting various views of a part are created in an attempt to describe the geometry. Each view incorporates aspects of various features but the features are not individually defined. In feature based modeling, each feature is individually described then integrated into the part. The other significant aspect of conventional drafting is that the part geometry is defined by the drawing. If it is desired to change the size, shape, or location of a feature, the physical lines on the drawing must be changed then associated dimensions are updated. When using parametric modeling, the features are driven by the dimensions. To modify the diameter of a hole, the hole diameter parameter value is changed. This automatically modifies the feature wherever it occurs – drawing views, assemblies, etc. Another unique attribute of CREO is that it is a solid modeling program. The design procedure is to create a model, view it, assemble parts as required, then generate any drawings which are required. It should be noted that for many uses of Pro/E, complete drawings are never created. A typical design cycle for a molded plastic part might consist of the creation of a solid model, export of an SLA file to a rapid prototyping system use of the SLA part in hands on verification of fit, form, and function, and then export of an IGES file to the molder or toolmaker. A toolmaker will then use the IGES file to program the NC machines which will directly create the mold for the parts.

B. Ansys: is general-purpose finite element analysis (FEA) software package. Finite Element Analysis is a numerical method of deconstructing a complex system into very small pieces (of user-designated size) called elements. The software Implements equations that govern the behavior of these elements and solves them all; creating a comprehensive explanation of how the system acts as a whole. These results then can be presented in tabulated or graphical forms. This type of analysis is typically used for the design and optimization of a system far too complex to analyze by hand. Systems that may fit into this category are too complex due to their geometry, scale, or governing equations

II. Experimental Procedure

C. Design calculation for helical spring of shock absorber: In this present paper the design of the helical spring shock absorber was done in creo taking the following data

Material: Steel

Modulus of rigidity, G = 77000 N/mm^2 Mean diameter of a coil, D=62mm
Diameter of wire, d = 8mm
Total no of coils, n_1= 16
Height, h = 220mm
Outer diameter of spring coil,
D_0 = D +d =70mm
No of active turns, n= 14
Weight of bike, W= 125kgs

Let weight of 1 person = 75Kgs Weight of 2 persons = 75×2=150Kgs Weight of bike + persons = 275Kgs Rear suspension = 65%
65% of 275 = 165Kgs
Considering dynamic loads it will be double,
W = 330Kgs = 3234N
For single shock absorber weight, w= W/2= 1617N
We Know that, compression of spring (δ) = $(8FD^3i)/(Gd^4)$
C = spring index = D/d = 7.75 = 8
(δ) = 8*1617*$(62)^3$*14/77000*$(8)^4$
= 136.8mm
Solid length, Ls=n1×d=16×8=128mm
Free length of spring, L_f = solid length + maximum compression + clearance between adjustable coils
L_f = 128 + 136.8+ (0.25 × 136.8)
= 297mm
Spring rate, K = F/δ = 1617/136.8
= 11.82N/mm
Pitch of coil, P = (L_f–2d) / i
= (297-2*8)/14 = 20.07 = 20
Pitch of coil, P = 20

Stresses in helical springs: maximum shear stress induced in the wire

$\tau_{max} = \tau_T + \tau_F$
$= 8FD/\pi d^3 * (1+1/2C)$
$= 529.78 N/mm^2$

D. Modeling and Drafting of Shock Absorber

Modeling and drafting is done for the all the parts

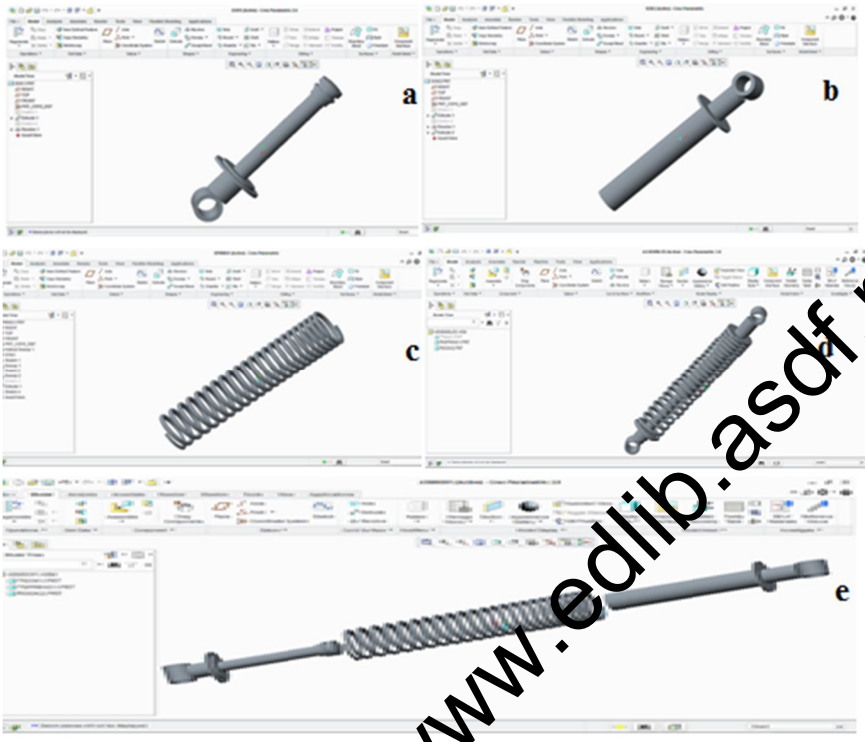

Figure 1. a) Bottom Part b) Top Part c) Helical Spring d) Total Assembly e) Exploded View

III. Results and Disscusions

E. Static Analysis

In shock absorbers, spring is the main part of it. The total suspension will depends upon the spring. So analysis is done only on spring by placing plates at both ends and two springs are analysed here to validate our design. To import a model from any design software to ANSYS its format should be portable for ANSYS. The portable format of CREO model for ANSYS is “iges”. Meshing of model is done in hyper mesh and imported to ANSYS as “cdb” file.

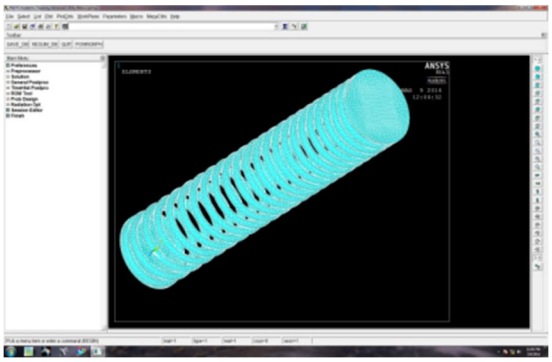

Figure 2. Analysis for helical spring

Case-1: Material: Stainless Steel 316

Element type: SOLID185
Young's Modulus: 195000 N/mm^2 Poisson's ratio: 0.3
Density: 0.0000078 Kg/mm^3
Pressure: 0.0078 N/mm^2

Case-2: Material: Inconel X-750

Element type: SOLID185
Young's Modulus: 215000 N/mm^2
Poisson's ratio: 0.29
Density: 0.0000082 Kg/mm^3
Pressure: 0.0078 N/mm^2

Case-3: Material: Nickel 200

Element type: SOLID185
Young's Modulus: 207000 N/mm^2
Poisson's ratio: 0.31
Density: 0.0000088 Kg/mm^3
Pressure: 0.0078 N/mm^2

Deformed Shapes of various springs

Figure 6. a) Stainless steel 316 b) Inconel X750 c) Nickel 200

Nodal Solutions of Various Springs

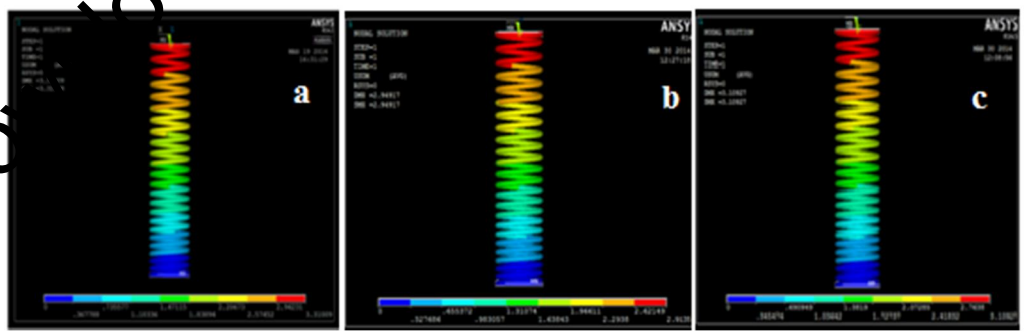

Figure 6. a) Stainless steel 316 b) Inconel X750 c) Nickel 200

Von Mises Stresses

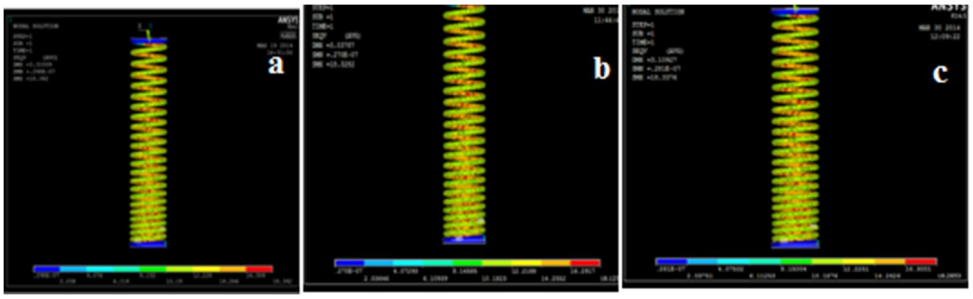

Figure 7. a) Stainless steel 316 b) Inconel X750 c) Nickel 200

Table 1. Results Summary

		Stainless Steel 316	Inconel X750	Nickel 200
Displacement (mm)	Min	0.367	0.327	0.345
	Max	3.31	2.91	3.10
Stress (N/mm^2)	Min	0.298E-7	0.27E-7	0.281E-7
	Max	18.342	18.1252	18.2853
Ultimate Strength (N/mm^2)		707	1100	900

IV. Conclusion

- In this investigation the designed shock absorber is used in a 100cc bike which has been modeled by using 3D parametric software CREO
- To validate the strength of our design, the structural analysis on the shock absorber spring has been done, the analysis done by varying spring material as Stainless steel, Inconel X750 and Nickel 200 has done
- By comparing the results for both materials, the stress value is less for Inconel X750 than Stainless steel 316.
- Since the cost of Inconel X750 is little higher than stainless steel 316, so it can be used for the higher end vehicles i.e. for sports bikes.
- As per our analysis, Inconel X750 for spring is best and safe

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Influence of Thermo Mechanical Properties Parameters on Titanium Metal Matrix Composite and Ti-6Al-4V for Aerospace Applications

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Assistant Professor CJITS Jangaon Warangal AP

Abstract: Ti-6Al-4V alloy is used mainly in aircraft industry due to its low density, excellent corrosion/oxidation resistance, and attractive combination of mechanical properties. This alloy has relatively low formability, so forming parts of complex geometries out of this alloy requires precisely controlled thermo mechanical processing parameters. In this respect, powder metallurgy methods are very promising, since the processing parameters in the case of P/M materials can be controlled more precisely. This work is aimed at the analysis of P/M Ti-6Al-4V alloy processing. The samples of Ti-6Al-4V alloy powder compacts, obtained from the blended mixtures of elemental powders, were subjected to plastometric tests under various temperature-strain-strain rate conditions. The microstructures of both Ti-6Al-4V alloy powder compacts and hot deformed in compression on Gleeble simulator P/M Ti-6Al-4V alloy samples were analyzed. Moreover, basing on the results of plastometric tests, thermo mechanical parameters of forging P/M Ti-6Al-4V alloy were determined. The investigated alloy was successfully forged in industrial conditions, what was also discussed in this study. The investigations showed a significant influence of processing parameters on development of the microstructure and mechanical behavior of P/M Ti-6Al-4V alloy.

Keywords: titanium alloy, metal Matrix Composites, Ti-6Al-4V, powder metallurgy, microstructure, temperature.

Introduction

Materials and materials processing have entered a new era. Where metals and alloys once dominated, advanced materials, such as polymers ceramics, intermetallic compounds and composites with polymeric, metallic, ceramic and intermetallic matrices have entered to Extend applications. Titanium matrix composites (TMCs), such as the particle reinforced Ti6Al4V+10 wt. % Tic can be included in this new era opening new perspectives for applications such as sporting goods and aerospace structures. The use of advanced materials is very attractive to material scientists and high-technology industries, usually for specific Applications in which their special properties can be tailored and used to great advantage Exploiting the desirable properties and minimizing those less desirable features. Advanced materials require novel joining techniques; therefore, developments in new structural materials research should be conducted in parallel with that into weld ability aspects. Among the modern joining processes used in engineering, the solid-state techniques such as diffusion bonding and rotary friction welding are intensively used in materials sensitive to fusion welding processes. Solid-state joining processes operate without melting of the base metal, usually by the application of high pressure, thus limiting the extent of metallurgical reactions that may cause welding defects such as cracking, porosity or formation of intermetallic compounds. Bonding is achieved by the introduction of mechanical, electrical or thermal energy and/or diffusion. Nowadays these processes play an important role in key technology industries helping to develop complex structures such as airframes, offshore accommodation units, pipelines, among other components. Titanium is a low-density metallic element that is abundant and widely distributed

Titanium Matrix Composite - TMC (Ti6Al4V+10 wt. % of Tic)

The material used in this investigation was a Tic-particulate reinforced Ti6Al4V Composite. It was produced by the CHIP process, which is a P/M technique (blended elemental method – BE), comprising

cold isocratic pressing of blended elemental powders (master alloy and Tic particles) in a reusable elastomeric mould, followed by vacuum sintering to achieve a closed porosity (94 to 98%) and hot isostatic pressing (HIP) at 899ºC for 2 hours at 103 MPa without need for additional expensive tooling achieving a final density of 99 to 100%. With this technique proper proportion of master alloy powders and reinforcement particles are blended to obtain a uniform distribution of the required chemical Composition. The Ti6Al4V+10 wt. % of Tic alloy was supplied by Dynamic Technology Inc. in the form of 50 mm diameter bars. The reinforcement of the Ti6Al4V alloy leads to several modifications in the mechanical and metallurgical properties changing the matrix alloy original characteristics. Basically, the most dramatically improvements in the composite are stiffness and high temperature tensile properties (10 to 15% higher). The material properties can be tailored to meet specific applications by increasing or decreasing the reinforcement level. The material has not been heat treated after fabrication and it was furnace cooled inside the HIP chamber under protective atmosphere. Such procedure allowed the formation of platelike α andintergranular β microstructures with Tic randomly distributed in the matrix alloy. The as-received Ti6Al4V/Tic-particulate reinforced chemical composition. A detailed description of the microstructure and properties of the base material

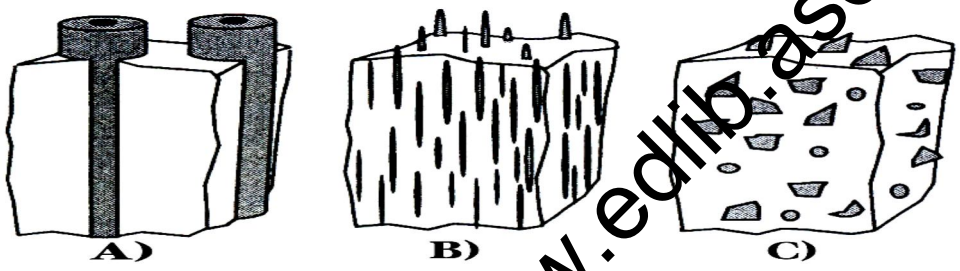


Figure 2.1 - Examples of reinforcements in composites: (a) Continuous reinforcement (fibres). (b) Discontinuous reinforcement (whiskers). (c) Discontinuous reinforcement (particulate

Alpha Alloys

Titanium and its alloys with α stabilizer either single or in combination are hcp at ordinary temperatures and are classified as α alloy. Satisfactory strength, toughness, creep resistance and weld ability characterize these alloys. Furthermore, the absence of ductile brittle transformation renders the α alloys suitable for cryogenic applications. Generally they have creep resistance superior to β alloys and are preferred for high temperature applications. Extra low-interstitial (ELI) grades retain ductility and toughness at cryogenic temperatures. Unlike α-β and β alloys, α alloy cannot be strengthened by heat treatment. Strengthening Mechanisms are cold work, coldwork and anneal to control α grain size as well as solute additions for solid solution strengthening. Alloys that contain small additions of stabilizers (Ti8Al1Mo1V or Ti3Al2.5V) have been classified as near-α alloy. Although they contain some retained β phase, these alloys consist primarily of α and behave more like conventional α alloys than α-β alloys. An example of α alloy is Ti5Al2.5Sn.

Alpha-Beta Alloys

α-β alloys are such that at equilibrium, usually at room temperature, they support a mixture of α and β phases (10 to 50% of β)]. Although many binary β-stabilized alloys in thermodynamic equilibrium are two-phase, in practice α-β alloys usually contain mixtures of both α and β stabilizers. They retain more β phase after the final heat treatment than do near-α alloys (specific amount depending on quantity of β stabilizers present and on heat treatment). It can be strengthened by solution treating and aging. Solution treating usually is done at a temperature high in the two-phase α+β field and followed by quenching. As a result of it, the β phase present at the solution treating temperature may be retained or partly transformed during cooling by either martens tic transformation or nucleation and growth. The specific response depends on the alloy composition, section size, cooling rate and solution-treating temperature. It is followed by aging to precipitate α and produce a fine mixture of α and β in retained or transformed β. Examples of α-β alloys are Ti6Al4V and Ti6Al6V2Sn.

Beta Alloys

Titanium can be made to exist entirely in the β phase at room temperature. Alloy additions inhibit the β-to-α transformation (β stabilizers) with the β phase completely retained. They are characterized by high harden ability, excellent forge ability and good cold formability in the solution treated condition. The disadvantages of the β alloys in comparison with the α-β alloys are higher density, lower creep strength and lower ductility in the aged condition. Although the ductility is lower, the fracture toughness of an aged β alloy generally is higher than that of an aged α-β alloy of comparable yield strength. In the solution treated condition (100% retained β), the β alloys have good ductility and toughness, relatively low strength and excellent formability. They are prone to ductile-brittle transformation; therefore unsuitable for low-temperature applications. Some examples of β alloys are Ti10V2Fe3Aland Ti15V3Cr3Al3Sn.

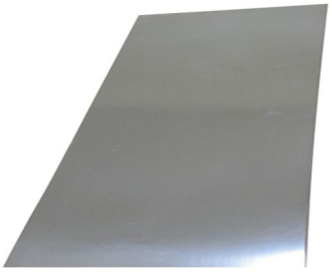
Alpha + Beta Alloy Ti6Al4V

The α+β Ti6Al4V alloy is the most widely used titanium alloy among all others. It contains 6% of aluminum and 4% of vanadium (weight percentage) and it has an excellent combination of specific strength and toughness as well as good stability at temperatures up to 400ºC. The Ti6Al4V modulus (100 to 130 GPA) is about midrange for the titanium alloys but relatively low compared to other high-strength materials. In general, it has been found that the α-stabilizing solutes increase modulus, whereas the β-stabilizing solutes decrease it . Room-temperature tensile properties are affected by heat treatment, composition and Texture. It is well established that the fracture toughness of titanium alloys strongly depends on micro structural parameters, which depend on both processing history and heat treatment. The micro structural parameters can strongly affect the fracture toughness behavior in two different ways: through direct influence on the material fracture properties and through influence on the crack front geometry. In general, the fracture toughness increases as amount of transformed β structure increases, with β annealing providing the highest fracture toughness . The best combination of micro structural parameters to improve the fracture Toughness value (KIC) is coarse grain size and lamellar microstructure, low age-hardening and low oxygen content. affirm that it is clear the superiority of microstructures that contain large acicular α percentage due to their high aspect ratio that provides extended α-β interfaces for preferential crack propagation resulting in greater energy consumption. The grain size also plays an important role (increasing the grain size increases the KIC) since the crack front is much smoother for the fine grained compared to the coarse grained material. The smoother the crack path is; the lower is the KIC value since a more irregular fracture path (crack direction changes) leads to a greater dissipation of work per unit crack extension distance in the direction normal to the loading direction resulting in higher\ KIC. The geometry of α+β structures also plays an important role in the KIC behavior; fine lamellar structure exhibits a much smoother crack path compared to serrated crack growth in coarse lamellar structure (higher KIC). When comparing equaled and lamellar structures, the equaled structure exhibits a smoother crack path than their lamellar counterparts. Also, the KIC of bimodal structures decreased with decreasing primary α volume fraction approaching the KIC of fine lamellar structure. Table 2.1 presents the mechanical properties of Ti6Al4V according to various micro structural condition resulted from different heat treatments and mechanical processing.

Advanced Titanium Alloys

Since the monolithic alloys have inherent performance limitations, the development of materials independent of equilibrium or met stable structures have been investigated leading to the development of MMCs where a metal or alloy is combined with a nonequilibriumdispersed phase - generally nonmetallic. Due to their unique properties, titanium alloys were among this initial MMC development, leading to the obtention of TMCs with boron fibers and later on with other kind of reinforcements (whisker or particulate). During the past decade, an extensive effort has been devoted in order to develop and increase the performance of advanced titanium alloys such as TMCs. These alloys have unique properties such as excellent high temperature performance (oxidation, fatigue and creep resistances) as a result of their high specific modulus, high recrystallisation temperature and low self diffusion. Much effort is currently being

made to use TMCs for high performance industrial applications such as automotive and aeronautic components



Advantages of Titanium

- Good corrosion resistance in seawater applications
- Low density/ high strength-to-weight ratio
- Low modulus of elasticity
- Low thermal expansion
- Non-magnetic
- Good fatigue resistance
- Good high temperature mechanical properties

Applications

- Blades, Rings, and Discs
- Sporting Equipment
- Aircraft Structural Components
- Hand Tools
- Airframes
- Fasteners, Components
- Vessels, Cases, Hubs, Forgings
  Biomedical Implants

Aerospace applications

Dynamet has produced and supplied its PM processed Ti-6Al-4V alloy mate- rials to a commercial aerospace Manufacture for extensive property analysis. Results of thousands of data points generated to date show that the static properties of CIP-Sinter and CHIP prod- uct data are consistently above the mini- mum allowable developed for wrought Ti-6Al-4V. Additional information and data was presented at the AeroMat2011Conference [5]. It is anticipated that this work will soon lead to Dynamet's PM titanium products being used to substi- tute for wrought titanium airframe com- ponents in commercial aircraft. This is expected to significantly increase the volume of PM titanium product and provide a major breakthrough at the intersection of the titanium industry, the aerospace industry and the powder metal industry.

Affordability and enhanced properties by PM will increase titanium's competitive position versus other materials, expand the use of titanium and provide a new supply base to meet customers' increasing demands for titanium product at lower
cost and shorter lead-times.

Physical Properties

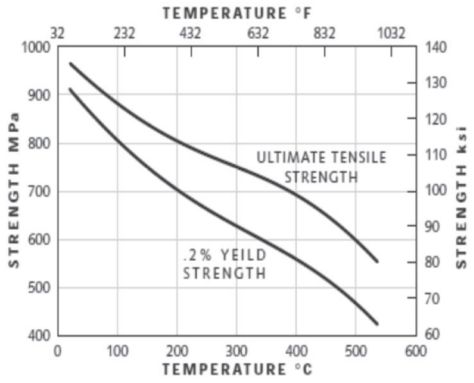
Melting Range: 2,800-3,000°F (1,538 - 1,649°C)

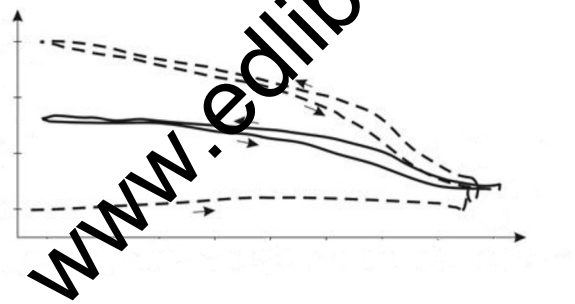
Density: 0.160 lbs/cu. in.(4.47 gm/cc) Beta Transus , Temperature: 1830°F (± 25°); 999°C (± 14°)

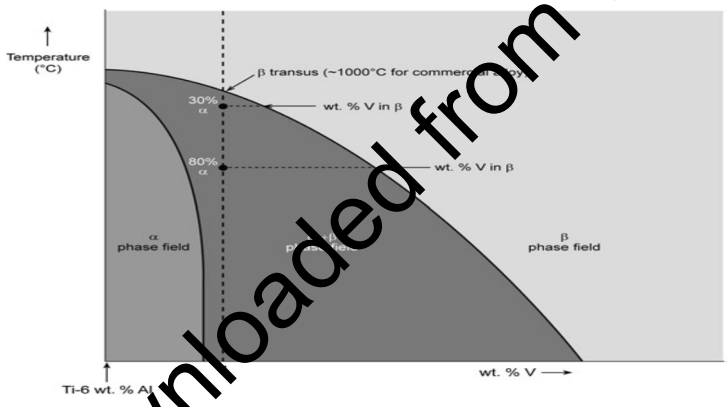
Mechanical Properties

Typical Mechanical Properties Annealed Condition (min)		
	MPa	Ksi
Yield Strength (0.2%)	828	120
Tensile Strength	895	130
Elongation (%)	10	
Reduction in Area (%)	25	
Hardness	Rc 30-34	

Note: Variations in mechanical properties are dependent on size/condition/heat treatment



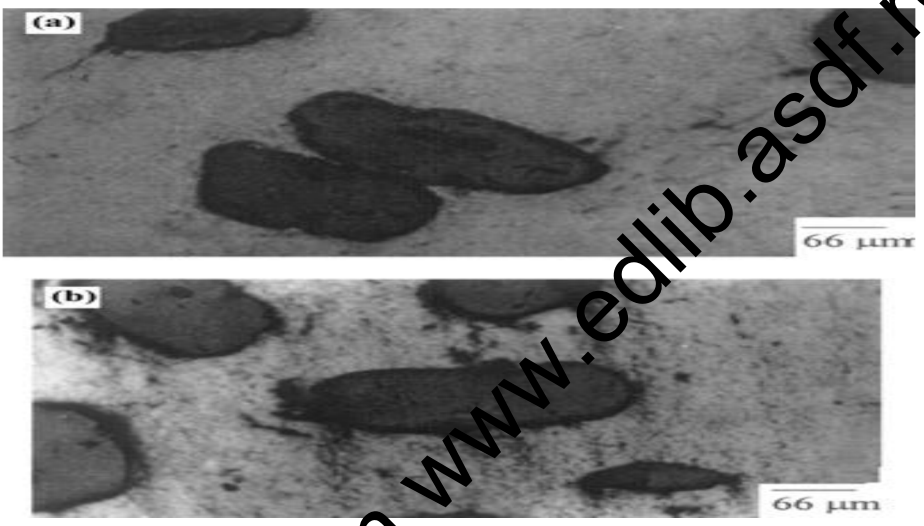




Pseudo-binary equilibrium phase diagram (schematic) for Ti-6Al-4V. The relative amounts of a at the two indicated temperatures are derived from the metallurgical phase diagram lever rule.

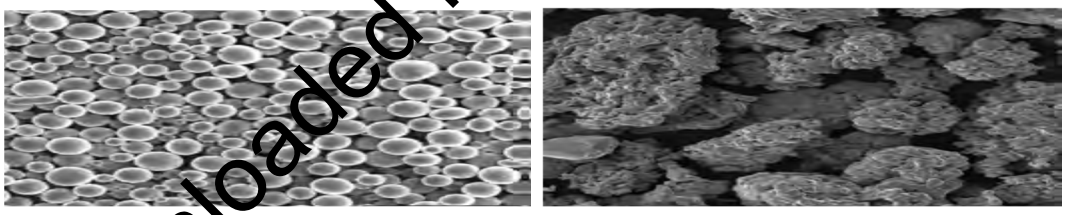
The General Metallurgy of Titanium Alloys Unalloyed titanium has two allotropic forms. The low temperature form, a, exists as an hexagonal-close-packed (hcp) crystal structure up to 882_C, above which it transforms to b, which has a body-centred-cubic (bcc) crystal structure. The alloying behavior of elements with titanium is defined by their effects on a and b. Element additions that increase or maintain the temperature range of stability of the a phase are called a-stabilizers. The most important of these are aluminium, tin and zirconium. Element additions that stabilize the b phase are called b-stabilizers. These include molybdenum, vanadium and iron. There are also important impurity elements, namely oxygen, hydrogen, nitrogen and carbon. Oxygen and hydrogen are the two most important impurities: oxygen is an

a-stabilizer and hydrogen is a b-stabilizer. These four elements are also referred to as interstitial elements. This is because their atomic sizes are much less than those of the metallic alloying elements and they fit in the spaces (interstices) between the crystallographic positions of the metal atoms in the a and b phases. Titanium alloys can be classified in four categories: (1) a alloys Examples are commercially pure grades of Ti, containing welldefined amounts of oxygen, and Ti-2.5Cu and Ti-5Al-2.5Sn. (2) Near-a alloys These contain only a small amount of b phase. They are heattreatable and stronger than a alloys. Early examples are Ti-6Al-2Sn-4Zr-2Mo and Ti-8Al-1Mo-1V. More complex alloys have been developed for improved creep resistance. These include TiAlZrMoSiFe and TiAlZrSnNb(Mo,Si) alloys.These variables are controlled by processing and heat treatment. Examples are Ti-6Al-4V and Ti-6Al-2Sn-4Zr-6Mo. b alloys These have sufficiently high b-stabilizer contents that commercially useful microstructures are predominantly b phase. They have been developed mainly because of excellent formability (e.g. cold-rolling) and very good response to heat treatment. Examples are Ti-15Mo-3Nb-3Al-0.2Si and Ti-10V-2Fe-3Al.

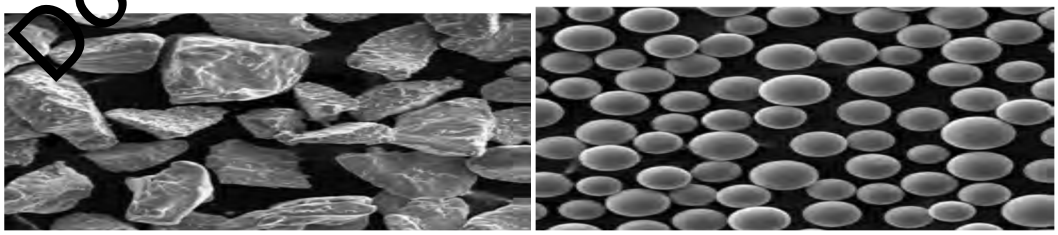


Optical micrograph of **Ti6Al4V+10 wt. % of TiC** composite:
(**a**) Hot rolled and (**b**) cold rolled

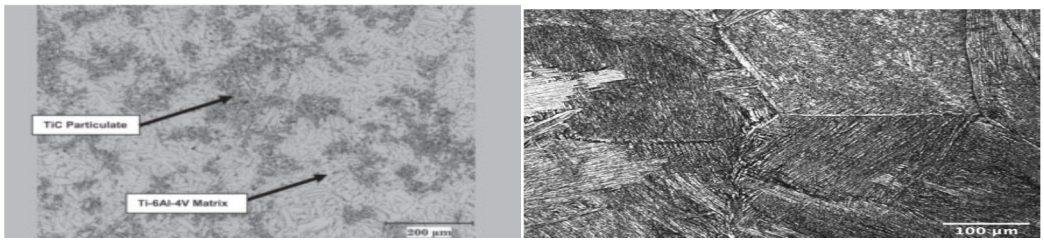
Thermo Mechanical Properties & SEM photomicrograph



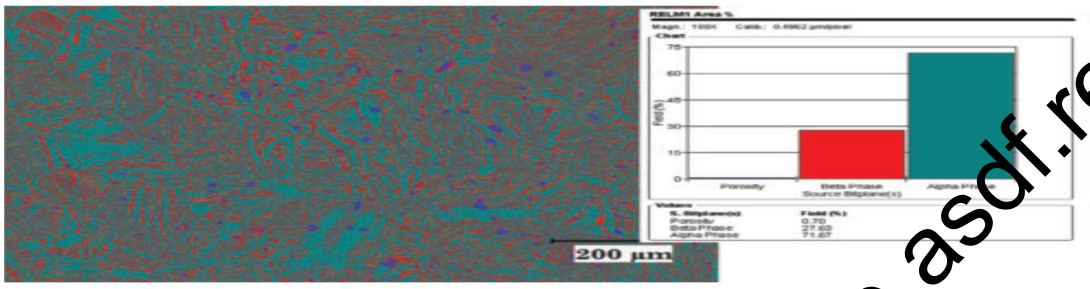
(a)SEM photomicrograph of gas-atomized prealloyed spherical Ti-6Al-4V
(b) SEM photomicrograph of sponge fines produced by the Kroll process



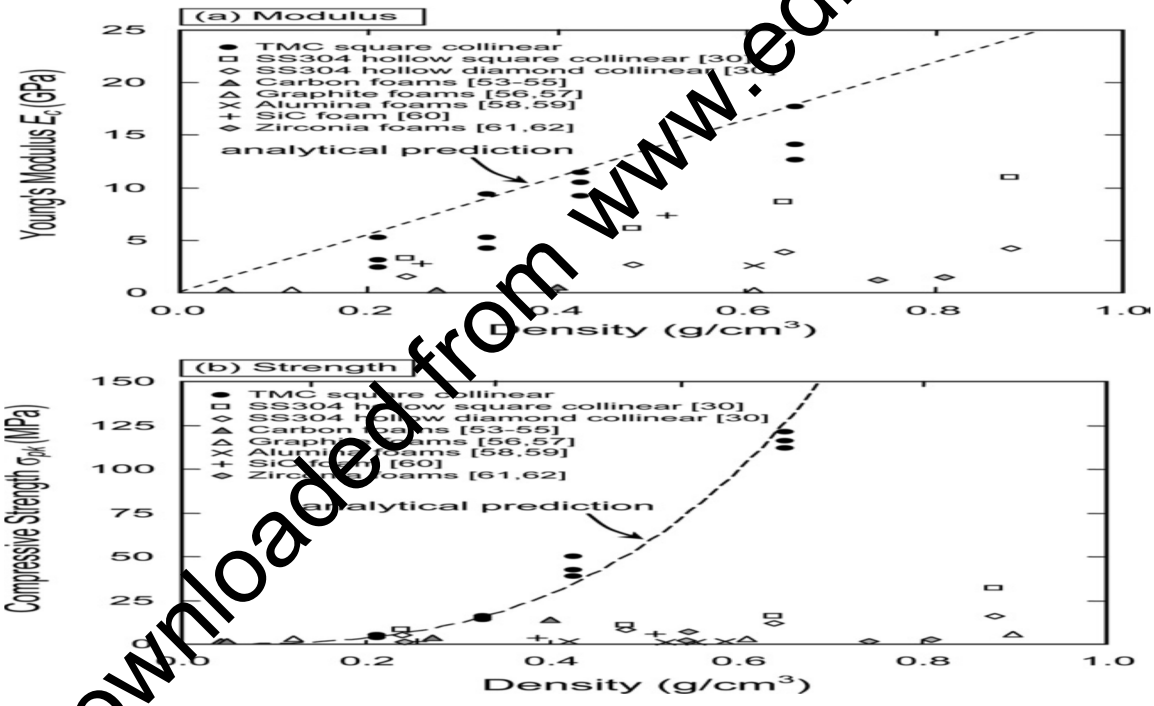
(c)SEM photomicrograph of angular HDH titanium powder; (d)SEM Photomicrograph of spherical powder produced by processing angular HDH titanium to a spherical morphology using the Tekna technique



SEM micrographs of P&S samples sintered at 900 ºC (a) and 1300 ºC (b)



Mechanical Properties



Results

A comparison of the mechanical properties of fine Ti/TiC composite and conventional Ti-6Al-4V (Ti64) alloy .By adding a small percentage of carbon black particles, the yield stress and tensile strength of fine Ti/Tic increased, approaching the lower levels of the Ti64 alloy. At the same time, the elongation was much higher than that of Ti64. We would expect that fine Ti/carbon black composite. May replace the conventional Ti64 alloy in the near future Micro voids are observed in the particles enriched zone. A phase transformation has been observed during the resistivity and DSC measurements owing to the precipitation of TiAl3 phase. Cold and hot rolling of the composite is successfully carried out to 40% and 50% reduction, respectively. Hardness of the composite is greater than the base alloy, which can be attributed to the

presence of higher dislocation density in the matrix due to the difference in thermal properties between the matrix and dispersions.

Conclusions

This study demonstrated that near net-shape, chemically-homogeneous and dense titanium products with properties similar to those of the wrought materials can be produced by means of powder metallurgy techniques, which should lower the production costs and, possibly, expand the employment of titanium in new industrial applications. Ti-6Al-4V/TiB composites were fabricated using a powder metallurgy route. Annealing studies of HIP'ed materials showed that increasing the anneal temperature accelerated the kinetics of the transformation of TiB2 particles to the stable TiB phase. Increasing the anneal temperature or duration led to more complete transformation, the formation of larger TiB whiskers, and a nearly complete elimination of densely-packed, fine TiB whisker aggregates which occurred in the vicinity of previous TiB2 clusters. Given the size of the TiB2 and Ti powders used in this study, a heat treatment of 1300 °C for 6 h was established to retain a fine matrix grain size and to provide a reasonably homogeneous distribution of distinctive whisker reinforcements. Composites reinforced with 20 and 40% by volume of axially aligned TiB whiskers were produced by blind die compaction and extrusion. The average elastic moduli of Ti-6Al-4V/TiB/20w/1D and Ti-6Al-4V/TiB/40w/1D composites tested along the extrusion axis are 169 and 205 GPa, respectively, representing increases of about 55 and 88% relative to the elastic modulus of the unreinforced Ti-6Al-4V matrix. TiB whiskers are

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Investigations of Analysis and Fabrication of butt joint using friction stir welding of A319 Aluminum Alloy

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Abstract- Friction stir welding (FSW) is a new and promising welding process that can produce low-cost and high-quality joints of heat-treatable aluminum alloys because it does not need consumable filler materials and can eliminate some welding defects such as crack and porosity. In this paper the effect of welding speed and tool pin profile on FSP zone formation in A319 alloy has been studied. Different tool pin profiles are used to fabricate the welding joints. Those profiles are round, round taper, square and treaded, and the Finite Element Analysis (FEA) process coupled field analysis on different tool pin profiles to verify the temperature distribution, thermal flux, gradient and stresses have been studied. The experimental results showed that thermal gradient is less for round cutting tool and it was found around 577.4 K/mm and thermal flux is also less which around 7.507 W/mm2.

Keywords: Friction stir welding, Aluminum319 alloy, thermal flux.

I. Introduction

Friction-stir welding (**fsw**) is a solid-state joining process (meaning the metal is not melted during the process) developed by twi in 1991[1] and is used for applications where the original metal characteristics must remain unchanged as far as possible. This process is primarily used on aluminum, and most often on large pieces which cannot be easily heat treated postweld to recover temper characteristics.

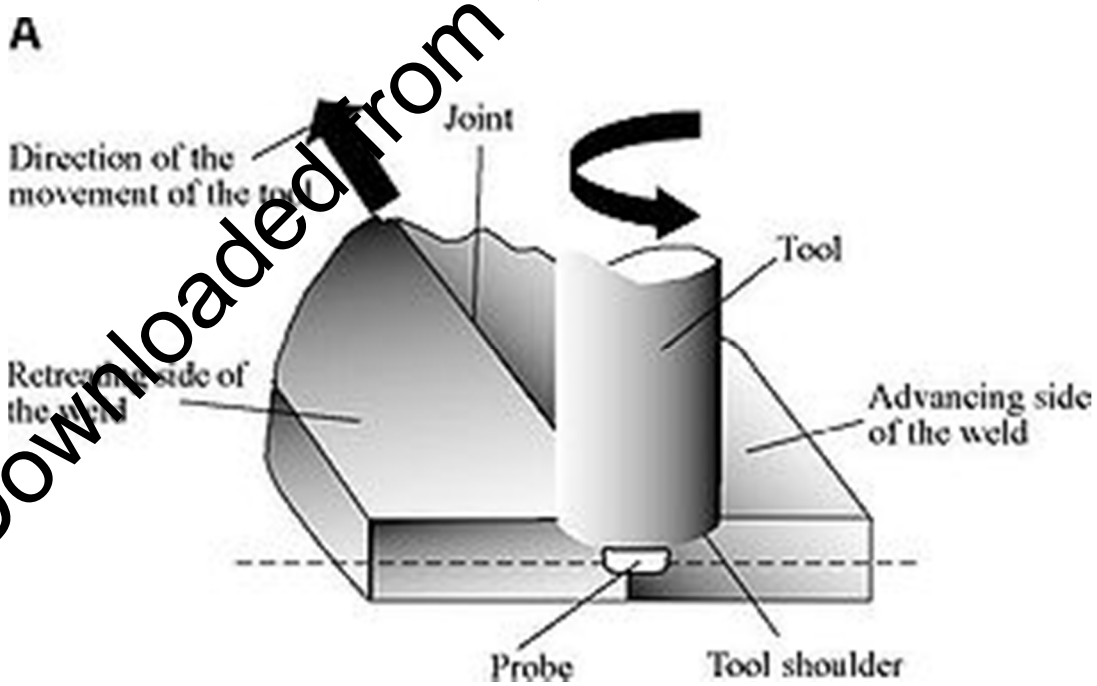

Fig 1.a. Schematic diagram of the FSW process: (A) Two discrete metal work pieces butted together, along with the tool (with a probe).

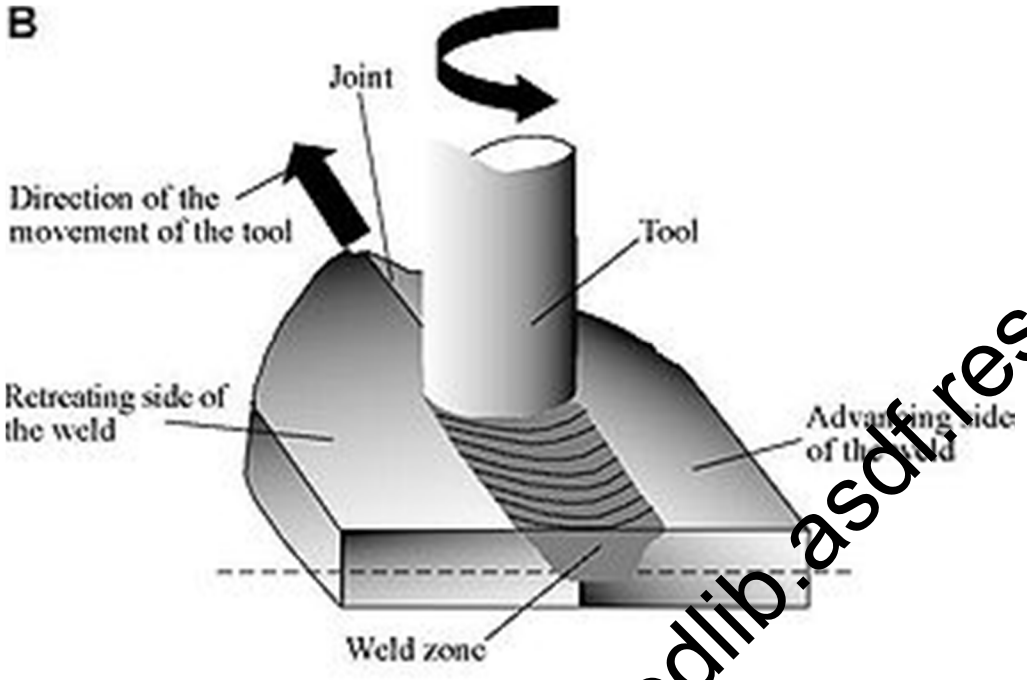

Fig 1.b. The progress of the tool through the joint, also showing the weld zone and the region affected by the tool shoulder.

In FSW, a cylindrical-shouldered tool, with a profiled threaded/unthreaded probe (nib or pin) is rotated at a constant speed and fed at a constant traverse rate into the joint line between two pieces of sheet or plate material, which are butted together [2]. The parts have to be clamped rigidly onto a backing bar in a manner that prevents the abutting joint faces from being forced apart. The length of the nib is slightly less than the weld depth required and the tool shoulder should be in intimate contact with the work surface. The nib is then moved against the work, or vice versa. Frictional heat is generated between the wear-resistant welding tool shoulder and nib, and the material of the work pieces. This heat, along with the heat generated by the mechanical mixing process and the adiabatic heat within the material, cause the stirred materials to soften without reaching the melting point (hence cited a solid-state process), allowing the traversing of the tool along the weld line in a plasticised tubular shaft of metal. The amount of heat conducted into the workpiece determines the quality of the weld, residual stress, distortion of the workpiece and the microstructure of the metal [4, 5]. As the pin is moved in the direction of welding, the leading face of the pin, assisted by a special pin profile, forces plasticised material to the back of the pin while applying a substantial forging force to consolidate the weld metal. The welding of the material is facilitated by severe plastic deformation in the solid state, involving dynamic recrystallization of the base material.

II. Experimental Procedure

Friction stir butt welded joints of A319 alloy, with a thickness of 6 mm and chemical composition of Al 87.2%, Si 5.8%, Cu 3.51%, Fe 0.68%, Mn 0.25%, Zn 0.9%, Cr 0.1%, Ti 0.16%, Ni 0.12%, Sn 0.02% & Pb 0.03% were selected in the present study. Friction stir welding was carried out using 3-Axis Vertical CNC Milling Machine with the position of the tool fixed relative to the surface of the Sheet as shown in fig.1. The work piece was firmly clamped to the bed and specially made tool was plunged in to the selected area of the material sheet for the sufficient time in order to plasticize around pin. After adequate plasticization tool is traversed across the surface the material for a single pass. Different tool pin profiles are used to fabricate

the welding joints. Those profiles are round, round taper, square and treaded used in the present investigation.

The design of the tool is a critical factor as a good tool can improve both the quality of the weld and the maximum possible welding speed. It is desirable that the tool material is sufficiently strong, tough and hard wearing, at the welding temperature. Further it should have a good oxidation resistance and a low thermal conductivity to minimise heat loss and thermal damage to the machinery further up the drive train. Hot-worked tool steel such as AISI H13 has proven perfectly acceptable for welding aluminium alloys within thickness ranges of 0.5 – 50 mm but more advanced tool materials are necessary for more demanding applications such as highly abrasive metal matrix composites or higher melting point materials such as steel or titanium. The experimental work for 5 different tools round tool, round tapered, Square tool, triangle tool and Treaded were modeled in Pro/ENGINEER Wildfire which is the standard in 3D product design. Coupled field analysis for both cutting tools and welding plates are done using ANSYS is general-purpose finite element analysis (FEA) software package.

III. Results and Discussions

The round cylindrical tool and two plates was modeled using ProE by taking the dimensions of the tool 18mm as shoulder Diameter, 6mm as the pin diameter 5.7 as the length of the pin and 80mm as the length of the tool and the plates were modeled with dimensions 50 mm x 100 mm and the thickness was taken of 6mm.

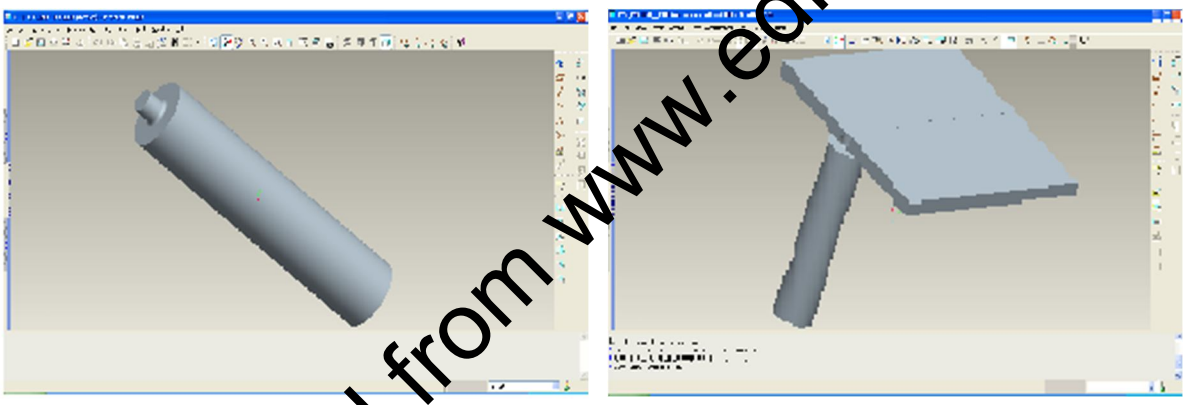

Fig 2 Round Tool and plates for friction stir welding

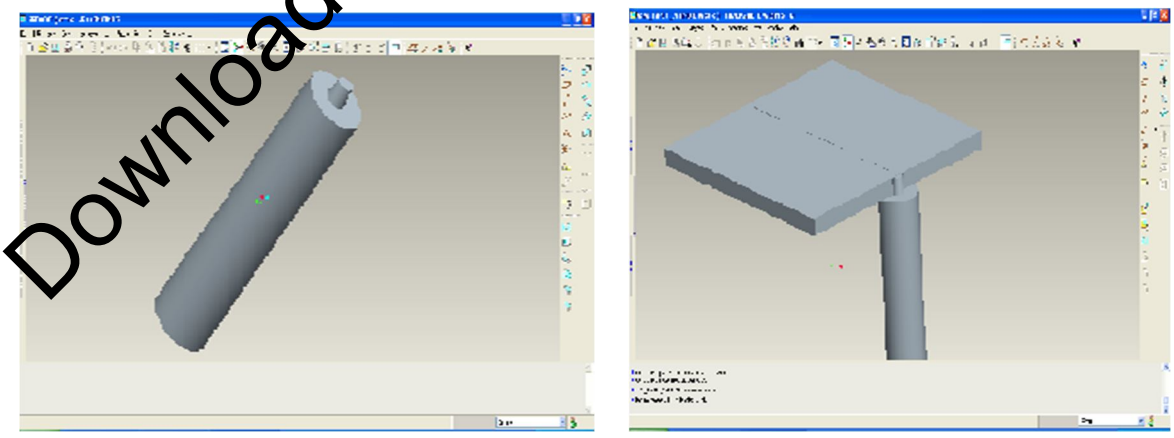

Fig 3.Round taper Tool and plates for friction stir welding

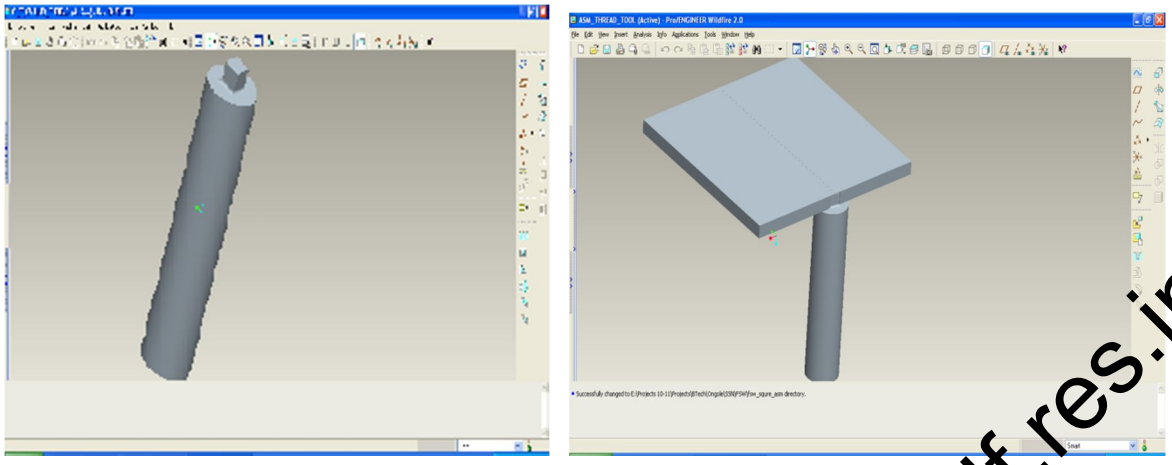

Fig 4.Square Tool and plates for friction stir welding

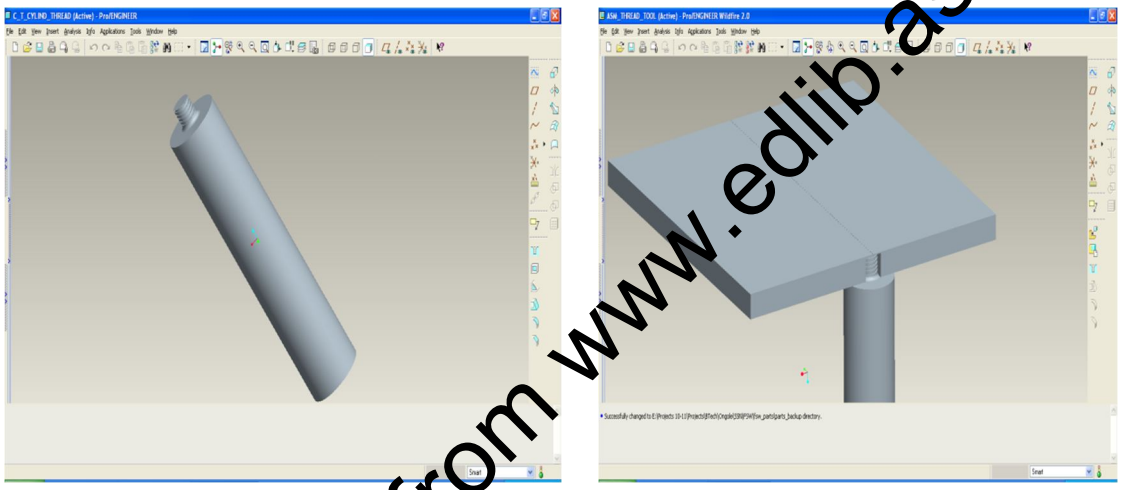

Fig 5 Threaded Tool and plates for friction stir welding

Coupled field Analysis was carried out for the all designed tools the fig 6 shows the various the simulation result can help select the material used for FSW tool and the proper welding parameter for its application.

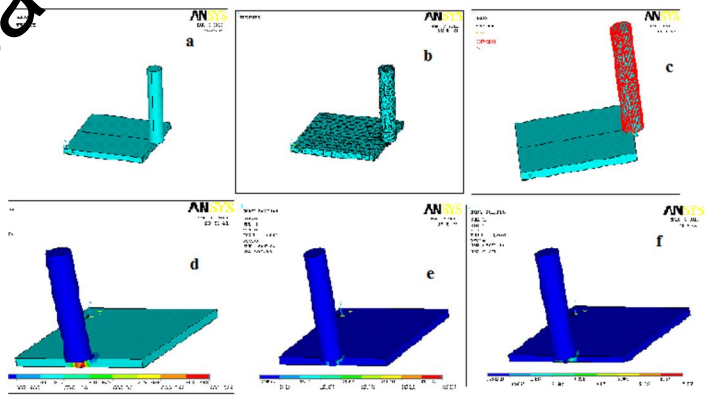

Fig 6 a) shows the imported Model from Pro/Engineer b) shows the meshed tool and plate taking Solid 20 node 90 c) Temperature loads d) nodal temperature e) Thermal Gradient f) Thermal Flux

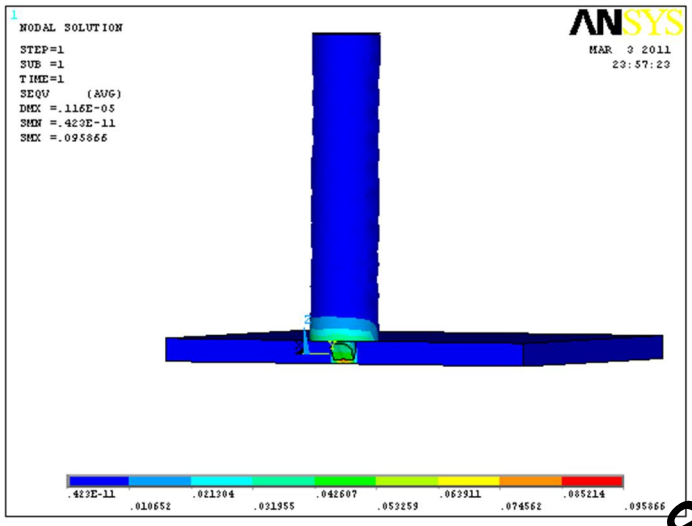

Fig 7 Stress distribution of round tool

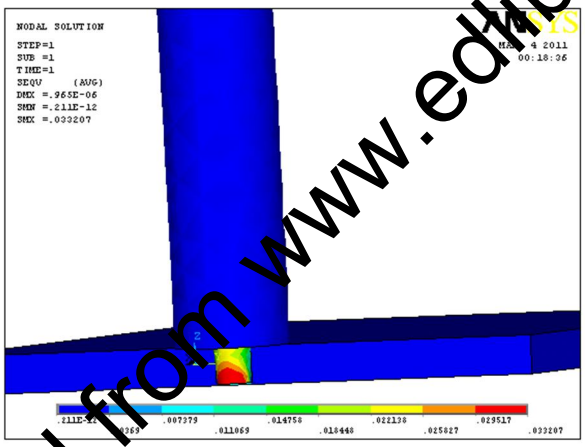

Fig 8 Stress distribution of round taper tool

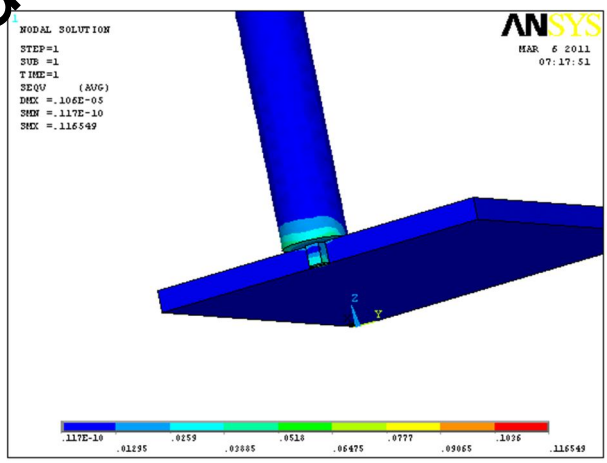

Fig 9 Stress distribution of square tool

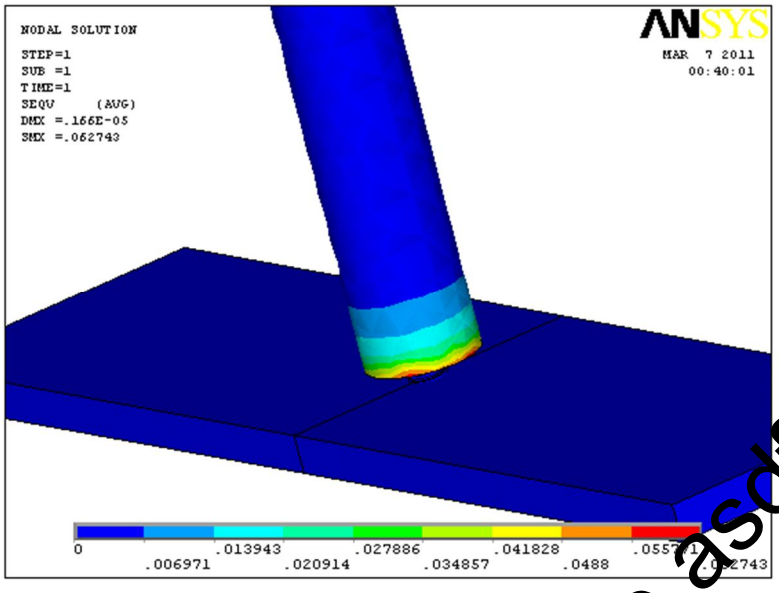

Fig 10 Stress distribution of treaded tool

Table 1: The analysis results

	ROUND TOOL	ROUND TAPER	SQUARE	THREAD
NODAL TEMPEARATURE (K)	982.654	987.792	983.049	973
THERMAL GRADIENT (K/mm)	577.498	1002	761.38	790.393
THERMAL FLUX (W/mm^2)	7.507	23.056	14.176	10.275
DISPLACEMENT (mm)	0.116e^{-5}	0.857e^{-6}	0.106e^{-5}	0.166e^{-5}
STRESS (N/mm^2)	0.95866	0.33207	0.116549	0.062743

IV. Conclusions

- In our project we have designed 4 types of cutting tools Round, Round taper, Square, and Thread for doing Friction Stir Welding.
- We have conducted FEA process coupled field analysis on tools Round, Round taper, square and treaded to verify the temperature distribution, thermal flux, gradient and stresses.
- By observing the results, thermal gradient is less for round cutting tool and thermal flux is also less. Temperature is also produced for required melting point of plates.
- So for using Friction Stir Welding, round cutting tool is more effective than other cutting tools from FEA results.
- By conducting experimental work also, it is proved that round cutting tool produces effective welding.

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FEA Analysis for Investigation of Stress Intensity Factor (SIF) for a Plate with Hole and Patches

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Abstract: Material and its processing effect the relative structure contains small flaws whose size and distribution. These may vary from nonmetallic inclusions and micro voids to weld defects, grinding cracks, quench cracks, surface laps, etc. The objective of a Fracture Mechanics analysis is to determine if these small flaws will grow into large enough cracks to cause the component to fail catastrophically. By using fracture mechanics theories i.e. LEFM approach, applied to two dimensional objects such as plates and shells etc. The aim of this paper is to estimate numerically the beneficial effect of a plate with hole and bounded single and double side patches are symmetrically bonded on the top and bottom on surface for repairing crack using the finite element method. An observed the change in stress intensity factor along the crack length by using FRANC-2D/L simulation software. The obtained results show the reduction of stress intensity factors. The effects of the adhesive, patch and plate properties on the rate of reduction of the stress intensity factors are highlighted.

Keywords: Stress intensity factor, plate, patches, finite element method.

1. Introduction

The determination of fracture mechanics parameters such as Stress Intensity Factors (SIF) (K_I, K_{II}, K_{III}) which corresponds to three basic modes of fracture. J–Integral a path-independent line that measure the strength of the singular stresses and strains near a crack tip. Energy release rate (G) which represents the amount of work associated with a Crack Opening Displacement (COD) or Closure. By comparing these parameters with critical values one can estimate the brittle failure state of structures. The crack analysis is found on three different following methods [2]. Which are displacement correlation methods, virtual crack extension methods, and modified crack closer method. The FRANC-2D/L simulation software is based on Finite element method (FEM) and boundary element method (BEM) are the most widely use techniques for evaluating stress intensity factor (SIF). The most important region in modeling the fracture is around the crack. While the domain is meshed we are using crack tip elements with singularity [16, 17], those elements remove the nodal singularity at the crack tip. Displacement correlation method was employed. To determine stress intensity factors (SIF)

The main objective of this paper is the stress intensity factors are calculated from displacement correlation method.

1. Displacement Correlation Method

Displacement correlation is a direct approach which the simplest and historically one of the first technique used to estimate SIFs from FEM results [3]. In its simplest form, the finite element displacements for one point in the same mesh are substituted directly into the analytical expressions for near tip displacements, after subtracting the displacements of the crack tip [1].

The point is to be selected as a node on the crack face where the displacements will be greatest, and thus the relative error in the displacements is expected to be smallest. The configuration for this simple approach is shown in fig 1.

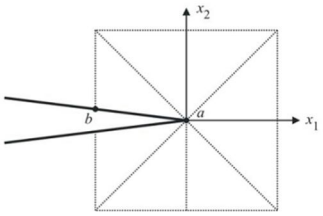

Fig.1. Possible sample point locations for displacement correlation.

The expressions for the SIF's using plane strain assumptions are:

$$K_{\text{I}} = \frac{\mu\sqrt{2\pi}(v_b - v_a)}{\sqrt{r}(2-2\vartheta)} \qquad K_{\text{II}} = \frac{\mu\sqrt{2\pi}(u_b - u_a)}{\sqrt{r}(2-2\vartheta)}$$

$$K_{\text{III}} = \frac{\mu\sqrt{\pi}(w_b - w_a)}{\sqrt{2r}}$$

The same expressions can be used for plane stress assumptions of ϑ is replaced with:

$$\vartheta = \vartheta / (1+\vartheta)$$

Crack tips produce a $\frac{1}{\sqrt{r}}$ singularity. The stress fields near a crack tip of an isotropic linear elastic material can be expressed as a product of $\frac{1}{\sqrt{r}}$ and a function of θ with a scaling factor K:

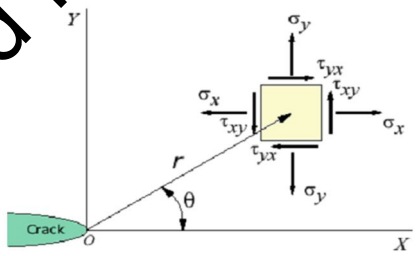

Fig .2.Stress field near crack tip of an isotropic linear elastic material.

$$\lim_{y\to 0} \sigma_{ij}^{(\text{I})} = \frac{K_{\text{I}}}{\sqrt{2\pi r}} f_{ij}^{(\text{I})}(\theta)$$

$$\lim_{y\to 0} \sigma_{ij}^{(\text{II})} = \frac{K_{\text{II}}}{\sqrt{2\pi r}} f_{ij}^{(\text{II})}(\theta)$$

$$\lim_{y \to 0} \sigma_{ij}^{(III)} = \frac{K_{III}}{\sqrt{2\pi r}} f_{ij}^{(III)}(\theta)$$

2. Problem Outline

The objective of this work is to illustrate the process of finite element program to compute the stress intensity factor histories accurately so that they can be used for fatigue crack growth (FCGR) and life predictions.

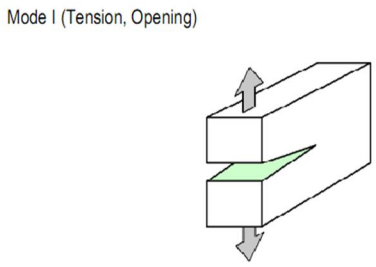

Fig.4. Opening mode of deformation.

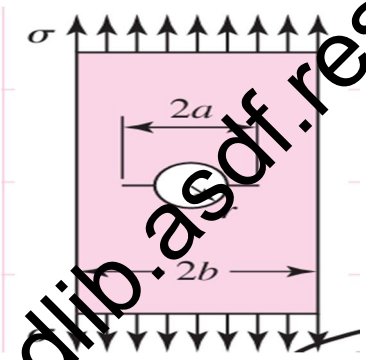

Fig.5. Finite width plate with hole

Fig.5 shows a simple plate with hole under symmetric loading. Let us consider half portion of the Figure (considering the right half).The traction load is applied on the top and bottom edges of the plate. A crack is initiated at the location of high effective stresses, and allows it to propagate in a straight line manner. FRANC 2D/L (Cornell Fracture Group, 2002) [6] is used as the finite element solver.

The input parameters are:

Young's modulus (E) = 10.06E6 N/mm^2

Poisson's ratio (ϑ) = 0.25

Thickness of the plate (t) = 0.04mm

Radius of the hole (r) = 0.5mm

Width of the plate (2b) = 4mm

Height of the plate = 8mm

Assumptions are: Material is linearly isotropic,

The problem is modeled as a Plane stress condition.

3. Approach

As discussed, the problem is reduced based on symmetry, the plate is modeled by using CASCA [7], and then a converged mesh is made with 8-noded quadrilateral element as shown in fig7. A traction load of 10000N is applied along the top and bottom edges of the plate. This is the condition for the simple plate with hole without addition of any patches and the results are as shown in table1, which will be discussed in results and discussions.

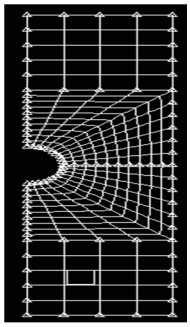

Fig.6.Mesh for plate

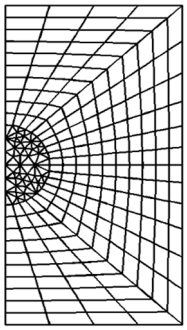

Fig.7. Patch mesh

The mesh for patch after adding patch is as shown in fig 8. The different layers patch and plate after adding adhesive are as shown in fig 9 and 10. The present case is the case for the plate with hole with single patch. In this case on patch is added at the bottom of plate.

For double patch, the patches are added at the top and bottom sides of the plate.

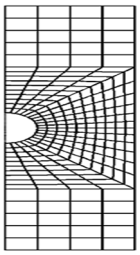

Fig.8. Plate Layer

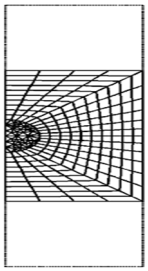

Fig.9.Patch Layer

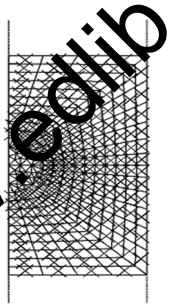

Fig.11. Adhesive elements

Results and Discussions:

The following table shows the values of SIF obtained for plate with hole without any patches

Table1. shows the results for plate with hole with single patch.

sl no	crack length (mm)	$N/mm^2-mm^{1/2}$
1	0.5	0
2	0.6	14660
3	0.8	19300
4	1	22710
5	1.2	27170
6	1.4	33260

Table2. Shown below shows the results for plate with hole with single patch

sl no	crack length (mm)	$N/mm^2-mm^{1/2}$
1	0.5	4246

2	0.6	4155
3	0.8	4247
4	1	4256
5	1.2	4372

Table3. SIF values for plate with hole with double patch.

sl no	crack length (mm)	N/mm^2-$mm^{1/2}$
1	0.5	3094
2	0.7	3030
3	0.9	3096
4	1.1	3141
5	1.4	3468

The following graph shows the variation of SIF along the crack length for the above three cases discussed.

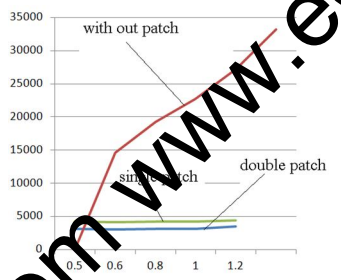

Fig6: *Variation of stress intensity factor V/s crack length*

The following graph is obtained from experimental observations.

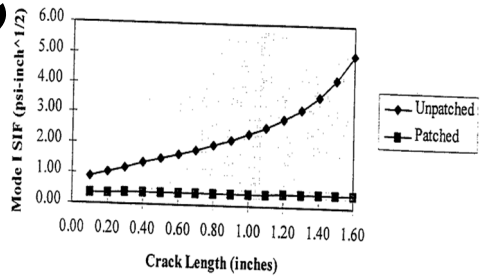

Fig 13: Variations of the stress intensity factors (experimental results**)**

Conclusions

In this work The problem is considered under mode-I conditions and K_I the stress intensity factors are calculated from displacement correlation method .An observed the change in stress intensity factor along the crack length by using FRANC-2D/L simulation software for a plate with hole and bounded single and double side patches are symmetrically bonded on the top and bottom on surface for repairing crack using

the finite element method. The increasing the number of patch layers reduces the stress intensity factors which mean a safe design. The results are plotted by varying crack length are compared with the experimental graphs .The obtained results are found to be satisfactory

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Design of R.G Blower Grid Coupling

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Abstract: Our aim is to design a R.G Blower in which instead of the grid coupling, a bush pin coupling is used so as to reduce the degree of blower failures due to the failure of a coupling. By doing so the work labour and manpower is reduced to half the amount when used with a grid coupling.

The failure of the R.G. Blower occurs due to the failing of the coupling used in the blower. Presently Grid Coupling is used in the blower. A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Couplings do not normally allow disconnection of shafts during operation , however there are torque limiting couplings which can slip or disconnect when some torque limit is exceeded. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both. By careful selection, installation and maintenance of couplings, substantial savings can be made in reduced maintenance costs and downtime.

Key words: Grid coupling & Bush-pin coupling

1. Introduction

Titanium dioxide pigment (rutile) is the product, which is produced in the plant. The product is known by the name 'EMOX'. The titanium dioxide pigment is used mainly in paint industry. Asian paints are one of the major consumers of the product.

This process consist of the following steps

- Reduction and leaching of the raw ilmenite containing 55-60% TiO2 to obtain beneficiated ilmenite of 90-92%
- Conversion of beneficiated ilmenite into TiO2 pigment.
- Regeneration of spent HCl acid for the safe economy and pollution prevention.

R.G blower is the most critical rotating equipment in oxidation plant (U-300).If anything goes wrong in the blower , the whole stream has to take a shutdown.

production loss/Hr/stream is about is 1.2 lakhs.

Hence we feel that this failure analysis is of great importance as far as the company is concerned.

1.1 Specifications

Kind of fan	: recycle gas blower
Type of fan	: 33531/308
Manfacturer	: tlt engineering (india) pvt. Ltd. 64,g.i.d.c. industrial estate, phase-1 vatva , ahmadabad , 382 445.
Job	: 900106
Built in	: 1997
Location	: quilon
Manfacturing number	: 130
Sence of rotation (looking from motor end)	: c.w.

Volumetric flow rate : 3.9 m^3/sec
Gas temperature : 150^0c
Total pressure rise : 39777.0 pa
Temperature
Inlet - 1040c
Exit - 1100c

Fig 1.Bushed pin flexible coupling

2. Design Procedure: Bush-Pin Coupling

a) Design for pins and rubber bush, b) Design for hub, c) Design for key, d) Design for flange

Calculation: N = 2980rpm P = 193.2KW

A. Design for pins (MS) and rubber bush:

We know that the mean torque transmitted by the shaft,

T mean= (P*60)/2πN = (193.2*1000*60)/2*π*960 =619.10*1000 N-mm

OD of shaft (d) =75mm, Number of pins (n) = (d/25) +3, = (75/25) +3 =6

Diameter of pin (d_1) = (0.5*d)/$\sqrt{n}$ = (0.5*75)/$\sqrt{6}$

Diameter of pin=15.30mm≈24mm (std.value)

Overall diameter of rubber bush: d_2=24+2*2+2*6 =40mm

Diameter of pitch circle of pin: D1=2d+d_2+2*6 =2*75+40+2*6 =202mm

Assume allowable bearing pressure (Pb) for rubber bush=0.5N/mm^2

Length of rubber bush=L, W = Pb*d2*L, W = 0.5*40*L

Now max torque transmitted by the coupling: T = W*n*(D1/2), 619.1*1000 = 20*L*6*(202/2), L = 51mm

Now put it in (W): W = 0.5*40*51 , W = 1020 N

Direct tension due to pure tension in coupling halves: T = W/ (π/4*24^2) = 1020/(π/4*24^2) = 2.25 N/mm

Since the pin and rubber bush are not rigidly held in the left hand flange. Therefore the tangential load (W) at the enlarged portion will exert a bending action on the pin. Assuming a UDL along the bush ,the maximum bending moment of the pin (M)

M = W (1/2+5) = 1020(51/2+5) = 31110 N mm

Section modulus (Z) =π/32*d_1^3 =π/32*24^3 =1357.16 mm^3

Bending stress (σ) =M/Z =31110/1357.16 =22.92 N/mm^2

Max principle stress = {(1/2)[σ+$\sqrt{(\sigma + 4\pi^2)}$]} = {(1/2)[22.92$\sqrt{(22.92^2+4*2.25^2)}$]} = 32.13 N/mm^2

Max shear stress = {(1/2)[$\sqrt{(\sigma^2+4\pi^2)}$]} = {(1/2)[$\sqrt{(22.92^2+4*2.25^2)}$]} =18.67 N/mm^2

Since the value of max principle stress for pin varies from 28 to 42 MPa, the design is safe.

B. Design of hub (CI):

Outer diameter of the shaft=75 mm

Length of the hub = 1.5*diameter=112.5mm

Outer diameter of the hub = 2*diameter, (D_H) =150 mm

Let us now check the induced shear stress for the hub material which is a cast iron considering hub as hollow shaft we know that maximum torque transmitted (T) is 619.1*10^3

Induced shear stress(τ_c) , 619.1*10 ^{3}= (π/16)*τ_c*(D_h^4-d^4/D_h) =(π/16)*τ_c*(150^4-75^4/150), τ_c=0.99 N/mm^2 =0.99 MPa

Hence the induced shear stress for hub material is less than the permissible value of 15 MPa Hence the design of the hub is safe.

C. Design of sunk key (MS):

From the handbook for d=75 mm, width of key (w)=22 mm, Thickness of key=14 mm, Length of key=1.5*d =1.5*75 =112.5 mm

Let us now check the induce stress in key by considering it in shearing and crushing.

Consider the key is shearing: T=l*w*τ_k*(d/2), 619.1*1000=112.5 mm*22*τ_k*(75/2), τ_k=6.67 MPa

Considering the key is crushing: T=L*(t/2)*σ_{ck}*(d/2), 619.1*1000=112.5*(14/2)*σ_{ck}*(75/2), σ_c=20.96 MPa

Therefore, both shearing and crushing stress in key are less than permissible shear of 40 MPa and 80 MPa respectively

Hence the design is safe

D. Design of flange (CI):

Thickness of flange (T_f) is taken as, T_f=0.5 d , =0.5*75 =35.7 mm

Check for the induced shear stress in flange

$T=\pi D_h^2/2*\tau_c*T_f$, $619.1*1000=\pi*(150^2/2)*\tau_c*37.5$, τ_c=0.467 MPa

OD of flange (D2) = 4*dl=4*75=300 mm

Since the induced shear stress in the flange of cast iron is less than 15 MPa , the design of the flange is safe.

3. Maintenance Cost of RG Blower With Grid Coupling:

- Per hour shut down loss =Rs 1,25,000 /-
- Maintenance time for one RG blower = 4hours
- Number of labourers required for changing RG blower = 2 people (Rs200/hr)
- Maintenance schedule for whole plant = 3
- Total time for the maintenance of RG blowers in whole plant = 4*3=12hours
- Total loss in shut down of whole maintenance of RG blowers in the plant =1,25,000*12 = Rs 15,00,000/-
- Labour cost for maintenance of coupling of RG blower per head =Rs200/-
- For two workers = 200*12*2 = Rs 4800/-

3.1. Maintenance Cost of RG Blower with Bush Pin Coupling:

Per hour shut down loss = Rs 1,25,000/-

Maintenance time for one RG blower = 2 hours

Number of labourers required for maintenance of a RG blower =2people (Rs 200/hr)

Maintenance schedule for whole plant = 3

Total time for maintenance for one RG blower in whole plant = 2*3=6hours

Total loss in shut down for maintenance of RG blowers in whole plant = 1,25,000*6 =7,50,000/-

Labour cost maintenance of RG blower for one worker = Rs 200/-

For two workers =200*6*2 = Rs 2400/-

Spare Parts List:

POS	PIECE	DENOMINATION	MATERIAL
1	1	Impeller ⌀1100	Ss 316
2	1	Shaft ⌀125*1090	Ck 316
3 u. 4	1	Block bearing assembly ⌀110/90- 500	div
3 a	1	Roller bearing	div
4 a	1	Ball bearing	div
5	1	Coupling type 212 FKN BIBBY MAKE	GG

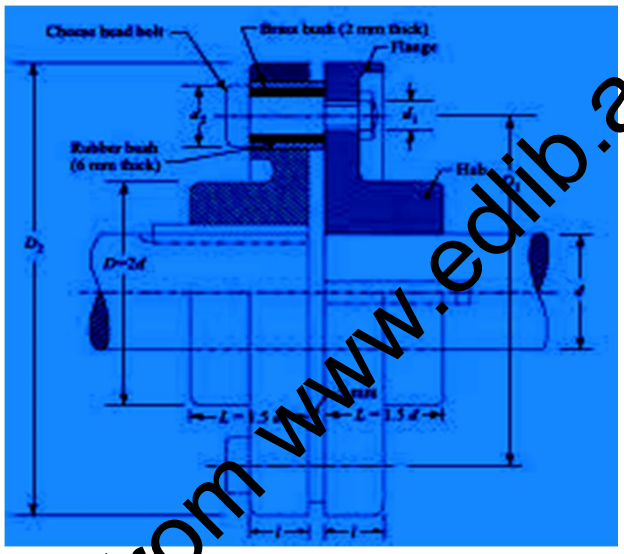

Fig. 2 Comparision between grid & bush-pin type coupling

4. Results

Saving from using bush pin coupling over grid coupling in RG blower =

(Maintenance cost of RG blower using grid coupling)- (Maintenance cost of RG blower using bush pin coupling)

=15, 00,000-7, 50,000

=Rs7, 50,000/-

Money saved in labour cost by using bush pin coupling over grid coupling

(Total labour cost of grid coupling RG blower)- (Total labour cost of bush pin coupling RG blower)

=4800-2400=Rs2400/-

5. Conclusion

The flexible coupling method of connecting rotating equipment is a vital and necessary technique. Large shaft in loosely mounted bearings, bolted together by flanged rigid couplings, do not provide for efficient and reliable mechanical power transmission. This is especially true in modern industrial's environment,

where equipment system designers are demanding higher speeds, higher torques, greater flexibility, additional misalignment, and lighter weights for flexible couplings. The need of flexible coupling is becoming more acute as is the need for technological improvements in them. The basic function of a coupling is to transmit torque from the driver to driven piece of rotating equipment. Flexible couplings expand upon the basic function by also accommodating misalignment and end movement.

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Failure Analysis and Rectification of Sealing Valve Failures in Blast Furnace

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Abstract- Blast Furnace is one of the major departments of VSP where the conversion of raw materials like Iron ore, Sinter and Coke into molten metal (Pig iron) takes place. To charge raw material into Blast Furnaces which are operated at 2 Kg/cm^2 pressure Bell-less top (BLT) charging system supplied by M/s. PAULWURTH, LUXUMBURGE is provided.

In this project various mechanical equipment failures are studied and noted. Based on that failure analysis Sealing Valve failure is taken for further study, which is causing highest production loss to the company.

The function of all BLT equipment's studied and various probable causes for Sealing Valve failure are noted. Major causes contributing to the failure of Sealing Valve analysed and suitable alternatives are suggested.

Key words: Pressure value, Blast furnace, Bell less System.

I. Introduction

Blast Furnace

The line diagram of blast furnace is shown in figure 1.1 Blast furnace is cylindrical, tapered, counter vessel was several reactions take place at different zones. The process of reduction will tap hot metal as the main product and slag as by product from four tap holes, which are provided at the bottom side of the furnace.

A blast furnace is designed to operate at 2 kg/cm^2 working pressure at the furnace top to get the rated production. To charge the material in the furnace 2kg/cm2 pressure is to be maintained in the bin. A separate bell less top charging system is provided. The system is provided exactly on the top of the furnace and the main purpose of it is to distribute the required quantity of material uniformly into the furnace as and when the furnace required. As the volume of the blast furnace is very high - its raw material requirement is also very high, hence the charging equipment should operate continuously without any break.

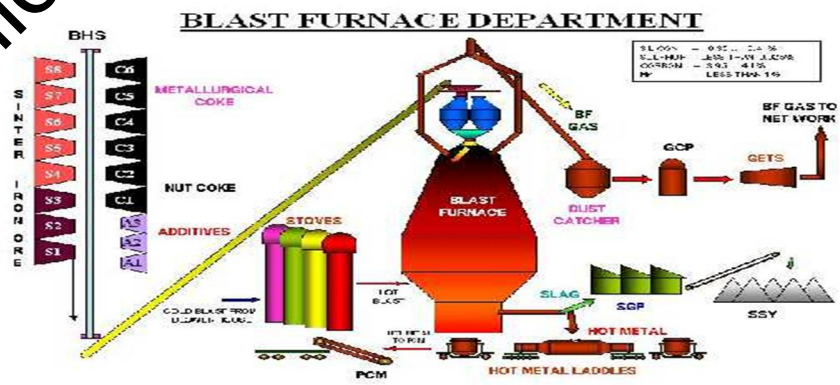

Fig 1.1 Blast Furnaces

2.2. Bell less Top Charging System

Bell less top valves like an upper sealing valve, lower sealing valve, material gate, equalizing valve and relief valves are required to be operated 300 times a day, especially receiving hopper material gate is required to be operated 600 times a day. Failure of any of these valves, valves leads to stoppage of B.F completely. Fig 1.2 shows different parts of Bell less top charging system.

The prime mover connected to these valves should very reliable and should work continuously without any problem. As the location of this valve is at height, weight of the prime mover should be less as possible to bear the structure weight. Considering all these points, hydraulic actuators was chosen as prime mover to all Bell less top charging equipment.

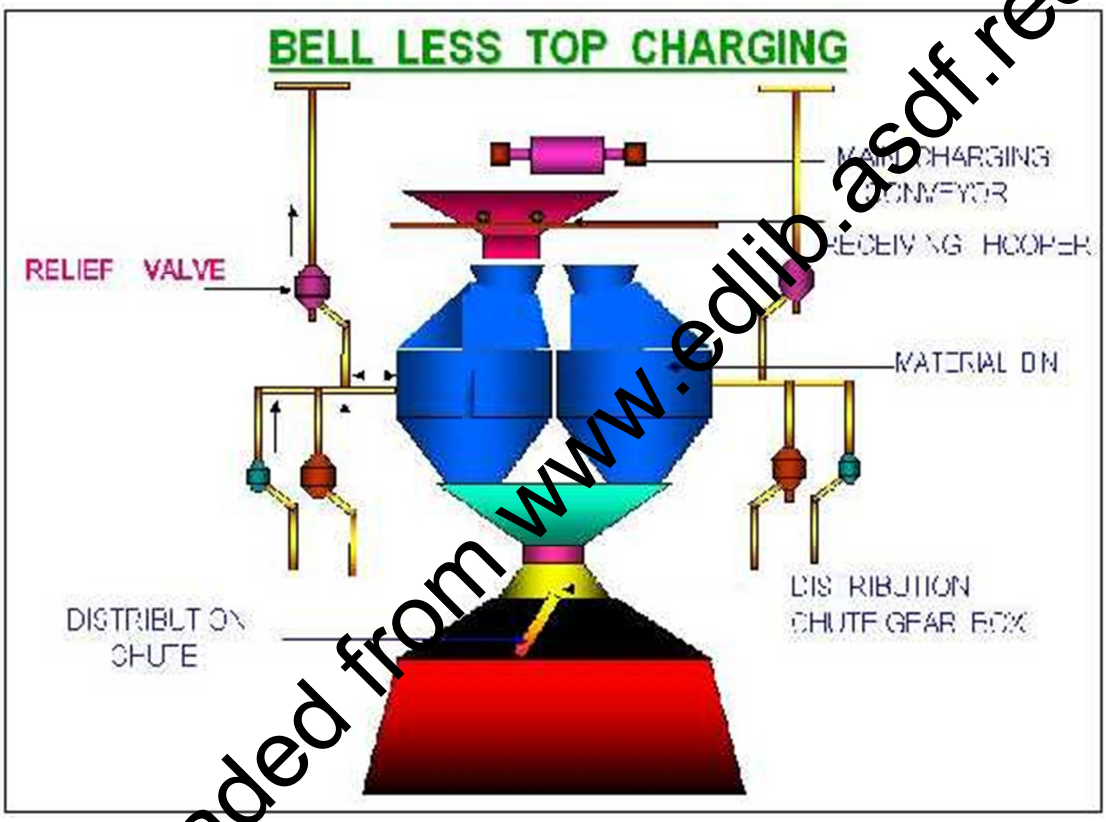

Fig 1.2 Bell less Top Charging System

Failure Analysis of the Bell less Top Charging System

3.1 Selection of problem

To select a problem for this project, data regarding various failures in Bell less top charging system are collected from past records. The following is the data in Table 1 of the major problems identified for the past three years:

Table 1:

				Wind restriction	Loss of hot metal(tons)
1.	Sealing valve failure	Nil	Nil	71.5	5577

2.	Hydraulic problems	8.15	5.30	6.10	3106
3.	Bleeder valve	10.20	Nil	Nil	2553
4.	Sealing valve seat leakage	6.25	Nil	Nil	1584
5.	Hatch cover leakage	3.25	1.25	0.25	1014
6.	Main charging conveyor	Nil	1.35	3.45	453
7.	Mobile hopper wheel failure	4.45	Nil	Nil	1128

2. Problem Definition and Analysis

Sealing valve description: Sealing valve plays an important role in Bell Less Top Charging System. These valves are meant for sealing the bin from Blast Furnace gas leakage which is driven by Hydraulic cylinder. They consist of flap and a seat with silicone rubber seal. The flap closes against the seat during closing, once the valve is closed, it will not allow any leakage through the valve. These valves are located one on top of the bin and another at the bottom. These are very critical valves. These valves are driven by hydraulic cylinders.

Sealing Valve Failure Means:

1. Bin is connected to furnace.
2. Bin is not ready to receive a fresh charge of raw material.
3. Entire bin operation that is charging process is stopped.
4. The complete Blast furnace production effected.

The two major reasons for failures are:

- Actuator Hydraulic cylinder end flange failure
- Actuator crank failure

From the above table it is clear that Actuator crank failure and Hydraulic actuator end flange failure together contributing to two third of the total failures. If these two failures are avoided, total sealing valve failures will be reduced to one third. Hence, these two main causes are considered for further analysis.

Analysis and Rectification of Acruator Crank Failure

4.2 Loads on the Crank/Lever

A total force acting on the lever at point A in Fig 1.3

= force exerted by the Hydraulic cylinder.

= Area of the piston X Maximum pressure in Hydraulic cylinder.

$= \pi/4 \times d^2 \times$ pressure.

$= \pi /4 \times (125)^2 \times 35.$

=429.514KN ~ 430KN.

[Since cylinder bore = 125mm

Hydraulic test pressure = 350 bar

1 bar = $(10)5$ N/m^2

1 bar = 0.1 N/mm^2 .Therefore 350 bar = 35 N/mm^2]

Total load acting on the lever at point A, F = 430KN.

Tangential Component of the Load = F Cos 408= 430 x Cos 408
= 329.39KN ~ 330KN.
Radial component of the load = FSin408= 430 x Sin408
=276.39KN ~ 276KN

Considering the reaction at point O

330 x350 = F_{Tk} x 110
F_{Tk} = Tangential force acting on the crank at key way
= (330 x 350)/110 =915KN

Crank failing at cross-section x-x

Cross-section of the crank at failure area = 10 x 218 + 10 X 95/2 x2
= 2180 + 950 = 3130mm^2

For given material C.S gr-4 IS2644

Maximum tensile strength = 1030 M pa

Maximum yield strength = 850 M pa

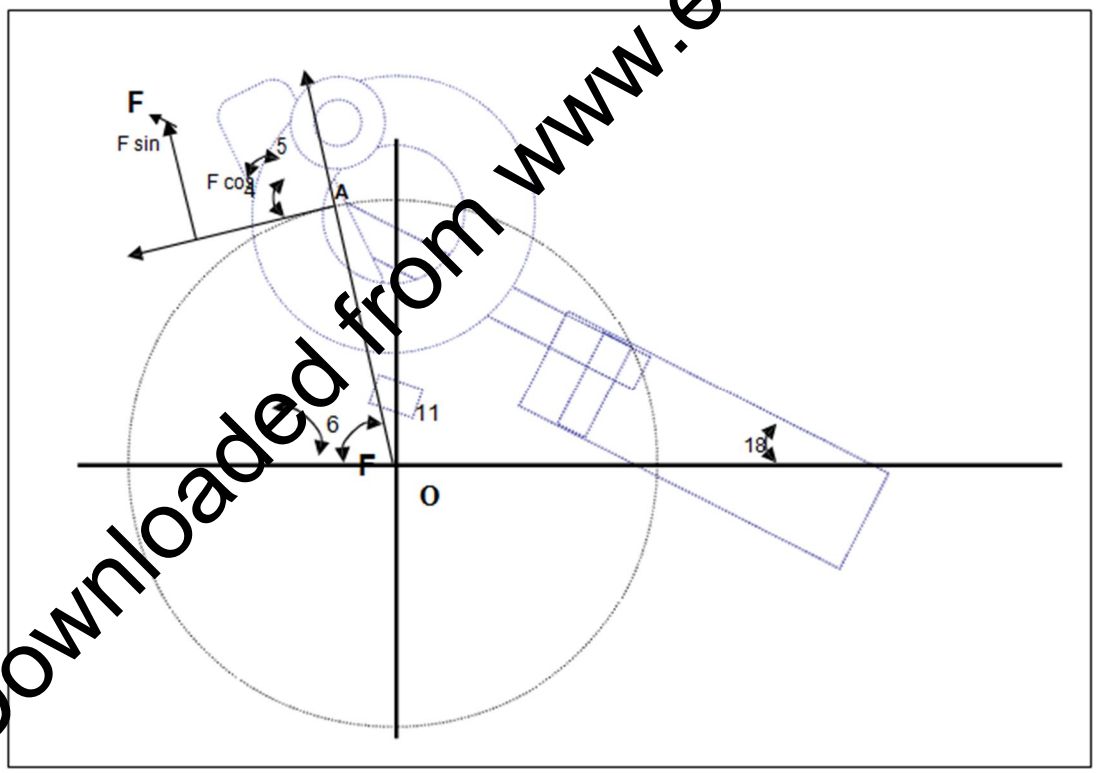

Fig 1.3

Therefore Induced stress in the Crank = Tangential force / Area of cross section
= 915 x $(10)^3$ / 3130 = 292 N/mm^2
Maximum tensile strength = 1030 N/mm^2
As the nature of the load is "impact load". Consider factor of safety is 4

Then safe working stress = 1030/4 = 257 N/mm^2

As the Induce tensile stress in the Crank is 292 N/mm2 which is more than safe working stress. Therefore the design is unsafe.

Alternative

Increase the web thickness from 10mm to 25mm.

Then Area of resistance of keyway = 10 x 218 + 25 x 95/2 x 2

= 2180 + 2375 = 4555 KN/mm^2

Then stress in the Crank = 915 x 10^3/4555 = 200 N/mm^2
As the Induced tensile stress is less than safe tensile stress.

Therefore new design is safe.

Key dimensions:

L = 204mm B = 50mm t = 22mm No. of keys = 2 Nos. Generally, key will be the weakest joint in any design. Maximum torque that can be handled by this key is considering the shearing of key:

Maximum Torque transmitted T = L x w x x d/2
= 204 x 50 x 42 x 219/2
= 46909800 N-mm = 46910 KN-mm.

Considering Crushing of the key:

Maximum Torque transmitted T = L x t/2 x σ_c x d/2
= 204 x 11 x 70 x 219/2
= 16414860N-mm
= 16414.86 KN-mm ~ 16415N-mm.

Taking smaller of the two values, we have maximum Torque transmitted by a single key = 16415KN-mm. Because two keys are provided to crank Maximum Torque transmitted by two keys = 2 x 16415 = 32830KN-mm.
Since the key is the weakest joint in the entire system. The torque transmitted by the lever/Crank should be more than 32830KN-mm. By using this analysis we can increase the production rate of the company.

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Exergetic Studies on Domestic and Industrial Solar Water Heaters

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Abstract: For a Solar Water Heater ,solar energy coming from sun in the form of solar radiations in infinite amount, when these solar radiations falls on any absorbing surface, then they gets converted into the heat, this heat is used for heating the water. Present study based on exergy theory. Exergy analysis is conducted with an objective of providing methods to save cost and to increase the efficiency of solar water heater. The calculation of exergy losses is also done. To optimize and allocate losses in energy systems exergy analysis has been widely used. Exergy is the indication for loss of available energy due to the creation of entropy in irreversible thermal systems or thermodynamic processes. The exergy loss in a system or process component is decided by multiplying the absolute temperature of the surroundings by the entropy increase. Exergy is defined as a maximum useful work that can be done by a system interacting with an environment. In the design, simulation and performance evaluation of energy systems Exergy analysis has been widely used.

Keywords: Thermodynamic process, exergy analysis, energy systems.

I. Introduction

The most competent of the unconventional energy sources is solar energy. Although the characteristic of low density and unsteady in nature, solar energy focus is more significant in recent years. By increased demand for energy and risen cost of fossil type fuels (i.e., gas or oil) solar energy is considered an eye-catching source of renewable energy that can be used for water heating in both domestic homes and industry. For an average family hot water consumed is nearly 25% of total energy consumption. The Solar water heating systems (SWH) are the cheapest and most reasonable clean energy available to homeowners that may provide most of hot water requisite by a family.

A Solar heater is a device which is used for heating the water, for producing the steam for household and industrial purposes by utilizing the solar energy. Solar energy is the energy which is coming from sun in the form of solar radiations in endless amount, when these solar radiations falls on absorbing surface, then they gets converted into the heat, this heat is used for heating the water. This type of thermal collector undergo from heat losses due to radiation and convection. Such losses increase rapidly as the temperature of the working fluid increases.Exergy is a quantifying of the maximum useful work that can be done by a system which is at constant pressure and temperature with an environment interaction.
Exergy is the term for loss of available energy due to the creation of entropy in irreversible processes. The analysis is based on the three procedure theory given by Professor Hua Ben, conversion procedure, utilization procedure, and recycling procedure respectively.

II. Characteristics of Exergy and Problem Statement

When energy loses its quality, exergy is destroyed. Exergy is the part of energy which is useful and therefore has economic value and is worth managing carefully. Exergy by definition depends not just on the state of a system or flow, but also on the state of the environment. Exergy efficiencies are a measure of approach to ideality (or reversibility). This is not necessarily true for energy efficiencies, which are often misleading. Exergy can generally be considered a valuable resource. There are both energy or non-energy resources and exergy is observed to be a measure of value for both.

Energy forms with high exergy contents are typically more valued and useful than energy forms with low exergy Fossil fuels, for instance, have high energy and energy contents [1].

III. About Solar Water Heating System

A working fluid (liquid) is brought into contact with a dark surface exposed to sunlight which causes the temperature of the fluid to rise. Generally this fluid may be the water being heated directly, also called a direct system. In an indirect system heat transfer fluid such as a glycol/water mixture that is passed through some form of heat exchanger. The classification of these systems can be three main categories mainly (a) Active systems (b) Passive systems (c) Batch systems.

3.1 Forced Circulation or Active Systems

Forced circulation or Active systems use electric pumps, valves, and controllers to circulate water or other heat-transfer fluids through the collectors. So, forced circulation systems and can be direct or indirect categories namely (a) Open-loop (Direct) Active System (b) Closed-loop (Indirect) Active System

3.1.1 Open-Loop Forced Circulation Systems

Open-loop active systems use pumps to circulate water through the collectors. This design is efficient and lowers operating costs but is not appropriate if the water is hard or acidic because scale and corrosion quickly disable the system. These open-loop systems are popular in nonfreezing climates.

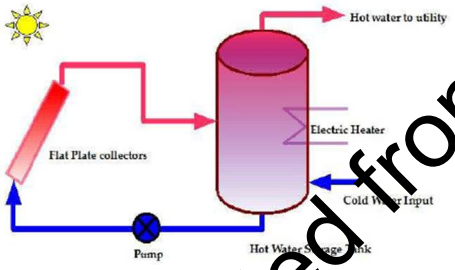


Fig1. Open-Loop Active Systems

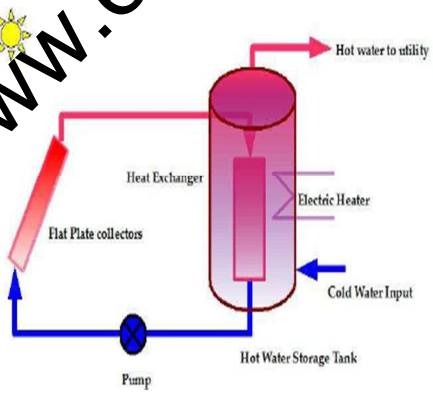


Fig2. Closed loop Active System

3.1.2 Closed-Loop Forced Circulation Systems

These systems pump heat-transfer fluids (usually a glycol-water antifreeze mixture) through collectors. Heat exchangers transfer the heat from the fluid to the household water stored in the tanks. Closed-loop glycol systems are popular in areas subject to extended freezing temperatures because they offer good freeze protection.

3.2 Passive Systems

Passive systems simply circulate water or a heat transfer fluid by natural convection between a collector and an elevated storage tank (above the collector). The principle is simple, as the fluid heats up its density decreases. The fluid becomes lighter and rises to the top of the collector where it is drawn to the storage tank. The fluid which has cooled down at the foot of the storage tank then flows back to the collector. Passive systems can be less expensive than active systems, but they can also be less efficient. Thermo siphon system is the best example of passive systems.

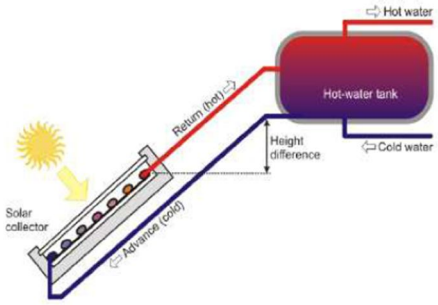


Fig3. Thermo siphon System

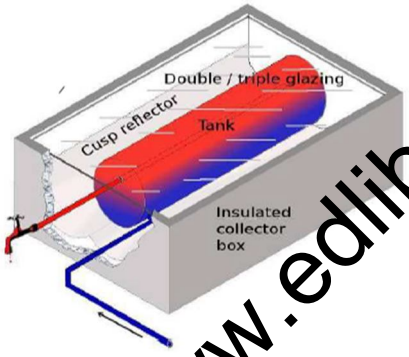


Fig4. Batch system

IV. Components of Solar Water Heater

SWH generally consists of a solar radiation collector panel, a storage tank, a pump, a heat exchanger, piping units, and auxiliary heating unit. Some of important components are described in the next sections.

4.1 Solar Collectors

The choice of collector is determined by the heating requirements and the environmental conditions in which it is employed. There are mainly three types of solar collectors like flat plate solar collector, evacuated tube solar collector, concentrated solar collector.

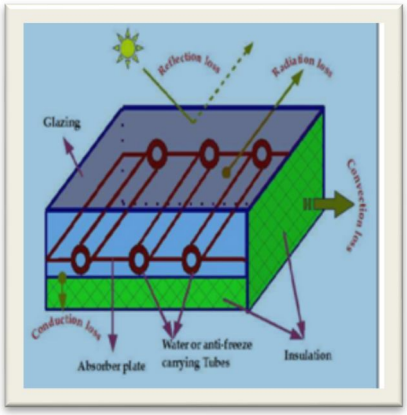


Fig5. Flat plate collector

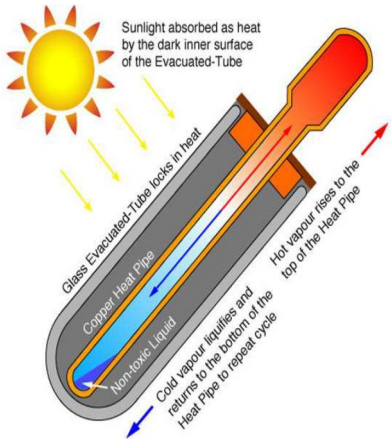


Fig6. Evacuated tube collector

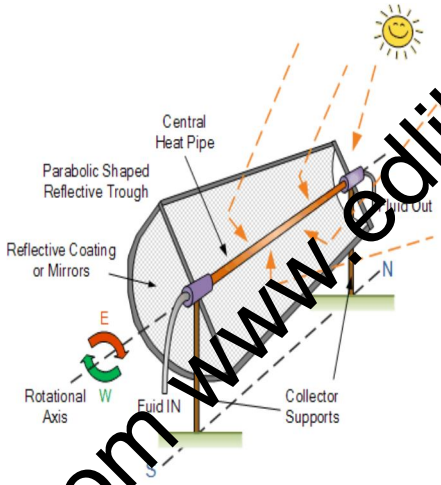


Fig7. Concentrating Collectors

The schematic diagrams of Fig1 to Fig.7 describe the components of different solar collectors and their principles of operations respectively [2].

4.2 Storage Tank

Most commercially available solar water heaters require a well-insulated storage tank. Thermal storage tank is made of high pressure resisted stainless steel covered with the insulated fiber and aluminum foil. Some solar water heaters use pumps to recirculate warm water from storage tanks through collectors and exposed piping. This is generally to protect the pipes from freezing when outside temperatures drop to freezing or below.

4.3 Heat Transfer Fluid

A heat transfer fluid is used to collect the heat from collector and transfer to the storage tank either directly or with the help of heat exchanger. In order to have an efficient SHW configuration, the fluid should have high specific heat capacity, high thermal conductivity, low viscosity, and low thermal expansion coefficient, anti-corrosive property and above all low cost. Among the common heat transfer fluids such as water, glycol, silicon oils and hydrocarbon Oils, the water turns out to be the best among the fluids. Water is the cheapest, most readily available and thermally efficient fluid but does freeze and can cause corrosion.

V. An Exergy Analysis

The method, Exergy analysis is employed to detect and evaluate quantitatively the causes of the thermodynamic imperfection of the process. Exergy is also a measure of the maximum useful work that can be done by a system interacting with an environment which is at a constant pressure and temperature. An expression for loss of available energy due to the creation of entropy in irreversible processes is exergy.The exergy loss in a system or component is determined by multiplying the absolute temperature of the surroundings by the entropy increase. The concepts of exergy, available energy, and availability are essentially similar. Similar concepts are exergy destruction, exergy consumption, irreversibility, and lost work.

5.1 Three Procedure Theory

The Professor Hua Ben [3] presented energy analysis entitled 'Three Procedure Theory'. Among all theories of energy analysis, three procedure theory is good platform to perform energy analysis. The three different procedures of this theory are conversion, utilization, and recycling. In Fig. 8. Three procedure theory energy conversion procedure takes places at the sun are shown. The nuclear reaction in the sun makes it possible for the sun to emit a great quantity of power, which is transmitted in the form of electromagnetic waves. Utilization of energy is carried out in the collector. Solar radiation penetrates the cover and is incident on the black-color plate where it heats water flowing through the pipe. Energy recycling procedure takes places between the collector and the storage tank which corresponds to the storage tank keep hot water is pumped to users and cold water fills the storage tank from the bottom pipe simultaneously.

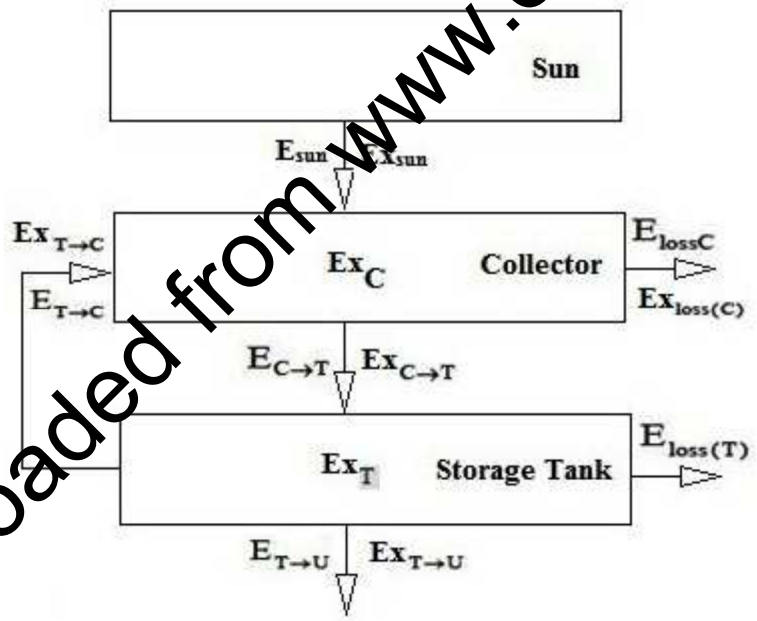


Fig8. Three procedure theory for the solar water heater

A) Energy balance equations:

At Collector:

$E_{sun} + E_{T->C} = E_{lossC} + E_{C->T}$ ---------- (1)

Where,

E_{sun} = Energy from Sun (input Energy) (W)

$E_{T->C}$ = Energy from storage tank to collector associated with water recycle (W)

E_{lossC} = Energy losses due to imperfectly thermal insulation in collector (W)
$E_{C->T}$ = Energy from collector to storage tank (W)

At Storage Tank:

$E_{C->T} = E_{loss(T)} + E_{T->U} + E_{T->C}$ ----------(2)
Where,
$E_{loss(T)}$ = Energy losses due to imperfectly thermal insulation in storage tank (W)
$E_{T->U}$ = Energy from storage tank to user (output Energy) (W)

B) Exergy balance equations:

At Collector:

$E_{Xsun} + E_{X(T->C)} = E_{X\,lossC} + E_{X(C->T)}$ ----------(3)
Where,
E_{Xsun} = Exergy from sun (input power) (W)
$E_{X(T->C)}$ = Exergy from storage tank to collector associated with water recycle (W)
$E_{X\,lossC}$ = Exergy losses due to imperfectly thermal insulation in collector (W)
$E_{X(C->T)}$ = Exergy from collector to storage tank (W)

At Storage Tank:

$E_{X(C->T)} = E_{X\,loss(T)} + E_{X(T->U)} + E_{X(T->C)} + E_{XT}$ ----------(4)
Where, $E_{X\,loss(T)}$ = Exergy losses due to imperfectly thermal insulation in storage tank (W)
$E_{X(T->U)}$ = Exergy from storage tank to user (output exergy) (W)
E_{XT} = Energy losses due to irreversibility in storage tank

In utilization procedure, we assume the change in kinetic energy are very small since the solar water heater is driven by the difference of density of water, namely no great decrease in pressure is involved, so we can calculate exergy from collector to storage tank ($E_{X(C->T)}$) by use the following equation.

$$E_{X(C->T)} = m_{fw} C_p (T_{CT} - T_a) + m_{fw} T_a \ln (T_{CT} / T_a) \quad \text{----------(5)}$$

Where, m_{fw} = Mass flow rate of water (kg/s)
T_{CT} = Outlet temperature of water from collector to storage tank (K)
T_a = Ambient temperature (K)
C_p = Specific heat of water {J/ (kg.K)}

Assuming the temperature distribution in the storage tank is linear ($\Delta T \propto \Delta L$), where L is the height of the storage tank), we get; $T_X = [(T_L - T_o)/L] X + T_o$ ----------(6)

Where T_X, T_L and T_0 are the temperature of water at position X, L and O from the bottom of the storage tank. Then

We obtain the exergy from storage tank to users ($E_{X(T->U)}$) by use the following equation:

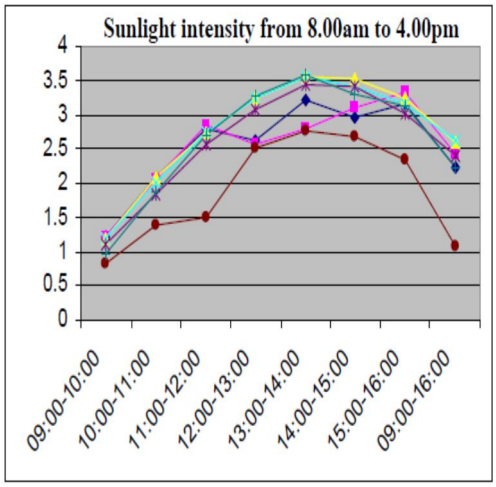
$$E_{X(T->U)} = \int_0^L dE_X = \int_0^L Apdx\, Cp \{(T_x - T_a) - T_a \ln(T_x \div T_a)\} / \int dt$$

$$E_{X(T->U)} = m_{fw}C_p\{(T_L - T_a)/2 - T_a\} - m_{fw}C_pT_a\{\ln(T_L / T_a) - 1\} - m_{fw}C_p\{(T_a T_o)/(T_L - T_o)\}\ln(T_L / T_a) \quad \text{----------(7)}$$

The Exergy based equations from equation (1) to equation (7) denotes different thermal energy sub systems and their relations with each other [2].

VI. Experimental Outcomes

An experiment [4] of studying the efficiency of the light divergence solar water heater was achieved during December - April. All data are collected from 8.00am – 4.00pm at the Solar energy research unit of Physics department in Nakhon Pathom. An example of the result is shown in Figure 9 and Figure 10 [4]. We found that the water temperature is depended on the intensity of the sunlight. An approximate temperature of the day is about 51 ^{o}C. Between noon to 3.00pm, the water temperature is between 50 – 70^{o} C, which is the range of a very useful water temperature.



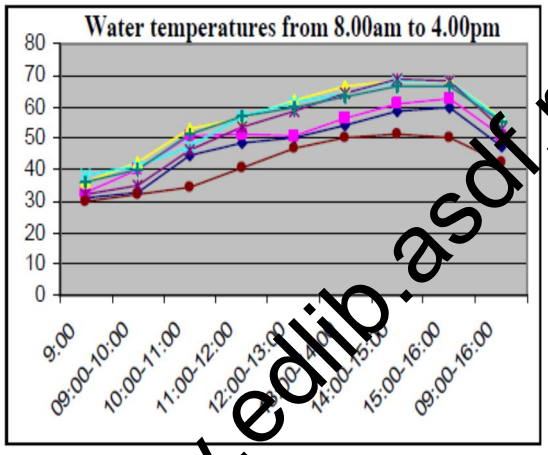


Fig 9. Sunlight intensity from 8.00am to 4.00 pm Fig.10 Water temperatures form 8.00am to 4.00 pm

6.1 Relation Between E_x and Q :

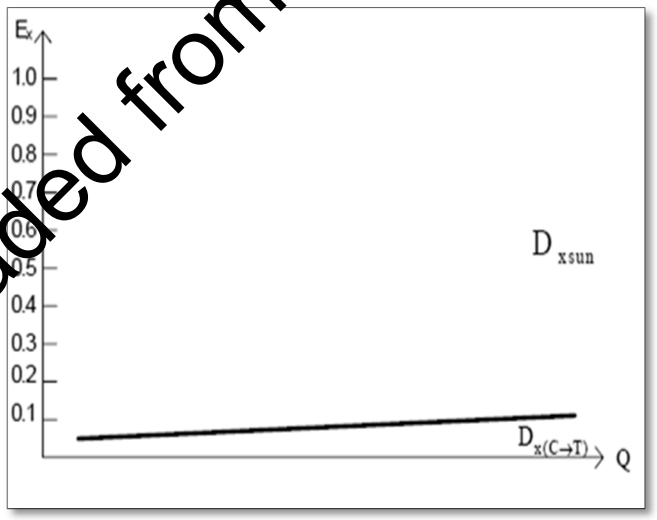


Fig 11. Graph between E_x and Q

The relation between Q and E_x indicated in Fig.11 geometrically interpreted as total exergy loss occurring in the system between curves D_{xsun} and $D_{x(T->U)}$,where D_{xsun} is the input power(exergy from sun) in Watts,$D_{x(C->T)}$ is exergy from collector to storage tank in Watts. Q is heat transferred between the system and environment and Ex is thermal exergy content [4].

V I I. Conclusion

The conversion of solar radiation in the evaluation of direct-solar systems leads to extremely high exergy losses in the direct solar systems. The optimization of these systems should be oriented so as to reduce the magnitude of exergy losses in the conversion device. Solar system exergy efficiency is highly dependent on the daily solar radiation and radiation intensity. For increasing the exergy efficiency, material selection, number of layers of transparent cover, pipe length is mandatory. Due to more exergy losses in the storage tank new design of storage tank is required.

VII. Future Work

In this work, the flat plate collector is analyzed and it would be a good initiative to explore the impact of other types of solar collectors like an evacuated tube or a concentrated types. In the present work only two components of the solar water heater are analyzed, other components such as a pump, piping system etc., could also be studied. For Optimization, pressure drop across the system and selection of pump, piping size are considered.

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Simplified Frequency Offset Estimation in MIMO OFDM Systems

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Abstract—This paper addresses a simplified frequency offset estimator for multiple-input–multiple-output (MIMO) orthogonal frequency division multiplexing (OFDM) systems over frequency-selective fading channels. By exploiting the good correlation property of the training sequences, which are constructed from the Chu sequence, carrier frequency offset (CFO) estimation is obtained through factor decomposition for the derivative of the cost function with great complexity reduction. The mean square error (MSE) of the CFO estimation is derived to optimize the key parameter of the simplified estimator as well as to evaluate the estimator performance. Simulation results confirm the good performance of the training-assisted CFO estimator.

Index Terms—Frequency offset estimation, frequency-selective fading channels, low complexity, multiple-input– multiple-output (MIMO) orthogonal frequency-division multiplexing (OFDM).

I. Introduction

Orthogonal frequency division multiplexing (OFDM) transmission is receiving increasing attention in recent years due to its robustness to frequency-selective fading and its sub carrier-wise adaptability. On the other hand, multiple-input multiple-output (MIMO) systems attract considerable interest due to the higher capacity and spectral efficiency that they can provide in comparison with single-input single-output (SISO) systems. Accordingly, MIMO-OFDM has emerged as a strong candidate for beyond third generation (B3G) mobile wide-band communications [1].It is well known that SISO-OFDM is highly sensitive to carrier frequency offset (CFO), and accurate estimation and compensation of CFO is very important [2]. A number of approaches have dealt with CFO estimation in a SISO-OFDM setup [3], [4], [2], [5], [6], [7]. According to whether the CFO estimators use training sequences or not, they can be classified as blind ones [3] [4] and training-based ones [2],[5], [6], [7]. Similar to SISO-OFDM, MIMO-OFDM is also very sensitive to CFO. Moreover, for MIMO-OFDM, there exists multi-antenna interference (MAI) between the received signals from different transmit antennas. The MAI makes CFO estimation more difficult, and a careful training sequence design is required for training-based CFO estimation. However, unlike SISO-OFDM, only a few works on CFO estimation for MIMO-OFDM have appeared in the literature. In [8], a blind kurtosis-based CFO estimator for MIMO-OFDM was developed. For training-based CFO estimators, the overviews concerning the necessary changes to the training sequences and the corresponding CFO estimators when extending SISO-OFDM to MIMO-OFDM were provided in [9], [10]. However, with the provided training sequences in [9], satisfactory CFO estimation performance cannot be achieved. With the training sequences in [10], the training period grows linearly with the number of transmit antennas, which results in an increased overhead. In [11], a white sequence based maximum likelihood (ML) CFO estimator was addressed for MIMO, while a hopping pilot based CFO estimator was proposed for MIMO-OFDM in [12]. Numerical calculations of the CFO estimators in [11] [12] require a large point discrete Fourier transform (DFT) operation and a time consuming line search over a large set of frequency grids, which make the estimation computationally prohibitive. To reduce complexity, computationally efficient CFO estimation was introduced in [13] by exploiting proper approximations. However, the CFO estimator in [13] is only applied to flat-fading MIMO channels.

When training sequence design for CFO estimation is concerned, it has received relatively little attention. It was investigated for single antenna systems in [14], where a white sequence was found to minimize the worst-case asymptotic Cramer-Rao bound (CRB). Recently, an improved training sequence and structure

design was developed in [15] by exploiting the CRB and received training signal statistics. In [16], training sequences were designed for CFO estimation in MIMO systems using a channel-independent CRB. In [17], the effect of CFO was incorporated into the mean square error (MSE) optimal training sequence designs for MIMO-OFDM channel estimation in [18]. Note that optimal training sequence design for MIMO-OFDM CFO estimation in frequency selective fading channels is still an open problem.

In this paper, by further investigating the above search-free approaches, a simplified CFO estimator is developed for multiple input– multiple - output (MIMO) OFDM systems over frequency selective fading channels. With the aid of the training sequences generated from the Chu sequence [9], we propose to estimate the CFO via a simple polynomial factor. Thus, the complicated polynomial rooting operation is avoided. Correspondingly, the CFO estimator can be implemented via simple additions and multiplications. To optimize the key parameter of the simplified CFO estimator as well as to evaluate the estimator performance, the mean square error (MSE) of the CFO estimation is derived

Notations: Upper (lower) bold-face letters are used for matrices (column vectors). Superscripts , *T* and *H* denote conjugate, transpose and Hermitian transpose, respectively. $(\cdot)_P$ denotes the residue of the number within the brackets, denote the floor, Euclidean norm-square, expectation and Kronecker product operators, respectively. sign(·) denotes the signum function and sign(0) = 1 is assumed. $[\boldsymbol{x}]_m$ denotes the *m*-th entry of a column vector $\boldsymbol{x}$. $\boldsymbol{x}(m)$ denotes the *m*cyclic-down-shift version of $\boldsymbol{x}$. diag{$\boldsymbol{x}$} denotes a diagonal matrix with the elements of $\boldsymbol{x}$ on its diagonal. $[\boldsymbol{X}]_{m,n}$ denote the (m, n)-th entry of a matrix $\boldsymbol{X}$. $\boldsymbol{F}_N$ and $\boldsymbol{I}_N$ denote the $N \times N$ unitary DFT matrix and the $N \times N$ identity matrix, respectively. $\boldsymbol{E}_k$ N denotes the k-th column vector of I_N. 1_Q (0_Q) and $0_{P\times Q}$ denote the $Q\times 1$ all-one (all-zero) vector and $P \times Q$ all-zero matrix, respectively. J_Q denotes the $Q \times Q$ exchange matrix with ones on its anti-diagonal and zeros elsewhere. Unless otherwise stated, $0 \le \mu \le N_t - 1$ and $0 \le \nu \le N_r - 1$ are assumed

II. Signal Model

Consider a MIMO OFDM system with N_t transmit antennas, N_r receive antennas, and N sub carriers. The training sequences for CFO estimation are the same as in [6] and [7]. Let $\boldsymbol{s}$ denote a length-P Chu sequence [9]. Then, the $P \times 1$ pilot sequence vector at the μth transmit antenna is generated from $\boldsymbol{s}$ as follows:

$\tilde{s}_\mu = \sqrt{Q/N_t}\boldsymbol{F}_P \boldsymbol{s}^{(\mu M}$, where $M = [P/N_t]$ Define

$\Theta_q = [e_N^q, e_N^{q+Q}, \ldots, e_N^{q+(P-1)Q}]$

Then, the $N \times 1$ training sequence vector at the μth transmit antenna is constructed as follows:

Let $\boldsymbol{y}_\nu$ denote the $N \times 1$ received vector at the νth receive antenna after cyclic prefix (CP) removal. Let $\boldsymbol{h}(\nu,\mu)$ denote the $L \times 1$ channel impulse response

$\tilde{t}_\mu = \Theta_{i_\mu}\tilde{s}_\mu$, where $0 \le i_\mu \le Q-1$, and $i_\mu = i_{\mu'}$ iff $\mu = \mu'$. For convenience, we refer to $\{\tilde{t}_\mu\}_{\mu=0}^{N_t-1}$ as the Chu-sequence-based training sequences (CBTSs).

vector, with L being the maximum channel length. Assume that L is shorter than the length of CP N_g. Let $\tilde{}\varepsilon$ denote the frequency offset normalized by the subcarrier frequency spacing. Define

$$y = \left[y_0^T, y_1^T, \ldots, y_\nu^T, \ldots, y_{N_r-1}^T\right]^T$$
$$h_\nu = \left[\left(h^{(\nu,0)}\right)^T, \left(h^{(\nu,1)}\right)^T, \ldots, \left(h^{(\nu,\mu)}\right)^T, \ldots \left(h^{(\nu,N_t-1)}\right)^T\right]^T$$
$$h = \left[h_0^T, h_1^T, \ldots, h_\nu^T, \ldots, h_{N_r-1}^T\right]^T$$
$$D_N(\tilde{\varepsilon}) = \mathrm{diag}\left\{\left[1, e^{j2\pi\tilde{\varepsilon}/N}, \ldots, e^{j2\pi\tilde{\varepsilon}(\tilde{N}-1)/N}\right]^T\right\}.$$

Then, the cascaded received vector ***y*** over the *Nr* receive antennas can be written as [6], [7]

$$y = \sqrt{N} e^{j2\pi\tilde{\varepsilon}N_g/N} \left\{I_{N_r} \otimes [D_N(\tilde{\varepsilon})S]\right\} h + w \qquad (1)$$

Where

$$S = F^H \mathrm{diag}\left\{\left[\tilde{s}_0^T, \tilde{s}_1^T, \ldots, \tilde{s}_\mu^T, \ldots, \tilde{s}_{N_t-1}^T\right]^T\right\} \breve{F}$$
$$F = [\Theta_{i_0}, \Theta_{i_1}, \ldots, \Theta_{i_\mu}, \ldots, \Theta_{i_{N_t-1}}]^T F_N$$
$$\breve{F} = \left[e_{N_t}^0 \otimes \Theta_{i_0}^T, e_{N_t}^1 \otimes \Theta_{i_1}^T, \ldots, e_{N_t}^\mu \otimes \Theta_{i_\mu}^T, \ldots, e_{N_t}^{N_t-1} \otimes \Theta_{i_{N_t-1}}^T\right]\left\{I_{N_t} \otimes \left[F_N \left[I_L, 0_{L\times(N-L)}\right]^T\right]\right\}$$

and ***w*** is an *NrN* × 1 vector of uncorrelated complex Gaussian noise samples with a mean of zero and an equal variance of σ2*w*

III. CFO Estimator for MIMO-OFDM Systems

By exploiting the periodicity property of CBTS, ***y*** can be stacked into the *Q* × *NrP* matrix

Y = [***Y*** 0,***Y*** 1, . . . , ***Y*** ν, . . . ,***Y*** *Nr*− 1] with its element given by

$$Y_\nu]_{q,p} = [((e_{N_r}^\nu)^T \otimes I_N)y]_{qP+p}$$

define

$$b_\mu = \left[1, e^{j2\pi(\tilde{\varepsilon}+i_\mu)/Q}, \ldots e^{j2\pi(\tilde{\varepsilon}+i_\mu)q/Q}, \ldots, e^{j2\pi(\tilde{\varepsilon}+i_\mu)(Q-1)/Q}\right]^T$$
$$B(\tilde{\varepsilon}) = [b_0, b_1, \ldots, b_\mu, \ldots, b_{N_t-1}].$$

Then, ***Y*** can be expressed in the following equivalent form [6], [7]:

$$Y = B(\tilde{\varepsilon})X + W \qquad (2)$$

where

$$X = [X_0, X_1, \ldots, X_\nu, \ldots, X_{N_r-1}]$$
$$X_\nu = \left[x^{(\nu,0)}, x^{(\nu,1)}, \ldots, x^{(\nu,\mu)}, \ldots, x^{(\nu,N_t-1)}\right]^T$$
$$x^{(\nu,\mu)} = \sqrt{P} e^{j2\pi\tilde{\varepsilon}N_g/N} D_P(\tilde{\varepsilon}+i_\mu) \times F_P^H \mathrm{diag}\{\tilde{s}_\mu\}\Theta_{i_\mu}^T F_N \left[I_L, 0_{L\times(N-L)}\right]^T h^{(\nu,\mu)}$$

and ***W*** is the *Q* × *NrP* matrix generated from ***w*** in the same way as ***Y*** According to the multivariate statistical theory, the log-likelihood function of ***Y*** conditioned on ***B***(ε) and ***X***, with ε denoting a candidate CFO, can be obtained as follows:

$$\ln p(\boldsymbol{Y}|B(\varepsilon),\boldsymbol{X}) = -\sigma_w^{-2}\mathrm{Tr}\left\{[\boldsymbol{Y}-B(\varepsilon)\boldsymbol{X}]\,[\boldsymbol{Y}-B(\varepsilon)\boldsymbol{X}]^H\right\}. \tag{3}$$

Exploit the condition $i\mu = i\mu\_$ iff $\mu = \mu\_$. Then, after some straightforward manipulations, we can obtain the reformulated log-likelihood function conditioned on ε as follows:

$$\ln p(\boldsymbol{Y}|\varepsilon) = \mathrm{Tr}\left[\boldsymbol{B}^H(\varepsilon)\hat{\boldsymbol{R}}_{\boldsymbol{YY}}\boldsymbol{B}(\varepsilon)\right] \tag{4}$$

k. Direct grid searching from

where $R_{YY} = \boldsymbol{YY}$ (4)

Yields the ML estimate; however, this approach is computationally quite expensive. To efficiently compute the CFO, we will subsequently propose a simplified CFO estimator for MIMO OFDM systems. Define $z = e^{j2\pi\varepsilon/Q}$, $z\mu = e^{j2\pi i\mu/Q}$, and $\boldsymbol{b}(z) = [1, z, \ldots, zq, \ldots, zQ-1]T$. Then, by exploiting the Hermitian property of, the log-likelihood function in (4) $^R Y\ Y$ can be transformed into the following equivalent form:

Where

$$f(z) = c^T\left\{\left[\sum_{\mu=0}^{N_t-1} b(z_\mu)\right]\odot b(z)\right\} + c^H\left\{\left[\sum_{\mu=0}^{N_t-1} b\left(z_\mu^{-1}\right)\right]\odot b(z^{-1})\right\} \tag{5}$$

Where $\boldsymbol{c}$ is a $Q \times 1$ vector with its qth element given by $[\boldsymbol{c}]q = \sum j-i = q[\hat{}\ \boldsymbol{R}_{YY}]i,j$. It can be seen from its definition that the qth element of $\boldsymbol{c}$ corresponds to the summation of the qth upper diagonal elements of $^R \boldsymbol{YY}$ Taking the first-order derivative of $f(z)$ with respect to z yields

$$f'(z) = z^{-1}\left\{c^T\left\{\left[\sum_{\mu=0}^{N_t-1} b(z_\mu)\right]\odot b(z)\odot q\right\} - c^H\left\{\left[\sum_{\mu=0}^{N_t-1} b\left(z_\mu^{-1}\right)\right]\odot b(z^{-1})\odot q\right\}\right. \tag{6}$$

where $\boldsymbol{q} = [0, 1, \ldots, q, \ldots, Q-1]$. By letting the derivative of the log-likelihood function $f\_(z)$ be zero, the solutions for all local minima or maxima can be obtained. Put these solutions back into the original log-likelihood function $f(z)$, and select the maximum by comparing all the solutions obtained in the previous stage. The improved blind CFO estimator that exploits the above mathematical rule has been addressed for single-antenna OFDM systems in [3]. Although the search-free approach has a relatively lower complexity, it still requires a complicated polynomial rooting operation, which is hard to implement in practical OFDM systems. With the aid of the CBTS training sequences, we will show in the following that the polynomial rooting operation can be avoided for training-aided CFO estimation in MIMO OFDM systems. Assume that $P \geq L$, the channel taps remain constant during the training period, and the channel energy is mainly concentrated in the first M taps, with $M < L$. Then

$$c^H\left\{\left[\sum_{\mu=0}^{N_t-1} b\left(z_\mu^{-1}\right)\right]\odot b(z^{-1})\odot q\right\} = z^{-Q}\kappa(\iota)\cdot c^T\left\{\left[\sum_{\mu=0}^{N_t-1} b(z_\mu)\right]\odot b(z)\odot q\right\} \tag{7}$$

with $1 \leq \iota \leq Q-1$, and the parameter ι denotes the index of the upper diagonal of . From (7), it $^R \boldsymbol{YY}$ immediately follows that $f'(z)$ can be decomposed as follows:

$$f'(z)=z^{-(Q+1)}\left[z^{Q}-\kappa(\iota)\right]\cdot c^{T}\left\{\left[\sum_{\mu=0}^{N_t-1}b(z_\mu)\right]\odot b(z)\odot q\right\}. \tag{8}$$

It follows from (8) and (9) that $z = \tilde{} z$ is one of the roots of both $f'(\tilde{} z) = 0$ and $zQ - \kappa(\iota) = 0$. Unlike $f\_(\tilde{} z) = 0$, the roots of $zQ - \kappa(\iota) = 0$ can be calculated without the polynomial rooting operation. Therefore, by solving the simple polynomial equation $zQ - \kappa(\iota) = 0$, the CFO estimate can be efficiently obtained as follows:

$$\hat{\varepsilon}=\underset{\varepsilon\in\{\varepsilon_q\}_{q=0}^{Q-1}}{\arg\max}\left\{f(z)|z=e^{j2\pi\varepsilon/Q}\right\} \tag{10}$$

Where $\varepsilon q = \arg\{\kappa(\iota)\}/(2\pi) + q - Q/2$. It can be calculated that the main computational complexity of the simplified CFO estimator is $4NrNQ + 8Q2$. Compared with the CFO estimator in [6] and [7], whose main computational complexity is $4NrN \log2 N + 9Q3 + 64/3(Q - 1)3$, the complexity of the simplified CFO estimator is generally lower. Furthermore, since the polynomial rooting operation is avoided, the simplified CFO estimator can be implemented via simple additions and multiplications, which is more suitable for practical OFDM systems. Note that ι is a key parameter for the proposed CFO estimator. We will show in the following how to determine the optimal ι.

IV. Simulation Results

Numerical results are provided to verify the analytical results as well as to evaluate the performance of the proposed CFO estimator. The considered MIMO OFDM system has a bandwidth of 20 MHz and a carrier frequency of 5 GHz with $N = 1024$ and $Ng = 80$. Each of the channels is with six independent Rayleigh fading taps, whose relative average powers and propagation delays are {0,– 0.9,– 4.9,– 8.0,– 7.8,– 23.9} dB and {0, 4, 16, 24, 46, 74} samples, respectively. The other parameters are given as follows: $P = 64$, $Q = 16$, $Nt = 3$, $Nr = 2$, and $\tilde{} \varepsilon \in (-Q/2, Q/2)$. Figs. 1 and 2 present the MSE of the proposed CFO estimator as a function of ι with $\{i\mu\}Nt-1\ \mu=0 = \{3, 5, 11\}$ and $\{3, 7, 14\}$, respectively. The solid and dotted curves are the results from the analysis and Monte Carlo simulations, respectively. It can be observed that the results from the analysis agree quite well with those from the simulations, except when the actual MSE of the estimate is very large. It can also be observed that MSE$\{\hat{} \varepsilon\}$ achieves its minimum for $\iota = 6, 8, 10$ with $\{i\mu\}Nt-1\ \mu=0 = \{3, 5, 11\}$ and for $\iota = 7, 9$ with $\{i\mu\}Nt-1\ \mu=0 = \{3, 7, 14\}$. These observations imply that we can obtain the optimum value of the parameter ι from the analytical results after $\{i\mu\}Nt-1\ \mu=0$ is determined

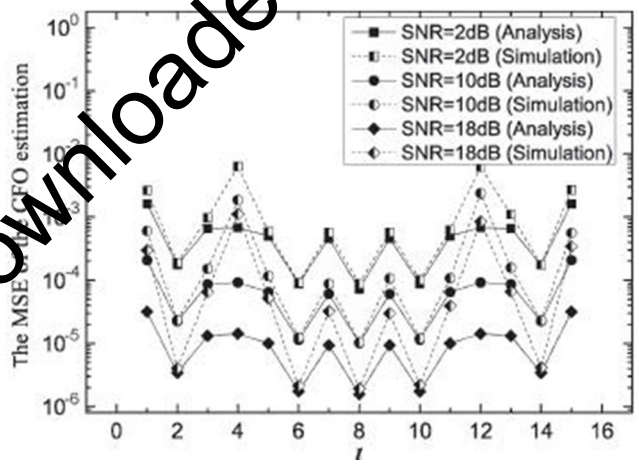

Fig. 1. MSE of the proposed CFO estimator as a function of ι with $_i Nt\ 1 = \{3,5, 11\}$.

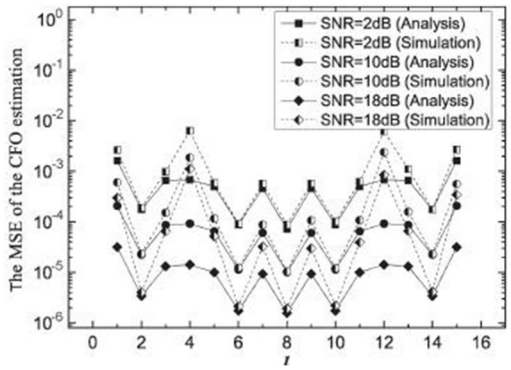

Fig. 2. MSE of the proposed CFO estimator as a function of ι with i^{Nt1} ={3,7,14}.

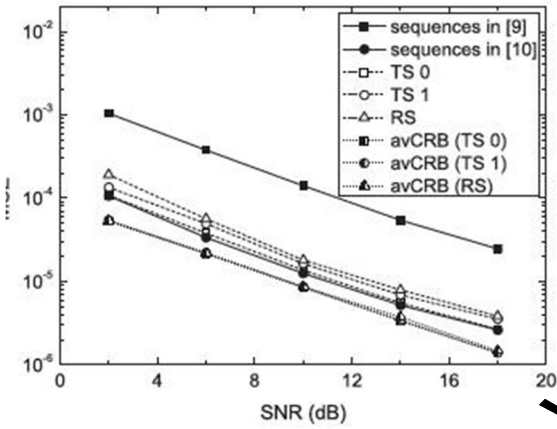

Fig. 1. CFO estimation performance for different training sequences with *Nt* = 3 and *Nr* = 2.

We resort to Monte Carlo simulations for its evaluation. It can be observed that the performance of the proposed estimator with CBTS is far better than that in [10] and slightly worse than that in [6] and [7], and its performance also approaches the EMCB, which verifies its high estimation accuracy. It can also be observed that the performance of the proposed CFO estimator with CBTS is far better than that with RS, which should be attributed to the good correlation property of CBTS.

V. Conclusion

In this paper, we have presented a low-complexity CFO estimator for MIMO OFDM systems with the training sequences generated from the Chu sequence. TheMSE of the CFO estimation has been developed to evaluate the estimator performance and to optimize the key parameter. By exploiting the optimized parameter from the estimation MSE, our CFO estimator with CBTS yields good performance

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The Influence of Career and Psychosocial Mentoring on Affective Institutional Commitment, Job commitment and Employee turnover-With a Focus on IT Employees

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Abstract- This study focuses on the relationships between career and psychosocial mentoring, and the employee outcomes of affective institution commitment (AIC), job commitment, and employee turnover. The relationships between psychosocial mentoring and the employee outcomes of AIC and employee turnover were significant. Building from affective events theory, it is found that AIC mediated the relationship between psychosocial mentoring and employee turnover. The study emphasizes the importance of emotion and affect by showing that employees who experienced positive mentoring events at work exhibited higher levels of AIC, which in turn led to reduced employee turnover.

Keywords - Career mentoring, Effective institutional commitment, Job commitment, employee turnover.

I Introduction

The outcomes of mentoring relationships have been studied widely for decades, with the majority of empirical research being done in the private sector (e.g., Allen, Eby, Poteet, Lentz, & Lima, 2004; Packard, 2003). Traditionally, scholars have focused on the benefits associated with mentoring; however, a growing body of literature highlights the negative aspects associated with implementing and maintaining mentoring relationships (e.g., Eby, Durley, Evans, & Ragins, 2008; Scandura, 1998). Individuals involved in formal and informal mentoring programs may feel positive, negative, and/or neutral outcomes

This study takes place in a private enterprise i.e., IT industry and seeks to replicate private sector results. With the exception of relatively few studies, mentoring research in the private sector has been limited (Reid, Allen, et al., 2008). Replication studies are important, given the range of differences IT employees face in public and private enterprises.

The majority of mentoring literature has focused on objective issues such as employee salary or promotion (e.g., Allen et al., 2004; Joiner, Bartram, & Garreffa, 2004) rather than on more intrinsic issues such as affective institutional commitment (AIC) or job commitment. Ofcourse, emotional reactions and subjective issues do matter. Research has demonstrated a mixed relationship between employee AIC and job commitment (e.g., Meyer, Stanley, Herscovitch, & Topolnytsky, 2002), and shown these work attitudes to provide predictive value in reducing employee turnover.

Given the importance of emotions, this study discusses the utility of affective events theory (AET; Weiss & Cropanzano, 1996) in enhancing our understanding of employee perceptions and reactions. In this study, we examine the relationships that career and psychosocial mentoring potentially have with AIC, job commitment, and employee turnover. The previous mentoring research has demonstrated a positive relationship with various employee outcomes, including low employee turnover and high AIC levels.

However, the link between mentoring and job commitment has been largely overlooked. Few studies have examined the relationships between mentoring and AIC, job commitment, and employee turnover in the context of the private sector, in IT enterprises.

In addition, the current study examines the possible mediating role that AIC plays between psychosocial mentoring and employee turnover. With the exception of the longitudinal study conducted by Payne and Huffman (2005), where AIC acted as a partial mediator between mentoring and employee turnover, the mentoring literature has primarily focused on direct relationships between antecedents and consequences. The study moves in this newer direction by building on Payne and Huffman's (2005) research to test the impact that more complex relationships have on employee turnover. The study proposes that an employee's affective reaction to mentoring in the form of AIC will mediate the relationship between psychosocial mentoring and employee turnover.

In its most basic form, AET is based on the premise that when salient, emotionally driven events happen at work, employee affective reactions occur (Weiss & Cropanzano, 1996). These affective reactions in turn influence employee and institutional outcomes, such as job satisfaction or employee turnover rate.

Emotions play an important role in explaining how employees evaluate and respond to their workplaces. Although scholars investigating AET have not explored mentoring as an independent variable. Mentors can assist their juniors to process emotional reactions to workplace experiences, which can influence their emotional connection to their institutions.

The purpose and objectives of the study is essentially twofold: (a) to examine the more affective, or emotionally driven, aspects of mentoring and AIC as guided by AET and (b) to add further support to the positive role mentoring plays in the Private sector, IT enterprises.

II Review of Literature

A Mentoring

It is the intense relationship between two people where a more experienced person (the mentor) helps the junior person by providing advice or modeling about career development issues as well as personal (psychosocial) support. We define mentoring "is a process for the informal transmission of knowledge, social thought, and psychosocial support understood by the juniors as related to professional career, work nature and job performance

Mentoring involves informal communication, usually face-to-face occurring over time "between someone perceived to have greater relevant knowledge, wisdom, or experience (the mentor) and a person who is perceived to have less knowledge. A mentor is often seen by his or her junior as a resource person or counselor whose views and judgment are trusted and valued.

Mentoring has been linked with beneficial employee outcomes such as AIC, job commitment, and lower employee employee turnover. In this study, the relationships career and psychosocial mentoring have with three outcome variables: AIC, job commitment, and employee turnover.

B Career mentoring

Career mentoring, or career-related support, involves coaching, sponsorship, exposure, and protection of the lesser skilled junior. Career mentoring behaviors involve task-related aspects of work and are often positively linked to more objective measures of success .Benefits of career mentoring include extrinsic success factors such as compensation, promotion, and career growth. There exists a strong link between

career mentoring activities and positive employee outcomes including AIC, job commitment, and reduced employee turnover.

Individuals with high levels of job commitment tend to find career mentoring appealing and seek out such relationships. Most of IT the employees appear to face problems acquiring or benefiting from their career mentoring due to over work load, time and resource constraints, and high fatigue levels.

Employee career support or development opportunities influence voluntary turnover. In a study of skilled workers in public accounting firms, career development reduced employee turnover. Among the skilled employees they surveyed, Scandura and Viator (1994) found that limited career development opportunities had a stronger negative impact on employee turnover than psychosocial support. Because of the limited qualified workers with IT training and skills, employee employee turnover and the resulting turnover can have salient negative effects on institutions.

C Psychosocial Mentoring:

Psychosocial mentoring, explains "those aspects of the relationship that improves an individual's sense of competence, identity, and effectiveness in a professional role".The advantages with psychosocial mentoring are affective outcomes like AIC or job commitment. Psychosocial mentoring includes intrinsic functions such as role modeling, acceptance, counseling, and friendship.

Because mentors provide their juniors with psychosocial support and opportunities for development, they contribute to the general satisfaction of juniors above and beyond the extrinsic rewards they can secure for their juniors.

The functions of psychosocial mentoring represent a deeper, more intense mentoring relationship and often depend more on relationship quality than on career function. Psychosocial mentoring may enhance an individual's ability and effectiveness, help reduce work-related stress, emerge into a strong emotional bond between the mentor and the junior, and become a positive, happy and interpersonal relationship effect.

In public and private sector enterprises, psychosocial support has following advantages:

- positive junior outcomes
- employee satisfaction
- High commitment
- lowered employee turnover

The Most important research outcomes variables are discussed below

A Effective institutional commitment Job commitment, and Employee turnover

AIC is of particular interest in this study due to the emotional reactions employees may experience in response to psychosocial and career mentoring. AIC is defined as the "emotional attachment to, identification with, and involvement in the institutions". This definition highlights the emotional overtones of affective commitment.

In this study, we focus on how effective institutional commitment may result from formal and informal mentoring relationships.

AIC has been linked with multiple positive outcomes. The concept has demonstrated the strongest negative relationship relative to the other forms of institutional commitment (i.e., normative, continuance) with employee turnover and turnover itself.

B Job Commitment

Although not studied as widely as other work attitudes in relation to mentoring, job commitment has demonstrated significant relationships with various institutional phenomena such as employee turnover and job satisfaction. Job commitment can be described as an employee's psychological identification with and active participation in a job.

Considering the characteristics of mentoring relationships, adequate feedback and decreased job insecurity have shown positive relationships with employee job commitment. In a private sector setting, the interaction between job commitment and job satisfaction proved to be an important predictor of employee absenteeism.

C Employee turnover

Employee turnover is a well-established and commonly used term for actual turnover in various contexts, including the private enterprises sector and IT industry.

Characteristics of the private enterprises that can lead to employee turnover include political cycles, budgeting limitations, expanded service offerings with limited resources, and the tendency of IT projects to go over time and over budget. .Further magnifying the outcomes associated with IT projects terminating due to political cycles, it is found that job insecurity was positively related to IT employee turnover. Turnover, particularly in a high-skilled IT environment, can have an immediate and negative impact on an institutions' success due to the shortage of qualified IT personnel.

More research on mentoring in a private enterprises of IT industry is needed because such relationships may increase positive employee outcomes, such as AIC and job commitment. Mentoring has consistently shown a negative relationship with employee turnover.

We hypothesize that the more affective, or emotional, nature of psychosocial mentoring will lead to a stronger and more significant relationship with AIC than will career mentoring. We draw empirical studies to support our hypothesis.

Hypothesis 1: Psychosocial mentoring will show a significant positive relationship with AIC than will career mentoring. Similar to psychosocial mentoring, job commitment is considered a psychological link between an employee and institutions or its agents As such, it is our contention that due to the more psychological and emotional nature of job commitment, and psychosocial mentoring will have a stronger and more significant relationship with job commitment than will career mentoring.

Hypothesis 2: Psychosocial mentoring will show a more positive significant relationship with job commitment than will career mentoring.

Mentoring has proven to be significantly related to employee turnover in past research. However, the nature of the relationship between career and psychosocial mentoring and employee turnover is inconclusive. In the current study, we hypothesize that psychosocial mentoring will exhibit a stronger and more negative relationship with employee turnover than will career mentoring.

Hypothesis 3: Psychosocial mentoring will show significant negative relationship with employee turnover than will career mentoring.

Hypothesis 4: Psychosocial mentoring has a negative relationship with turnover intention that is mediated through AIC.

III Method

Sample

All IT personal of small company in south India were asked to complete an online survey. The e-mail sent to all 120 IT employees .This number included personnel in the central IT department, as well as IT personnel located within the functional departments they supported. The CIO determined the sampling frame (all IT workers) for this study. Thus, our sample was a non probability convenience sample.

Of the 120 employee enquired, following is the statistics:

Table - I

S.No	Enquiry VAriable	Percentage
1	Married	69%
2	Single	17%
3	Divorce	12%
4	South Indians	93%
5	North Indians	7%
6	22-72 Years	Mean age of 46

Figure1: statistics of responses from 120 IT Employees

Respondents ranged in age from 22 to 72 years with a mean age of 46. Worker tenure with the state ranged from 1 to 35 years, with a mean tenure of 12 years. Of the respondents, only 33% percent had an IT-related degree, 46% had an associate's degree or less, 49% had a bachelor's degree or higher, and 5% of respondents did not provide educational information.

Regarding salary, 49% of respondents earned less than Rs.55,000, 30% earned between Rs.55,000 and Rs.69,999, 17% earned over Rs.70,000, and 5% of respondents did not provide salary information. Job functions included systems analyst (28%), information systems manager (17%), project leader (15%), and systems programmer (12%).

IV Procedure

All employees received a project endorsement e-mail from the CIO that included the URL for the online survey and provided information about the project. The online survey consisted of 145 Likert-type questions and took approximately 20 minutes to complete. Due to the sensitive nature of working with a state agency, no personal information was collected to ensure anonymity and to potentially increase response rate. A reminder e-mail was sent 2 weeks after the initial e-mail. Responses to the online survey came directly to the author, thereby eliminating any possible negative consequences associated with participation or nonparticipation.

Measures

All survey items came from previously validated and reliable scales, and were tested for reliability. Because personnel working in multiple departments were under the direction of the CIO, it was necessary to replace the words "my institutions" with "state government" in the survey items. At the beginning of the survey, we prompted respondents to think about the state IT department rather than the individual department they might support.

V Discussion

The results of our analysis made two key contributions: (a) we provided further support for the theoretical AET model by confirming the mediating role that AIC occupies between psychosocial mentoring and employee turnover, and (b) we replicated and extended previous research to provide additional support to existing findings on mentoring outcomes in a public sector IT context.Due to the emotional nature of AIC, we hypothesized that psychosocial mentoring—the more subjective form of mentoring—would exhibit a stronger relationship relative to career mentoring with AIC.

Our findings are important because they indicate emotional experiences have a greater impact than the more objective functions of career mentoring on the AIC and voluntary employee turnover of skilled public sector IT employees.

The greatest contribution of our study can be found in the results to Hypothesis 4, showing that AIC functions as a mediator between psychosocial mentoring and employee turnover. To the best of our knowledge, this appears to be the first study to show support for AIC as a full mediator between these two variables. Our findings suggest that affective reactions in the form of commitment in response to psychosocial mentoring activities have predictive value with regard to employee employee turnover, whether over time or following a particularly salient event.

Contrary to research demonstrating the relationship between mentoring and job commitment, we were unable to provide support for Hypothesis 2. The relationship between job commitment and mentoring was in the hypothesized direction, but neither form of mentoring was significantly related to job commitment. To the best of our Knowledge, this is the first study to look at the relationship between job commitment and mentoring in a public IT context.

When looking at the relationship between mentoring activities and employee turnover proposed in Hypothesis 3, we found a negative relationship consistent with research from a variety of contexts. Psychosocial mentoring had a stronger negative relationship with employee turnover than did career mentoring. This probably is because of the emotional, relational, counseling, and problem-solving aspects of successful psychosocial mentoring. In addition, the results from Hypothesis 3 indicate that only psychosocial mentoring was significantly related to employee turnover, providing additional support to the idea that affective reactions play a central role in employee and institutional outcomes.

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Entity Mining Extraction Using Sequential Rules

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Abstract: A comparative sentence expresses an ordering relation between two sets of entities with respect to some common features. For example, the comparative sentence "*Canon's optics are better than those of Sony and Nikon*" expresses the comparative relation Comparing one thing with another is a typical part of human decision making process. However, it is not always easy to know what to compare and what are the alternatives. To address this difficulty, we present a new way for automatically extracting comparable entities from comparative questions based on the pattern. We propose new techniques based on these two types of sequential rules to perform the tasks.

Introduction

Comparing alternative options is one of the essential things in decision-making that we carry out every day. Example, if someone is interested in certain products such as digital cameras, he or she would want to know what the different alternatives we have and compare different cameras before making a purchase. This type of comparison activity is very common in our daily life but requires high knowledge skill. And Magazines such as *Consumer Reports* and *PC Magazine* and online media such as *CNet.com* strive in providing editorial comparison content and surveys to satisfy this need. In World Wide Web, a comparison activity typically involves: search for relevant web pages containing information about the targeted products, find competing products, read reviews, and identify pros and cons. In this paper, we focus on finding a set of comparable entities given a users input entity. For example, given an entity, *Nokia N95* (a cellphone), we want to find comparable entities such as *Nokia N82*, *iPhone* and so on. In general, it is difficult to decide if two entities are comparable or not since people do compare apples and oranges for various reasons. For example, "*Ford*" and "*BMW*" might be comparable as "car manufacturers" or as "market segments that their products are targeting", but we rarely see people comparing "*Ford Focus*" (car model) and "*BMW 328i*". Things also get more complicated when an entity has several functionalities. For example, one might compare "*iPhone*" and "*PSP*" as "portable game player" while compare "*iPhone*" and "*Nokia N95*" as "mobile phone". Fortunately, plenty of comparative questions are posted online, which provide evidences for what people want to compare, e.g. "*Which to buy, iPod or iPhone*?". We call "*iPod*" and "*iPhone*" in this example as *comparators*. In this paper, we define comparative questions and comparators as:

Comparative question: A question that intends to compare two or more entities and it has to mention these entities explicitly in the question.

Comparator: An entity which is a target of comparison in a comparative question.

Comparisons can be subjective or objective. For example, a typical opinion sentence is "*The picture quality of camera x is great*" A subjective comparison is "*the picture quality of camera x is better than that of camera y*" An objective comparison is "*car x is 2 feet longer than car y*". We can see that comparative sentences use different language constructs from typical opinion sentences (although the first comparative sentence above is also an opinion). In this paper, we study the problem of comparative sentence mining. It has two tasks:

1. Given a set of evaluative texts, identify comparative sentences from them, and classify the identified comparative sentences into different types (or classes).
2. Extract comparative relations from the identified sentences. This involves the extraction of entities and their features that are being compared, and comparative keywords. The relation is expressed with (<relationWord>, <features>, <entityS1>, <entityS2>)

For example, we have the comparative sentence "*Canon's optics is better than those of Sony and Nikon.*" The extracted relation is: (better, {optics}, {Canon}, {Sony, Nikon})

Both tasks are very challenging. Although we see that the above sentences all contain some indicators i.e., "better", "longer", many sentences that contain such words are not comparatives, e.g., "*I cannot agree with you more*". The second step is a difficult information extraction problem. For the first task, we present an approach that integrates *class sequential rules* (CSR) and *naïve Bayesian classification* to perform the task. This task is studied in detail in (Jindal & Liu 2006). We include it for completeness. For the second task, a new type of rules called *label sequential rules* (LSR) is proposed for extraction. Our results show that LSRs outperform Conditional Random Fields (CRF) (Lafferty, McCallum & Pereira 2001), which is perhaps the most effective extraction method so far (Mooney & Bunescu 2005).

Types of Sequential Rules

We now start to present the proposed techniques, which are based on two types of sequential rules. Mining of such rules is related to mining of sequential patterns (SPM) (Agrawal and Srikant 1994). Given a set of input sequences, SPM finds all subsequences (called *sequential patterns*) that satisfy a user-specified minimum support threshold. Below, we first explain some notations, and then define the two new types of rules, *Class sequential rules* (CSR) used in classification of sentences, and *label sequential rules* (LSR) used in relation item extraction. For more details about these types of rules and their mining algorithms, please see (Liu 2006).

Let $I = \{i1, i2, ..., in\}$ be a set of items. A *sequence* is an ordered list of itemsets. An *itemset X* is a non-empty set of items. We denote a sequence s by $(a_1a_2...a_r)$, where a_i is an itemset, also called an *element* of s. We denote an element of a sequence by $\{x_1, x_2, ..., x_k\}$, where x_k is an item. An item can occur only once in an element of a sequence, but can occur multiple times in different elements. A sequence $s1 = (a_1a_2...a_r)$ is a *subsequence* of another sequence $s2 = (b_1b_2...b_m)$ or s_2 is a *supersequence* of s_1, if there exist integers $1 \leq j_1 < j_2 < ... < j_{r-1} \leq j_r$ *such that* $a_1 \subseteq b_{j1}, a_2 \subseteq b_{j2}, ..., a_r \subseteq b_{jr}$. We also say that s_2 contains s_1.

Class Sequential Rules

Let S be a set of data sequences. Each sequence is labeled with a class y. Let Y be the set of all classes, $I \cap Y = \emptyset$. Thus, the input data D for mining is represented with $D = \{(s_1, y_1), (s_2, y_2), ..., (s_n, y_n)\}$, where s_i is a sequence and $y_i \in Y$ is its class. A *class sequential rule* (CSR) is an implication of the form $X \rightarrow y$, where X is a sequence, and $y \in Y$. A data instance (s_i, y_i) in D is said to *cover* the CSR if X is a subsequence of s_i. A data instance (s_i, y_i) is said to *satisfy* a CSR if X is a subsequence of s_i and $y_i = y$. The *support* (sup) of the rule is the fraction of total instances in D that satisfies the rule. The *confidence* (conf) of the rule is the proportion of instances in D that covers the rule also satisfies the rule. Given a labeled sequence data set D, a minimum support (*minsup*) and a minimum confidence (*minconf*) threshold, CSR mining finds all class sequential rules in D.

Label Sequential Rules

A *label sequential rule* (LSR) is of the following form,

$X \rightarrow Y$,

where Y is a sequence and X is a sequence produced from Y by replacing some of its items with wildcards. A wildcard, denoted by a '*', matches any item. The definitions of support and confidence are similar to those above. The input data is a set of sequences, called *data sequences*.

Mining Indicative Extraction Patterns

Our weakly supervised IEP mining approach is based on two key assumptions:

- If a sequential pattern can be used to extract many reliable comparator pairs, it is very likely to be an IEP.
- If a comparator pair can be extracted by an IEP, the pair is *reliable*.

Based on these two assumptions, we design our bootstrapping algorithm.

The bootstrapping process starts with a single IEP. From it, we extract a set of initial seed comparator pairs. For each comparator pair, all questions containing the pair are retrieved from a question collection and regarded as comparative questions. From the comparative questions and comparator pairs, all possible sequential patterns are generated and evaluated by measuring their reliability score defined later in the Pattern Evaluation section. Patterns evaluated as reliable ones are IEPs and are added into an IEP repository. Then, new comparator pairs are extracted from the question collection using the latest IEPs. The new comparators are added to a reliable comparator repository and used as new seeds for pattern learning in the next iteration. All questions from which reliable comparators are extracted are removed from the collection to allow finding new patterns efficiently in later iterations. The process iterates until no more new patterns can be found from the question collection.

Pattern Generation

To generate sequential patterns, we adapt the surface text pattern mining method introduced in (Ravichandran and Hovy, 2002). For any given comparative question and its comparator pairs, comparators in the question are replaced with symbol $Cs. Two symbols, #start and #end, are attached to the beginning and the end of a sentence in the question. Then, the following three kinds of sequential patterns are generated from sequences of questions:

Lexical patterns: Lexical patterns indicate sequential patterns consisting of only words and symbols ($C, #start, and #end). They are generated by suffix tree algorithm (Gusfield, 1997) with two constraints: A pattern should contain more than one $C, and its frequency in collection should be more than an empirically determined number β.

Generalized patterns: A lexical pattern can be too specific. Thus, we generalize lexical patterns by replacing one or more words with their POS tags. $2^n - 1$ generalized patterns can be produced from a lexical pattern containing *N* words excluding *$Cs*.

Specialized patterns: In some cases, a pattern can be too general. For example, although a question *"ipod or zune?"* is comparative, the pattern *"<$C or $C>"* is too general, and there can be many noncomparative questions matching the pattern, for instance, *"true or false?"*. For this reason, we perform pattern specialization by adding POS tags to all comparator slots. For example, from the lexical pattern "<$C or $C>" and the question "*ipod or zune?*", "<$C/NN or $C/NN?>" will be produced as a specialized pattern. Note that generalized patterns are generated from lexical patterns and the specialized patterns are generated from the combined set of generalized patterns and lexical patterns. The final set of candidate patterns is a mixture of lexical patterns, generalized patterns and specialized patterns.

Conclusion

This paper studied the new problem of identifying comparative sentences in evaluative texts, and extracting comparative relations from them. Two techniques were proposed to perform the tasks, based on class sequential rules and label sequential rules, which give us syntactic clues of comparative relations. Experimental results show that these methods are quite promising.

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Development of A Novel Control Scheme for Grid Integrated Wind Energy System using FACTS Controller

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Abstract: The need to integrate the renewable energy like wind energy into power system is to minimize the environmental impact on conventional plant. The proposed work demonstrates the power quality problems due to installation of wind turbine with the grid. The Injection of the wind power into an electric grid affects the power quality The performance of the wind turbine and thereby power quality are determined on the basis of measurements and the norms followed. The influence of the wind turbine in the grid system concerning the power quality are the active power, reactive power, variation of voltage, flicker, harmonics, and electrical behaviour of switching operation etc. In this proposed scheme STATCOM is connected at a point of common coupling with a battery energy storage system (BESS) to mitigate the power quality issues. The battery energy storage is integrated to sustain the real power source under fluctuating wind power. The STATCOM control scheme for the grid connected wind energy generation system for power quality improvement is simulated using MATLAB/SIMULINK.

Keywords: Wind energy, power quality, Facts controller, Grid interconnected system, Hormonics.

I. Introduction

To have sustainable growth and social progress, it is necessary to meet the energy need by utilizing the renewable energy resources like wind, biomass, hydro, co-generation, etc in sustainable energy system, energy conservation and the use of renewable source are the key paradigm [1]. The integration of wind energy in to existing power system presents a technical challenges and that requires consideration of voltage regulation, stability, power quality problems. The power quality issues can be viewed with respect to the wind generation, transmission and distribution network, such as voltage sag, swells, flickers, harmonics etc [3]. However the wind generator introduces disturbances in to the distribution network. A STATCOM based control technology has been proposed for improving the power quality which can technically manages the power level associates with the commercial wind turbines [2]. The proposed STATCOM control scheme for grid connected wind energy generation for power quality improvement has objectives of unity power factor at the source side, reactive power support only from STATCOM to wind generator and load, and simple bang-bang controller for STATCOM to achieve fast dynamic response [4].

II. Power Quality Issues

The quality of power has often been characterized as "clean" or "dirty." Clean power refers to power that has sinusoidal voltage and current without any distortion and operates at the designed magnitude and frequency. Dirty power describes power that has a distorted sinusoidal voltage and current or operates outside the design limits of voltage, current, and/or frequency. Natural and man-made events in the power system provide sources or initiating events that cause clean power to become dirty. Categories of dirty power quality sources include power system events, nonlinear loads, and poor wiring and grounding. In solving power quality problems, the power quality engineer uses classical problem-solving techniques [6].

The power quality characteristics of the disturbance identify the type of power quality problem. The nature of the variation in the basic components of the sine wave, i.e., voltage, current, and frequency, identifies the type of power quality problem [5]. Voltage sags are the most common type of power quality problem. The voltage variation issues results from the wind velocity and generator torque. The voltage variation is directly related to real and reactive power variations. The voltage flicker issue describes dynamic variations in the network caused by wind turbine or by varying loads [11]. Voltage fluctuation, or variation in the voltage at the electrical outlet, can be caused by events at many different points in the power distribution system [7]. Harmonics are the major source of sine waveform distortion. The increased use of nonlinear equipment has caused harmonics to become more common. Harmonics are integral multiples of the fundamental frequency of the sine wave. Voltage fluctuation, or variation in the voltage at the electrical outlet, can be caused by events at many different points in the power distribution system 9]. Harmonics are the major source of sine waveform distortion. The increased use of nonlinear equipment has caused harmonics to become more common. Harmonics are integral multiples of the fundamental frequency of the sine wave. Nonlinear loads cause harmonic currents to change from a sinusoidal current to a non-sinusoidal current by drawing short bursts of current each cycle or interrupting the current during a cycle [8]. This causes the sinusoidal current waveform to become distorted. The total distorted wave shape is cumulative. Harmonic currents and voltages have a detrimental effect on utility and end-user equipment. They cause overheating of transformers, power cables, and motors; inadvertent tripping of relays; and incorrect measurement of voltage and current by meters.

III. The Proposed System

The STATCOM is a static compensator used to regulate voltage and to improve dynamic stability. There are some variations of the STATCOM, but the composition of it is basically the same. It is composed of inverters with a capacitor in its dc side, coupling transformers, and a control system. The inverters are in conventional STATCOM, switched with a single pulse per period and the transformers are connected in order to provide harmonic minimization. The studies have shown that the STATCOM has a good performance under balanced conditions but using the conventional control methods it is subjected to oscillations when negative sequence components are present in the AC system. The use of PWM technique brings better “average” voltage, current and power behavior results.**T**he STATCOM based current control voltage source inverter injects the current into the grid in such a way that the source current are harmonic free and their phase-angle with respect to source voltage has a desired value. The injected current will cancel out the reactive part and harmonic part of the load and induction generator current, thus it improves the power factor and the power quality. The control scheme approach is based on injecting the currents into the grid using “bang-bang controller.” The controller uses a hysteresis current controlled technique. Using such technique, the controller keeps the control system variable between boundaries of hysteresis area and gives correct switching signals for STATCOM operation.

The proposed grid connected system is implemented for power quality improvement at point of common coupling is shown in Fig:1. The grid connected system consists of wind energy generation system and battery energy storage system with STATCOM. In this configuration, wind generations are based on constant speed topologies with pitch control turbine. The induction generator is used in the proposed scheme because of its simplicity, it does not require a separate field circuit, it can accept constant and variable loads, and has natural protection against short circuit.

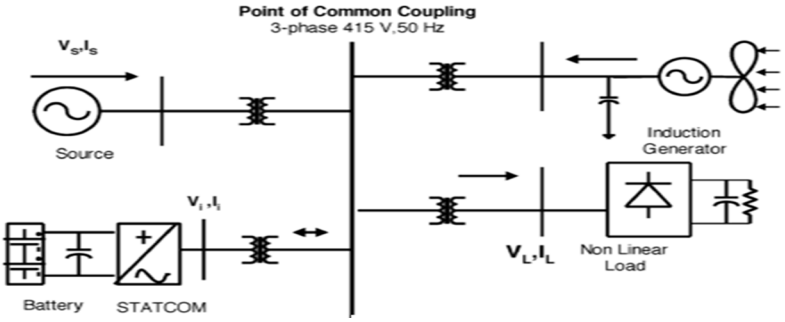

Fig: 1. Grid connected system for power quality improvement.

The shunt connected STATCOM with battery energy storage is connected with the interface of the induction generator and non-linear load at the point of common coupling (PCC) in the grid system. The STATCOM compensator output is varied according to the controlled strategy so as to maintain the power quality norms in the grid system. The current control strategy is included in the control scheme that defines the functional operation of the STATCOM compensator in the power system. A single STATCOM using insulated gate bipolar transistor is proposed to have a reactive power support to the induction generator and to the nonlinear load in the grid system. The three phase injected current into the grid from STATCOM will cancel out the distortion caused by the nonlinear load and wind generator. The IGBT based three-phase inverter is connected to grid through the transformer.

V. Results and Discussions

The shunt connected STATCOM with battery energy storage is connected with the interface of the induction generator and non-linear load at the PCC in the grid system. The STATCOM compensator output is varied according to the controlled strategy, so as to maintain the power quality norms in the grid system. The mat lab simulated main block diagram of the system operational scheme is shown in Fig 2.The three phase injected current into the grid from STATCOM will cancel out the distortion caused by the nonlinear load and wind generator. The IGBT based three-phase inverter is connected to grid through the transformer. The generation of switching signals from reference current is simulated within hysteresis band of 0.08. The choice of narrow hysteresis band switching in the system improves the current quality. The compensated current for the nonlinear load and demanded reactive power is provided by the inverter. The real power transfer from the batteries is also supported by the controller of this inverter. The simulated three phase inverter injected current are shown in Fig. 3

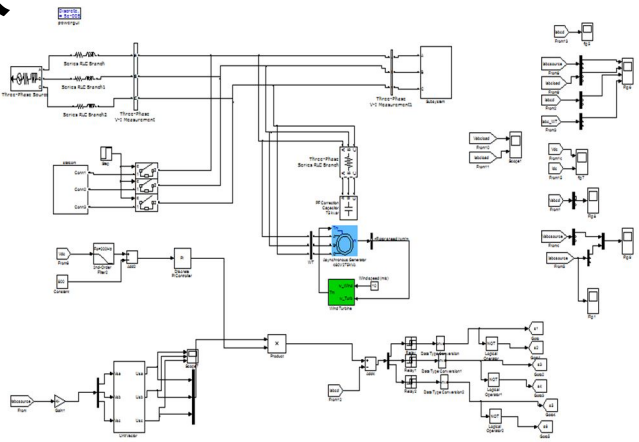

Fig: 2. system operational scheme

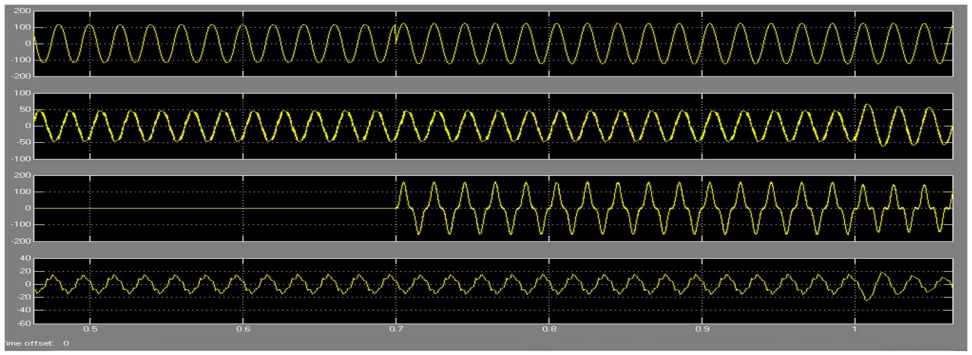

Fig.3 (a) Source Current. (b) Load Current. (c) Inverter Injected Current. (d) Induction generator current.

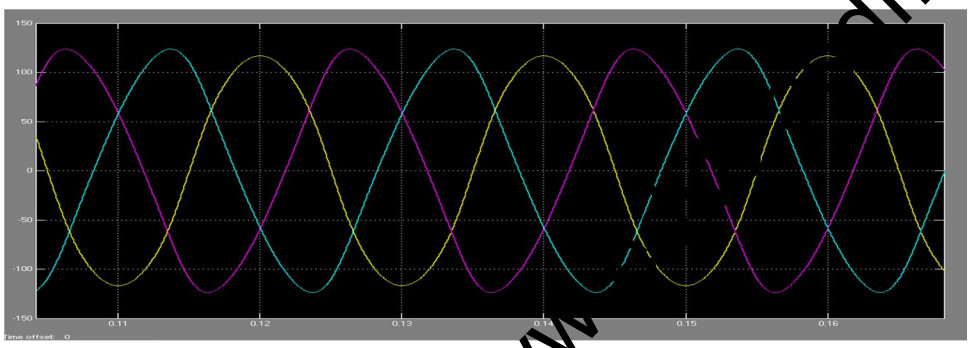

Fig 4. Three phase Source Current

The performance of the system is measured by switching the STATCOM at times in the system and how the STATCOM responds to the step change command for increase in additional load at1.0 s is shown in the simulation.

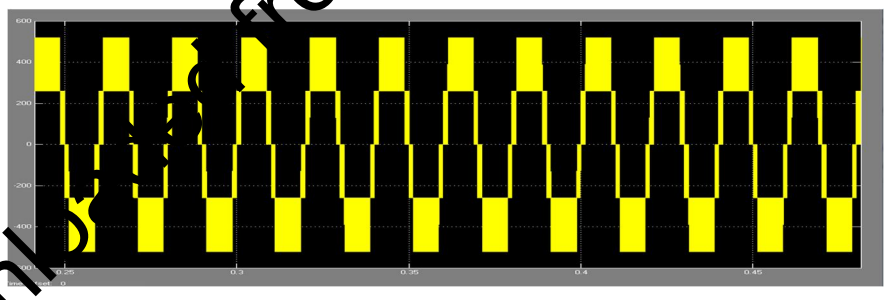

Fig: 5. STATCOM output voltage

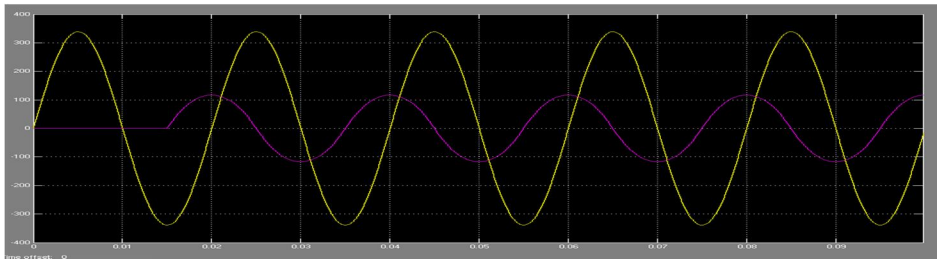

Fig.6. Supply Voltage and Current at PCC.

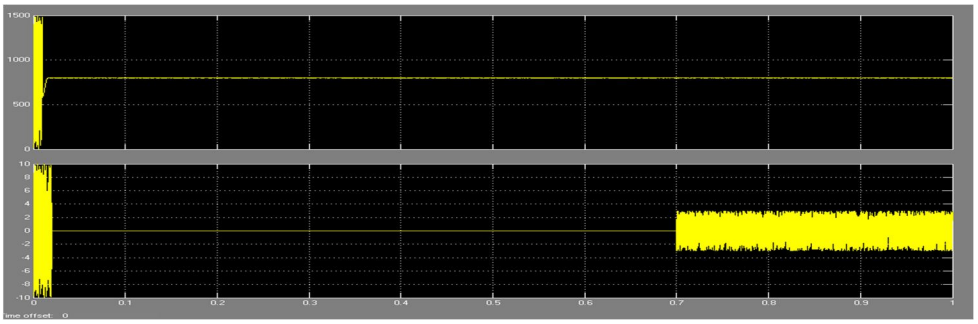

Fig.7. (a) DC link voltage. (b) Current through Capacitor

VI. Conclusion

This paper presents the STATCOM-based control scheme for power quality improvement in grid connected wind generating system and with non-linear load. The power quality issues and its consequences on the consumer and electric utility are presented. The operation of the control system developed for the STATCOM-BESS in MATLAB/SIMULINK for maintaining the power quality is simulated. It has a capability to cancel out the harmonic parts of the load current. It maintains the source voltage and current in-phase and support the reactive power demand for the wind generator and load at PCC in the grid system, thus it gives an opportunity to enhance the utilization factor of transmission line. The integrated wind generation and STATCOM with BESS have shown the outstanding performance.

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SKM: Effective Secure Coverage for Wireless Sensor Networks

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Abstract: In this paper, we propose a new scalable key management scheme for WSNs which provides a good secure connectivity coverage. For this purpose, we make use of the unital design theory. We show that the basic mapping from unitals to key pre-distribution allows us to achieve high network scalability. We propose an enhanced unital-based key pre-distribution scheme providing high network scalability and good key sharing probability. Our results show that the proposed approach enhances the network scalability while providing high secure connectivity coverage and overall improved performance. Moreover, for an equal network size, our solution reduces significantly the storage overhead compared to those of existing solutions.

1. Introduction

A **wireless sensor network (WSN)** consists of spatially distributed autonomous sensors to *monitor* physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling *control* of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

2. Related Work

Key pre distribution is an important topic that constitutes the basis of security in wireless sensor networks. Many security mechanisms such as encryption and authentication can be provided by accessing to shared keys. Several techniques are previously proposed to address this issue. The Extensive features about key distribution in sensor networks are given by L. Eschenauer and V. Gligor [1], H. Chan. A. Perrig and D. Song [2], D. Liu and P. Ning [3] and Subash.T.D,Divya .C [4]. Eschenauer and Gligor's basic scheme [1] is taken as a framework for many techniques using probabilistic key sharing for key management.These studies compared themselves with the basic scheme as we did in this paper. Eschenauer and Gligor's basic scheme [1] proposed a probabilistic key sharing scheme similar to basic scheme. It provides a secure communication network can be formed with key sharing information between sensor nodes. but it is vulnerable to the node compromise attack. H. Chan. A. Pemg, and D. Song modified E-G scheme by only increasing the number of keys that two random nodes share from at least 1 to at least q. It increased vulnerability in large scale node compromise attack. D. Liu and P. Ning proposed a polynomial pool-based

key pre-distribution scheme where any two sensors can definitely establish a pair-wise key when there are no compromised sensors. It has low resiliency. Subash.T.D,Divya .C used Pairwise key pre distribution scheme to improves the resilience of the network. it is used single hop communication. These above papers are compared which describe information about security issues in wireless sensor network. So in this papers author are given some key management scheme techniques such as probabilistic, q-composite randomize, pair wise and polynomial pool based scheme. Key pre distribution results in high security during adversarial attacks. Key pre distribution algorithms are classified into two groups:

1) Deterministic key pre distribution where the key assignment follows a certain pattern.
2) Randomized key distribution, in which keys are assigned randomly from a large key pool and preloaded in the sensors. On comparisons we concluded that pair wise scheme is better than other scheme because by using this scheme our communication become very secure as compared to other scheme because we are using pairwise keys in this technique so intruder cannot alter data because it contain combination of 2 keys, so if intruder knows all this 2 keys then he/she can only access our data otherwise not.

3. Problem Statement

3.1: Existing System

Key management is a corner stone for many security services such as confidentiality and authentication which are required to secure communications in WSNs. The establishment of secure links between nodes is then a challenging problem in WSNs. Because of resource limitations, symmetric key establishment is one of the most suitable paradigms for securing exchanges in WSNs.

Disadvantages

A host of research work dealt with symmetric key pre-distribution issue for WSNs and many solutions have been proposed In the existing system many disadvantages occur: the design of key rings (blocks of keys) is strongly related to the network size, these solutions either suffer from low scalability (number of supported nodes), or degrade other performance metrics including secure connectivity, storage overhead and resiliency in the case of large networks.

3.2: Proposed System

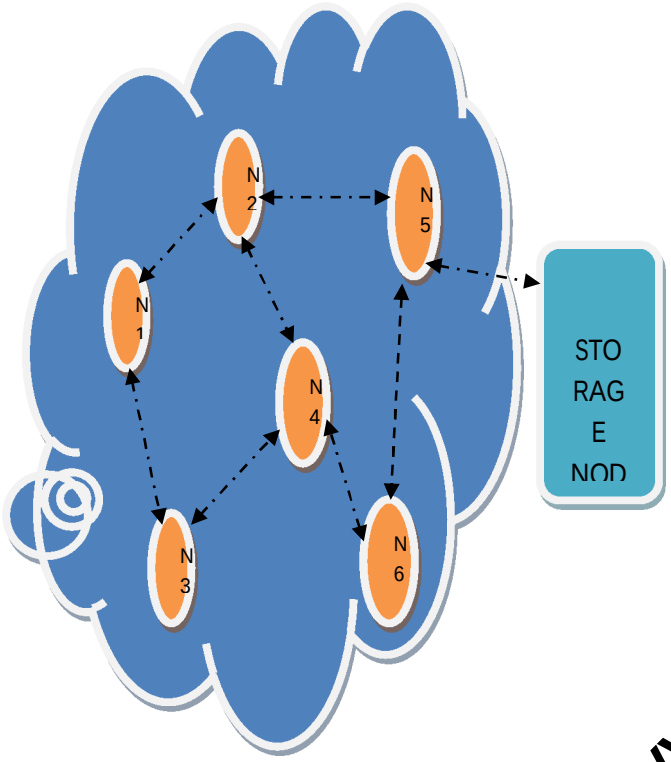
In this proposed system, our aim is to tackle the scalability issue without degrading the other network performance metrics. For this purpose, we target the design of a scheme which ensures a good secure coverage of large scale networks with a low key storage overhead and a good network resiliency. To this end, we make use, of the unital design theory for efficient WSN key pre-distribution.

Advantages

We propose a naive mapping from unital design to key pre-distribution and we show through analytical analysis that it allows to achieve high scalability.

We propose an enhanced unitalbased key pre-distribution scheme that maintains a good key sharing probability while enhancing the network scalability.

4. System Architecture



5. Modules

1. Node Deployment

The first module is Node deployment, where the node can be deployed by specifying the number of nodes in the network. After specifying the number of nodes in the network, the nodes are deployed. The nodes are deployed with unique ID (Identity) number so that each can be differentiated. And also nodes are deployed with their energy levels.

2. Key Generation

After the Node deployment module, the key generation module is developed. Where the number of nodes and number of blocks should be specified, so that the key will be generated. The key is symmetric key and the key is displayed in the text area given in the node.

3. Key Pre-distribution Technique

In this module, we generate blocks of m order initial design, where each block corresponds to a key set. We pre-load then each node with t completely disjoint blocks where t is a protocol parameter that we will discuss later in this section. In lemma 1, we demonstrate the condition of existence of such t completely disjoint blocks among the unital blocks.

4. Secure Transmission with Energy

In this module, the node distance is configured and then the nodes with their neighbor information are displayed. So the nodes which is near by the node, is selected and the energy level is first calculated to

verify the secure transmission. After that the data is uploaded and sent to the destination node. Where in the destination node, the key is verified and then the data is received.

6. Experimental Results

7. Future Enhancement

We will concentrate on probabilistic scheme in future. we will try to increase Local connectivity between nodes by adding XOR operation in efficient key management scheme. In the future, this wide range of application areas will make sensor networks an integral part of our lives. However, realization of sensor networks needs to satisfy the constraints introduced by factors such as fault tolerance, scalability, cost, hardware, topology change, environment and power consumption. Since these constraints are highly stringent and specific for sensor networks, new wireless ad hoc networking techniques are required.

8. Conclusion

We proposed, in this work, a scalable key management scheme which ensures a good secure coverage of large scale WSN with a low key storage overhead and a good network resiliency. We make use of the unital design theory. We showed that a basic mapping from unitals to key pre-distribution allows achieving high network scalability while giving a low direct secure connectivity coverage. We proposed then an efficient scalable unital-based key pre-distribution scheme providing high network scalability and good secure connectivity coverage. We discuss the solution parameter and we propose adequate values giving a very good trade-off between network scalability and secure connectivity. We conducted analytical analysis and simulations to compare our new solution to existing ones, the results showed that our approach ensures a high secure coverage of large scale networks while providing good overall performances.

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Implementing Virtual Machines for Dynamic Resource Allocation in Cloud Computing Environment

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Abstract— To scale up and down the resource usage of stake holders such as customers, the cloud computing environment is used. In this paper, we present a system that uses virtualization technology to allocate data center resources dynamically based on application demands, the green computing is supported by optimizing the number of servers in use. We introduce the concept of "skewness" to measure the unevenness in the multidimensional resource utilization of a server. By minimizing skewness, we can combine different types of workloads nicely and improve the overall utilization of server resources. We develop a set of heuristics that prevent overload in the system effectively while saving energy used. Trace driven simulation and experiment results demonstrate that our algorithm achieves good performance.

Index Terms—Cloud computing, resource management, virtualization, green computing.

1. Introduction

There are great discussion how to move legacy applications onto the cloud platform and here we study how a cloud service provider best can multiplex its virtual resources onto the physical hardware. This is important because much of the touted gains in the cloud model come from multiplexing. It is observed that in many existing data centers the servers are underutilized due to over provisioning for the peak demand. [1], [2]. The cloud model is expected to make such practice unnecessary by offering automatic scale up and down in response to load variation. Besides reducing the hardware cost, it also saves on electricity which contributes to significant portion of the operational expenses in large data centers.

Virtual machine monitors (VMMs) like Xen provide a mechanism for mapping virtual machines (VMs) to physical resources [3]. This mapping is largely hidden from the cloud users. It is up to the cloud provider to make sure the underlying physical machines (PMs) have sufficient re- sources to meet their needs. VM live migration technology makes it possible to change the mapping between VMs and PMs While applications are running [5], [6]. However, a policy issue remains as how to decide the mapping adaptively so that the resource demands of VMs are met while the number of PMs used is minimized. This is challenging when the resource needs of VMs are hetero-geneous due to the diverse set of applications they run and vary with time as the workloads grow and shrink.

We aim to achieve two goals in our algorithm:

- Avoiding overloading: The capacity of a PM should be sufficient to satisfy the resource needs of all VMs running on it. Otherwise, the PM is overloaded and can lead to degraded performance of its VMs.
- Green Computing: The number of PMs used should be minimized as long as they can still satisfy the needs of all VMs. Idle PMs can be turned off to save energy.

For overload avoidance, we should keep the utilization of PMs low to reduce the possibility of overload in case the resource needs of VMs increase later.

For green computing, we should keep the utilization of PMs reasonably high to make efficient use of their energy.

In this paper, we present the design and implementation of an automated resource management system that achieves a good balance between the two goals. We make the following contributions:

- We develop a resource allocation system that can avoid overload in the system effectively while minimizing the number of servers used.
- We introduce the concept of "skewness" to measure the uneven utilization of a server. By minimizing skewness, we can improve the overall utilization of servers in the face of multidimensional resource constraints.
- We design a load prediction algorithm that can capture the future resource usages of applications accurately without looking inside the VMs. The algorithm can capture the rising trend of resource usage patterns and help reduce the placement churn significantly.

The rest of the paper is organized as follows. Section-2 provides an overview of our system and Section -3 describes our algorithm to predict resource usage. Section-4 provides simulation and Section-5 presents experiment results, respectively. Section- 6 discusses related work and Section- 7 concludes.

2. System Overview

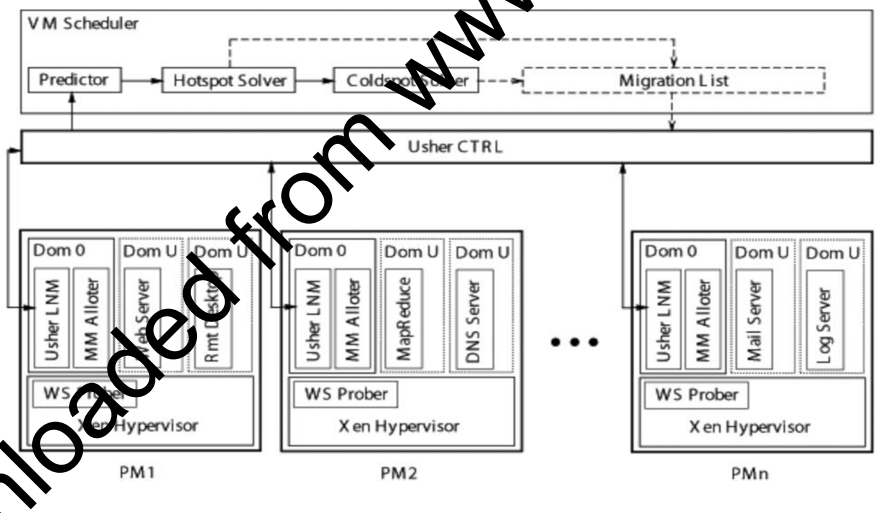


Figure. 1. System architecture.

The architecture of the system is presented in Fig. 1. Each PM runs the Xen hypervisor (VMM) which supports a privileged domain 0 and one or more domain U [3]. Each VM in domain U encapsulates one or more applications such as Web server, remote desktop, DNS, Mail, Map/ Reduce, etc. We assume all PMs Share back end storage.

The multiplexing of VMs to PMs is managed using the Usher framework [7]. The main logic of our system is implemented as a set of plug-ins to usher. Each node runs an Usher local node manager (LNM) on domain 0 which collects the usage statistics of resources for each VM on that node. The CPU and network usage can be calculated by monitoring the scheduling events in Xen. The memory usage with in a VM, however, is not visible to the hypervisor. One

approach is to infer memory shortage of a VM by observing its swap activities [8]. Unfortunately, the guest OS is required to install a separate swap partition. Furthermore, it may be too late to adjust the memory allocation by the time swapping occurs. Instead we implemented a working set prober (WS Prober) on each hypervisor to estimate the working set sizes of VMs running on it. We use the random page sampling technique as in the VM ware ESX Server [9].The statistics collected at each PM are forwarded to the Usher central controller (Usher CTRL) where our VM scheduler runs. The VM Scheduler is invoked periodically and receives from the LNM the resource demand history of VMs, the capacity and the load history of PMs, and the current layout of VMs on PMs. The scheduler has several components. The predictor predicts the future resource demands of VMs and the future load of PMs based on past statistics. We compute the load of a PM by aggregating the resource usage of its VMs. The LNM at each node first attempts to satisfy the new demands locally by adjusting the resource allocation of VMs sharing the same VMM. Xen can change the CPU allocation among the VMs by adjusting their weights in its CPU scheduler. The MM Allotter on domain 0 of each node is responsible for adjusting the local memory allocation.

The hot spot solver in our VM Scheduler detects if the resource utilization of any PM is above the hot threshold (i.e., a hot spot). If so, some VMs running on them will be migrated away to reduce their load. The cold spot solver checks if the average utilization of actively used PMs (APMs) is below the green computing threshold. If so, some of those PMs could potentially be turned off to save energy. It identifies the set of PMs whose utilization is below the cold threshold (i.e., cold spots) and then attempts to migrate away all their VMs. It then compiles a migration list of VMs and passes it to Usher CTRL for execution.

3 The Skewness Algorithm

We introduce the concept of skewness to quantify the unevenness in the utilization of multiple resources on a server. Let n be the number of resources we consider r_i be the utilization of the ith resource. We define the resource skewness of a server p as

$$\text{Skewness}(p) = \sqrt{\sum_{i=1}^{n} r_i^2}$$

where r is the average utilization of all resources for server p. In practice, not all types of resources are performance critical and hence we only need to consider bottleneck resources in the above calculation. By minimizing the skewness, we can combine different types of workloads nicely and improve the overall utilization of server resources. In the following, we describe the details of our algorithm. Analysis of the algorithm is presented in Section 1..

3.1 Hot and Cold Spots

Our algorithm executes periodically to evaluate the resource allocation status based on the predicted future resource demands of VMs. We define a server as a hot spot if the utilization of any of its resources is above a hot threshold. This indicates that the server is overloaded and hence some VMs running on it should be migrated away. We define the temperature of a hot spot p as the square sum of its resource utilization beyond the hot threshold, move onto the next hot spot. Note that each run of the algorithm migrates away at most one VM from the overloaded server. This does not necessarily eliminate the hot spot, but at least reduces its temperature. If it remains a hot spot in the next decision run, the algorithm will repeat this process. It is possible to design the algorithm so that it can migrate away multiple VMs during each run. But this can add more load on the related servers during a period when they are already overloaded. We decide to use this more conservative approach and leave the

system some time to react before initiating additional migrations.

3.2. Green Computing

When the resource utilization of active servers is too low, some of them can be turned off to save energy. This is where R is the set of overloaded resources in server p and rt is the hot threshold for resource r. (Note that only overloaded resources are considered in the calculation.) The temperature of a hot spot reflects its degree of overload. If a server is not a hot spot, its temperature is zero.

We define a server as a cold spot if the utilizations of all its resources are below a cold threshold. This indicatesthat the server is mostly idle and a potential candidate to turn off to save energy. However, we do so only when the average resource utilization of all actively used servers (i.e., APMs) in the system is below a green computing threshold. A server is actively used if it has at least one VM running. Otherwise, it is inactive. Finally, we define the warm threshold to be a level of resource utilization that is sufficiently high to justify having the server running but not so high as to risk becoming a hot spot in the face of temporary fluctuation in application resource demands.

Different types of resources can have different thresh- olds. For example, we can define the hot thresholds for CPU and memory resources to be 90 and 80 percent, respectively. Thus a server is a hot spot if either its CPU usage is above 90 percent or its memory usage is above 80 percent.

3.3 Hot Spot Mitigation

We sort the list of hot spots in the system in descending temperature (i.e., we handle the hottest one first). Our goal is to eliminate all hot spots if possible. Otherwise, keep their temperature as low as possible. For each server p, we first decide which of its VMs should be migrated away. We sort its list of VMs based on the resulting temperature of the server if that VM is migrated away. We aim to migrate away the VM that can reduce the server's temperature the most. In case of ties, we select the VM whose removal can reduce the skewness of the server the most. For each VM in the list, we see if we can find a destination server to accommodate it. The server must not become a hot spot after accepting this VM. Among all such servers, we select one whose skewness can be reduced the most by accepting this VM. Note that this reduction can be negative which means we select the server whose skewness increases the least. If a destination server is found, we record the migration of the VM to that server and update the predicted load of related servers. Otherwise, we move onto the next VM in the list and try to find a destination server for it. As long as we can find a destination server for any of its VMs, we consider this run of the algorithm a success and then handled in our green computing algorithm. The challenge here is to reduce the number of active servers during low load without sacrificing performance either now or in the future. We need to avoid oscillation in the system.

Our green computing algorithm is invoked when the average utilizations of all resources on active servers are below the green computing threshold. We sort the list of cold spots in the system based on the ascending order of their memory size. Since we need to migrate away all its VMs before we can shut down an underutilized server, we define the memory size of a cold spot as the aggregate memory size of all VMs running on it. Recall that our model assumes all VMs connect to share back-end storage. Hence, the cost of a VM live migration is determined mostly by its memory footprint. Section 7 in the supplementary file explains why the memory is a good measure in depth. We try to eliminate the cold spot with the lowest cost first.

For a cold spot p, we check if we can migrate all its VM somewhere else. For each VM on p, we try to find a destination server to accommodate it. The resource utilizations of the server after accepting

the VM must be below the warm threshold. While we can save energy by consolidating underutilized servers, overdoing it may create hot spots in the future. The warm threshold is designed to prevent that. If multiple servers satisfy the above criterion, we prefer one that is not a current cold spot. This is because increasing load on a cold spot reduces the likelihood that it can be eliminated. However, we will accept a cold spot as the destination server if necessary. All things being equal, we select a destination server whose skewness can be reduced the most by accepting this VM. If we can find destination servers for all VMs on a cold spot, we record the sequence of migrations and update the predicted load of related servers. Otherwise, we do not migrate any of its VMs. The list of cold spots is also updated because some of them may no longer be cold due to the proposed VM migrations in the above process.

The above consolidation adds extra load onto the related servers. This is not as serious a problem as in the hot spot mitigation case because green computing is initiated only when the load in the system is low. Nevertheless, we want to bound the extra load due to server consolidation. We restrict the number of cold spots that can be eliminated in each run of the algorithm to be no more than a certain percentage of active servers in the system. This is called the consolidation limit.

Note that we eliminate cold spots in the system only when the average load of all active servers (APMs) is below the green computing threshold. Otherwise, we leave those cold spots there as potential destination machines for future offloading. This is consistent with our philosophy that green computing should be conducted conservatively.

4. Simulations

We evaluate the performance of our algorithm using trace driven simulation. Note that our simulation uses the same code base for the algorithm as the real implementation in the experiments. This ensures the fidelity of our simulation results. Traces are per minute server resource utilization, such as CPU rate, memory usage, and network traffic statistics, collected using tools like "perfmon" (Windows), the "/proc" file system (Linux), "pmstat/vmstat/netstat" commands (Solaris), etc.. The raw traces are pre-processed into "Usher" format so that the simulator can read them. We collected the traces from a variety of sources:

- Web InfoMall. The largest online Web archive in China (i.e., the counterpart of Internet Archive in the US) with more than three billion archived Web pages.
- Real course. The largest online distance learning system in China with servers distributed across 13 major cities.
- Amazing Store. The largest P2P storage system in China.

We also collected traces from servers and desktop computers in our university including one of our mail servers, the central DNS server, and desktops in our department. We post processed the traces based on days collected and use random sampling and linear combination of the data sets to generate the workloads needed. All simulation in this section uses the real trace workload unless otherwise specified.

We used the FUSD load prediction algorithm with " ¼ 0:2, # ¼ 0:7, and W ¼ 8. In a dynamic system, those parameters represent good knobs to tune the performance of the system adaptively. We choose the default parameter values based on empirical experience working with many Internet applications. In the future, we plan to explore using AI or control theoretic approach to find near optimal values automatically.

4.1 Effect of Thresholds on APMs

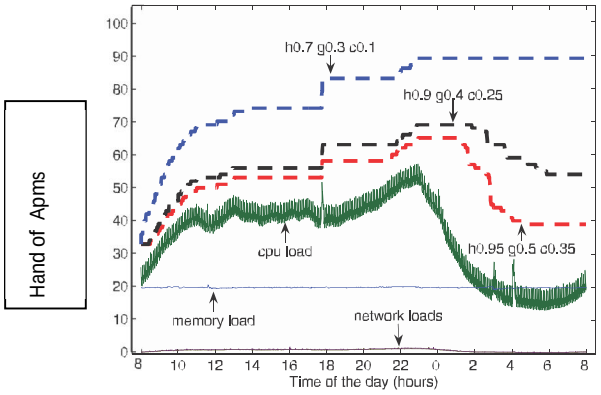


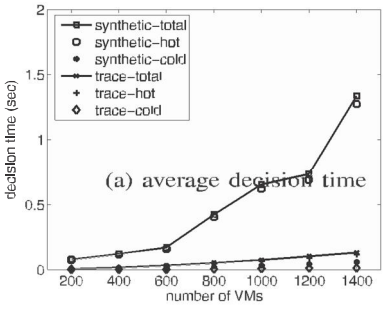
Figure 2 Impact of thresholds on the number of APMs

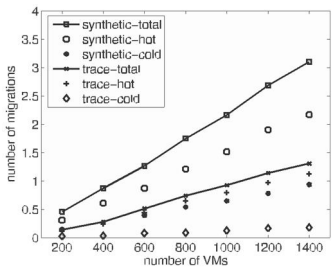
We first evaluate the effect of the various thresholds used in our algorithm. We simulate a system with 100 PMs and 1,000 VMs (selected randomly from the trace). We use random to PM mapping in the initial layout. The scheduler is invoked once per minute. The bottom part of Fig. 2 shows the daily load variation in the system. The x- axis is the time of the day starting at 8 am. The y-axis is overloaded with two meanings: the percentage of the load or the percentage of APMs (i.e., Active PMs) in the system. Recall that a PM is active (i.e., an APM) if it has at least one VM running. As can be seen from the figure, the CPU load demonstrates diurnal patterns which decrease substantially after midnight. The memory consumption is fairly stable over the time. The network utilization stays very low.

The top part of Fig. 2 shows how the percentages of APMs vary with the load for different thresholds in our algorithm. For example, "h0.7 g0.3 c0.1" means that the hot, the green computing, and the cold thresholds are 70, 30, and 10 percent, respectively. Our algorithm can be made more or less aggressive in its migration decision by tuning the thresholds. The figure shows that lower hot thresholds cause more aggressive migrations to mitigate hot spots in the system and increases the number of APMs, and higher cold and green computing thresholds cause more aggressive consolidation which leads to a smaller number of APMs. The percentage of APMs in our algorithm follows the load pattern closely.

To examine the performance of our algorithm in more extreme situations, we also create a synthetic workload which mimics the shape of a sine function (only the positive part) and ranges from 15 to 95 percent with a 20 percent random fluctuation. It has a much larger peak-to-mean ratio than the real trace. The results are shown in Section 2 of the supplementary file, which can be found on the Computer Society Digital Library.

4.2 Scalability of the Algorithm





(b) average number of migrations

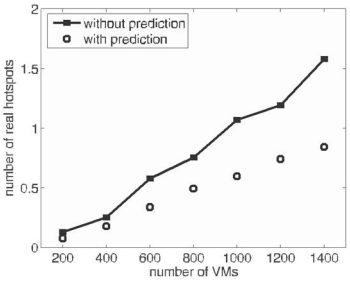
Figure 3. Scalability of the algorithm with system size.

We evaluate the scalability of our algorithm by varying the number of VMs in the simulation between 200 and 1,400. The ratio of VM to PM is 10:1. The results are shown in

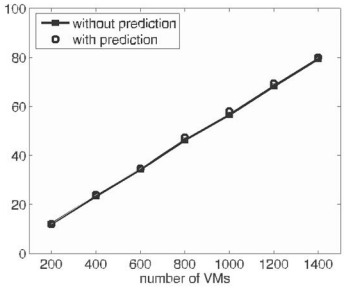
Fig. 3. Fig. 3a shows that the average decision time of our algorithm increases with the system size. The speed of increase is between linear and quadratic. We break down the decision time into two parts: hot spot mitigation (marked as "hot") and green computing (marked as "cold"). We find that hot spot mitigation contributes more to the decision time. We also find that the decision time for the synthetic workload is higher than that for the real trace due to the large variation in the synthetic workload. With 140 PMs and 1,400 VMs, the decision time is about 1.3 seconds for the synthetic workload and 0.2 second for the real trace.

Fig. 3b shows the average number of migrations in the whole system during each decision. The number of migrations is small and increases roughly linearly with the system size. We find that hot spot contributes more to the number of migrations. We also find that the number of migrations in the synthetic workload is higher than that in the real trace. With 140 PMs and 1,400 VMs, on average each run of our algorithm incurs about three migrations in the whole system for the synthetic workload and only 1.3 migrations for the real trace.

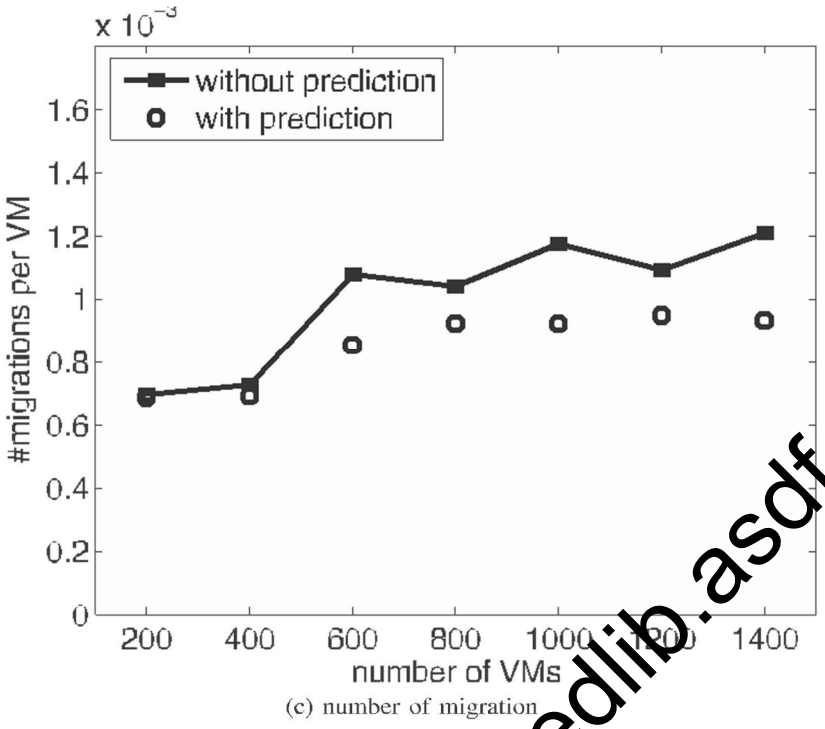
4.3 Effect of Load Prediction



(a) number of hot spots



(b) number of APMs



(c) number of migration

Figure. 4. Effect of load prediction

We compare the execution of our algorithm with and without load prediction in Fig. 4. When load prediction is disabled, the algorithm simply uses the last observed load in its decision making. Fig. 4a shows that load prediction significantly reduces the average number of hot spots in the system during a decision run. Notably, prediction prevents over 46 percent hot spots in the simulation with 1,400 VMs. This demonstrates its high effectiveness in preventing server overload proactively. Without prediction, the algo- rithm tries to consolidate a PM as soon as its load drops below the threshold. With prediction, the algorithm correctly foresees that the load of the PM will increase above the threshold shortly and hence takes no action. This leaves the PM in the "cold spot" state for a while. However, it also reduces placement churns by avoiding unnecessary migrations due to temporary load fluctuation. Consequently, the number of migrations in the system with load prediction is smaller than that without prediction as shown in Fig. 4c. We can adjust the conservativeness of load prediction by tuning its parameters, but the current configuration largely serves our purpose (i.e., error on the side of caution). The only downside of having more cold spots in the system is that it may increase the number of APMs. This is investigated in Fig. 4b which shows that the average numbers of APMs remain essentially the same with or without load prediction (the difference is less than 1 percent). This is appealing because significant overload protection can be achieved without sacrificing resources efficiency. Fig. 6c compares the average number of migrations per VM in each decision with and without load prediction. It shows that each VM experiences 17 percent fewer migrations with load prediction.

5 Experiments

Our experiments are conducted using a group of 30 Dell Power Edge blade servers with Intel E5620 CPU and 24 GB of RAM. The servers run Xen-3.3 and Linux 2.6.18. We deploy 8 VMs on each server at the beginning. Each VM is configured with one virtual CPU and two gigabyte memory. Self-ballooning is enabled to allow the hypervisor to reclaim un used memory. Each VM runs the server side of the TPC-W benchmark corresponding to various types of the workloads: browsing, shopping, hybrid workloads, etc. Our algorithm is invoked every 10 minutes.

5.1 Algorithm Effectiveness

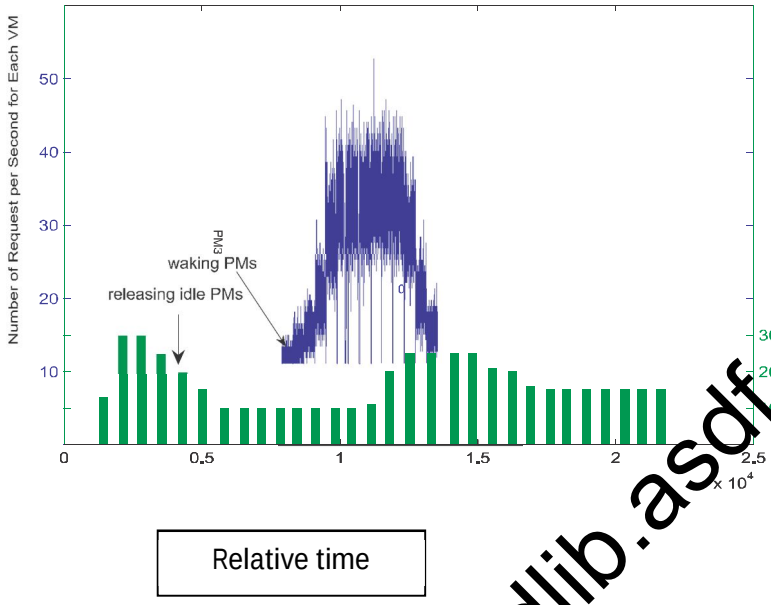


Figure 5. #APMs varies with TPC-W load.

We evaluate the effectiveness of our algorithm in overload mitigation and green computing. We start with a small scale experiment consisting of three PMs and five VMs so that we can present the results for all servers in Fig. 5. Different shades are used for each VM. All VMs are configured with 128 MB of RAM. An Apache server runs on each VM. We use httperf to invoke CPU intensive PHP scripts on the Apache server. This allows us to subject the VMs to different degrees of CPU load by adjusting the client request rates. The utilization of other resources are kept low. We first increase the CPU load of the three VMs on PM_1 to create an overload. Our algorithm resolves the overload by migrating VM_3 to PM_3. It reaches a stable state under high load around 420 seconds. Around 890 seconds, we decrease the CPU load of all VMs gradually. Because the FUSD prediction algorithm is conservative when the load decreases, it takes a while before green computing takes effect. Around 1,700 seconds, VM_3 is migrated from PM_3 to PM_2 so that PM_3 can be put into the standby mode. Around 2,200 seconds the two VMs on PM_1 are migrated to PM_2 so that PM_1 can be released as well. As the load goes up and down, our algorithm will repeat the above process: spread over or consolidate the VMs as needed.

Next we extend the scale of the experiment to 30 servers. We use the TPC-W benchmark for this experiment. TPC-W is an industry standard benchmark for e-commerce even when idle, consumes several hundred megabytes of memory. After two hours, we increase the load dramatically to emulate a "flash crowd" event. The algorithm wakes up the stand-by servers to offload the hot spot servers. The figure shows that the number of APMs increases accord- ingly. After the request rates peak for about one hour, we reduce the load gradually to emulate that the flash crowd is over. This triggers green computing again to consolidate the underutilized servers. Fig. 5 shows that over the course of the experiment, the number of APM rises much faster than it falls. This is due to the effect of our FUSD load prediction. The figure also shows that the number of APMs remains at a slightly elevated level after the flash crowd. This is because the TPC-W servers maintain some data in cache and hence its memory usage never goes back to its original level.

5.2 Impact of Live Migration

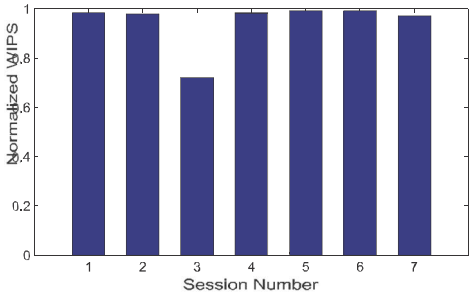


Figure 6. Impact of live migration on TPC-W performance.

One concern about the use of VM live migration is its impact on application performance. Previous studies have found this impact to be small [5]. We investigate this impact in our own experiment. We extract the data on the 340 live migrations in our 30 server experiment above. We find that 139 of them are for hot spot mitigation. We focus on these migrations because that is when the potential impact on application performance is the most. Among the 139 migrations, we randomly pick seven corresponding TPC-W sessions undergoing live migration. All these sessions run the "shopping mix" workload with 200 emu- lated browsers. As a target for comparison, we rerun the session with the same parameters but perform no migra- tion and use the resulting performance as the baseline. Fig. 6 shows the normalized Web interactions per second (WIPS) for the 7 sessions. WIPS is the performance metric used by TPC-W. The figure shows that most live migration sessions exhibit no noticeable degradation in performance compared to the baseline: the normalized WIPS is close to the only exception is session 3 whose degraded performance is caused by an extremely busy server in the original experiment. Next we take a closer look at one of the sessions in Fig. 6 and show how their performances vary over time. The figure verifies that live migration causes no noticeable performance degradation. The duration of the migration is under 10 seconds. Recall that our algorithm is invoked every 10 minutes.

5.3 Resource Balance

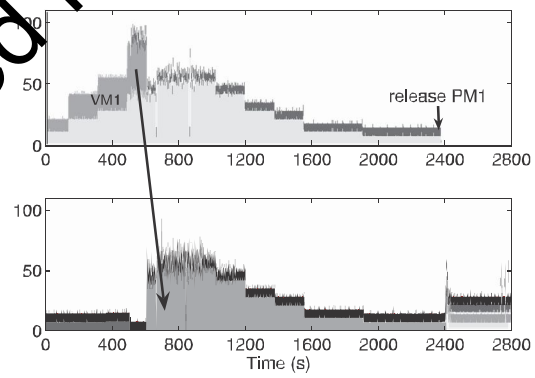


Figure 7 Resource balance for mixed workloads

Recall that the goal of the skewness algorithm is to mix workloads with different resource requirements together so that the overall utilization of server capacity is improved. In this experiment, we see how our algorithm handles a mix of CPU, memory, and network intensive workloads. We vary the CPU load as before. We inject the network load by sending the VMs a series of network packets. The memory intensive applications are created by allocating memory on

demand. Again we start with a small scale experiment consisting of two PMs and four VMs so that we can present the results for all servers in Fig. 7. The two rows represent the two PMs. The two columns represent the CPU and network dimensions, respectively. The memory consumption is kept low for this experiment. Initially, the two VMs on PM_1 are CPU intensive while the two VMs on PM_2 are network intensive. We increase the load of their bottleneck resources gradually. Around 500 seconds, VM_4 is migrated from PM_2 to PM_1 due to the network overload in PM_2. Then around 600 seconds, VM_1 is migrated from PM_1 to PM_2 due to the CPU overload in PM_1. Now the system reaches a stable state with a balanced resource utilization for both PMs—each with a CPU intensive VM and a network intensive VM. Later we decrease the load of all VMs gradually so that both PMs become cold spots. We can see that the two VMs on PM_1 are consolidated to PM_2 by green computing.

Next we extend the scale of the experiment to a group of 72 VMs running over 8 PMs. Half of the VMs are CPU intensive, while the other half is memory intensive. Initially, we keep the load of all VMs low and deploy all CPU intensive VMs on PM_4 and PM_5 while all memory intensive VMs on PM_6 and PM_7. Then we increase the load on all VMs gradually to make the underlying PMs hot spots. Fig. 12 shows how the algorithm spreads the VMs to other PMs over time. As we can see from the figure, the algorithm balances the two types of VMs appropriately. The figure also shows that the load across the set of PMs becomes well balanced as we increase the load.

6 Related Work

Automatic scaling of Web applications was previously studied in [14] and [15] for data center environments. In Muse [14], each server has replicas of the web applications running in the system. The dispatch algorithm in a frontend L7-switch makes sure requests are reasonably served while minimizing the number of underutilized servers. Work [15] uses network flow algorithms to allocate the load of an application among its running instances.

6.1 Resource Allocation by Live VM Migration

VM live migration is a widely used technique for dynamic resource allocation in a virtualized environment [8], [12],

Our work also belongs to this category. Sandpiper combines multidimensional load information into a single Volume metric [8]. It sorts the list of PMs based on their volumes and the VMs in each PM in their volume-to-size ratio (VSR). This unfortunately abstracts away critical information needed when making the migration decision. It then considers the PMs and the Ms in the presorted order. The results are analyzed in Section 5 of the supplementary file, which is available online, to show how they behave differently. In addition, their work has no support for green computing and differs from ours in many other aspects such as load prediction. Dynamic placement of virtual servers to minimize SLA violations is studied in [12]. They model it as a bin packing problem and use the well-known first-fit approximation algorithm to calculate the VM to PM layout periodically. That algorithm, however, is designed mostly for offline use. It is likely to incur a large number of migrations when applied in online environment where the resource needs of VMs change dynamically.

6.2 Green Computing

Many efforts have been made to curtail energy consumption in data centers. Hardware-based approaches include novel thermal design for lower cooling power, or adopting power-proportional and low-power hardware.

Our work belongs to the category of pure-software low- cost solutions [10], [12], [14].

7. Conclusion

We have presented the design, implementation, and evalua- tion of a resource management system for cloud computing services. Our system multiplexes virtual to physical resources adaptively based on the changing demand. We use the skewness metric to combine VMs with different resource characteristics appropriately so that the capacities of servers are well utilized. Our algorithm achieves both overload avoidance and green computing for systems with multi-resource constraints.

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Early Detection and Prevention of Vampire Attacks in Wireless Sensor Networks

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Abstract - Vampire attacks are not specific to any protocol, but rather rely on the properties of classes of routing protocols. A single Vampire can increase network-wide energy usage by a factor of O (N), where N is the number of network nodes. This paper uses two attacks on stateless protocol in which the Carousel attack is an adversary and sends a packet with a route composed as a series of loops, such that the same node appears in the route many a times, and the Stretch attack where a malicious node constructs artificially long source routes, causing packets to traverse a larger than optimal number of nodes. The vampire attacks are very difficult to detect and prevent.

Keywords – Ad-hoc Networks, Carousel attack, Stretch attack and malicious discovery attack.

1. Introduction

Wireless ad-hoc network is needed to explore in sensing and pervasive computing. The security work focuses on denial of communication at the routing or medium access control levels. The "Vampire" attacks are not specific to any specific protocol, but rather rely on the properties of many popular classes of routing protocols. Vampire attack is the composition and transmission of a message that causes more energy to be consumed by the network than if an honest node transmits a message of identical size to the same destination, although using different packet headers. All the protocols are devastating, difficult to detect and easy to carry out using as few as one malicious insider sending only protocol compliant messages. The proposed system discuss the methods to detect and mitigate these types of attacks, including a new proof-of-concept protocol that provably bounds the damage caused by Vampires during the packet forwarding phase. Vampire attacks are not protocol-specific, in that they do not rely on design properties or implementation faults of particular routing protocols, but rather exploit general properties of protocol classes such as link-state, distance-vector, source routing and geographic and beacon routing. Neither do these attacks rely on flooding the network with large amounts of data, but rather try to transmit as little data as possible to achieve the largest energy drain, preventing a rate limiting solution. Since Vampires use protocol-compliant messages, these attacks are very difficult to detect and prevent.

This paper makes three primary contributions. First, we thoroughly evaluate the vulnerabilities of existing protocols to routing layer battery depletion attacks. We observe that security measures to prevent Vampire attacks are orthogonal to those used to protect routing infrastructure, and so existing secure routing protocols such as SAODV, and SEAD do not protect against Vampire attacks.

DOS attacks represents in wired networks are frequently characterized by amplification an adversary can amplify the resources it spends on the attack the cumulative energy of an entire network, amplification attacks are always possible, given that an adversary can compose and send messages which are processed by each node along the message path. Vampire attack has the composition and transmission of a message that causes more energy to be consumed by the network than if an honest node transmitted a message of identical size to the same destination, although using different packet headers.

1.2 Protocols and Assumptions

All routing protocols employ at least one topology discovery period, since ad-hoc deployment implies no prior position knowledge. a single Vampire may attack every network node simultaneously, meaning that

continuous recharging does not help unless Vampires are more resource-constrained than honest nodes Vampire attacks may be weakened by using groups of nodes with staggered cycles: only active-duty nodes are vulnerable while the Vampire is active; nodes are safe while the Vampire sleeps this defence is only effective when duty cycle groups outnumber Vampires, since it only takes one Vampire per group to carry out the attack.

1.3 Overview

In the first attack that is Carousal attack an adversary composes packets with purposely introduced routing loops it targets source routing protocols by exploiting the limited verification of message headers at forwarding nodes, allowing a single packet to repeatedly traverse the same set of nodes. In the second attack that is stretch attack an adversary constructs artificially long routes, potentially traversing every node in the network. The assumption has been made that only messages originated by adversaries may have maliciously-composed routes.

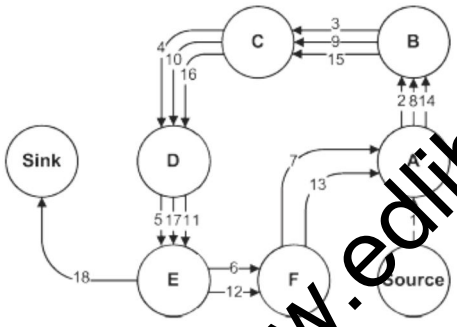


Fig (a) An honest route would exit the loop Fig (b) Honest route is dotted while immediately from Node E to sink. Malicious code is dashed. Above figure shows Malicious route construction attacks on source routing: carousel attack Fig (a) and stretch attack Fig (b).

2. Related Work

Existing work on secure routing attempts to ensure that adversaries cannot cause path discovery to return an invalid network path, but Vampires do not disrupt or alter discovered paths, instead using existing valid network paths and protocol compliant messages. Protocols that maximize power efficiency are also inappropriate, since they rely on cooperative node behavior and cannot optimize out malicious action. [1,2,3] the most permanent denial of service attack is to entirely deplete nodes batteries.Disadvantages of existing system are power outages, due to environmental disasters, loss in the information, lost productivity various dos attacks, secure level is low, they do not address attacks that affect long-term availability.

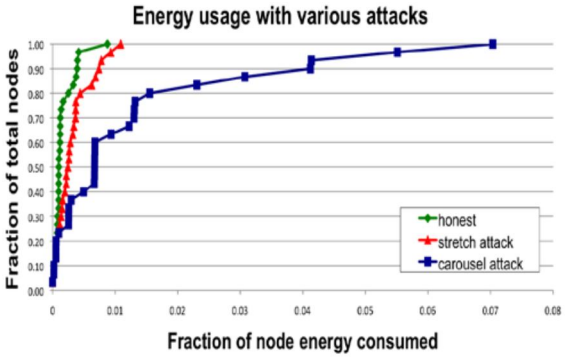
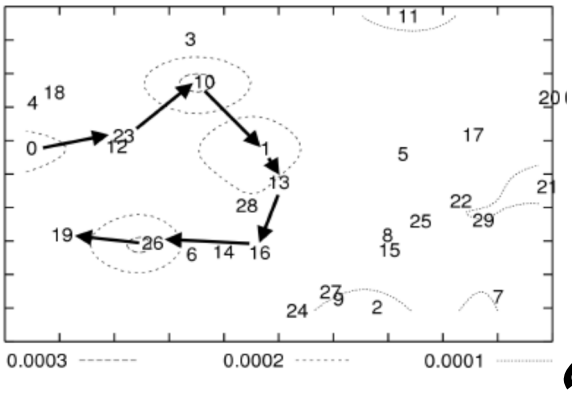


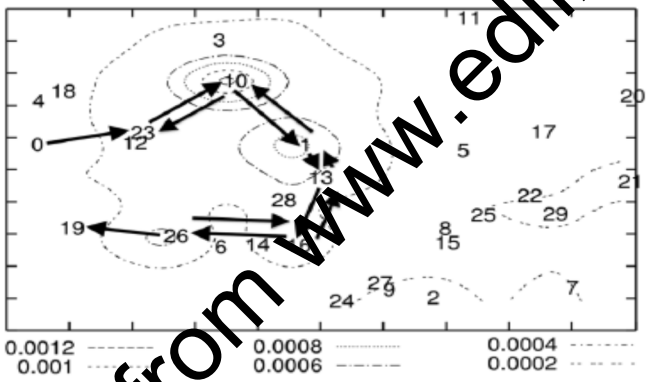
Fig (c) Node energy distribution under various attack scenarios.

3. Attacks on Stateless Protocol

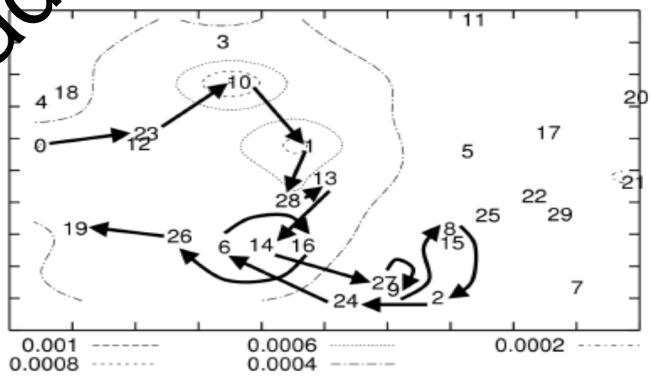
The carousel and stretch attacks (Fig (a) & Fig (b)) in a randomly-generated 30-node topology and a single randomly-selected malicious DSR agent, using the ns-2 network simulator. Malicious nodes are not driving down the cumulative energy of the network purely by their own use of energy.



(a) Honest scenario: node 0 sends a single message to node 19



(b) Carousel attack (malicious node 0): the nodes traversed by the packet are the same as in (a), but the loop over all forwarding nodes roughly triples the route length (the packet traverses the loop more than once). Note the drastically increased energy consumption among the forwarding nodes.



(c) Stretch attack (malicious node 0): the route diverts from the optimal path between source and destination, roughly doubling in length. Note that while the per-node energy consumption increase is not as drastic as in (b), the region of increased energy consumption is larger. Overall energy consumption is greater than in the carousel attack but spread more evenly over more network nodes.

3.1 Mitigation methods

The carousel attack can be prevented when a loop is detected, the source route could be corrected and the packet sent on, but one of the attractive features of source routing is that the route can itself be signed by the source. The stretch attack is more challenging to prevent. Its success rests on the forwarding node not checking for optimality of the route.

4. Attacks on Stateful Protocols

Routes in link-state and distance-vector networks are built dynamically from many independent forwarding decisions, so adversaries have limited power to affect packet forwarding, making these protocols immune to carousel and stretch attacks. Vampires have little control over packet progress when forwarding decisions are made independently by each node, but they can still waste energy by restarting a packet in various parts of the network. In Malicious discovery attack the attack on all previously-mentioned routing protocols (including stateful and stateless) is spurious route discovery.

5. Provable Security Against Vampire Attacks

The non backtracking property is satisfied for a given packet if and only there exists routes for its transmission. This means that the adversary cannot perform carousel or stretch attacks, no node may unilaterally specify a suboptimal path through the network.

Results

S.No.	A	B	c	d	E	f	Result
1	No link	No link	No link	No link	No link	received	F
2	No link	No link	received	No link	No link	sent	C
3	Received	No link	sent	No link	No link	No link	A
4	Sent	No link	No link	received	No link	No link	D

Table 1: Validation with the given link source f-c-a-d

6. Conclusion & Future Work

Distance Vector is the wireless sensor network routing protocol that provably bounds damage from Vampire attacks by verifying that packets consistently make progress toward their destinations. The detection and avoidance of formation of loops help this protocol detect and avoid vampire attacks. Derivation of damage bounds and defenses for topology discovery, as well as handling mobile networks, is left for future work.

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Minimizing Communication Overhead Computation Cost for Dynamic Users in The Cloud

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Abstract: Storing data on remote cloud storage makes the maintenance affordable by data owners. The reliability and trustworthiness of these remote storage locations is the main concern for data owners and cloud service providers. When Multiple data owners are involved, the aspects of membership and data sharing need to be addressed. In this paper, we propose a secure multi owner data sharing scheme, named Mona, for dynamic groups in the cloud. By leveraging group signature and dynamic broadcast encryption techniques, any cloud user can anonymously share data with others.

1. Introduction

CLOUD computing is recognized as an alternative to traditional information technology [1] due to its intrinsic resource-sharing and low-maintenance characteristics. In cloud computing, the cloud service providers (CSPs), such as Amazon, are able to deliver various services to cloud users with the help of powerful datacenters. By migrating the local data management systems into cloud servers, users can enjoy high-quality services and save significant investments on their local infrastructures. To preserve data privacy, a basic solution is to encrypt data files, and then upload the encrypted data into the cloud [2]. Unfortunately, designing an efficient and secure data sharing scheme for groups in the cloud is not an easy task due to the following challenging issues. First, identity privacy is one of the most significant obstacles for the wide deployment of cloud computing. Without the guarantee of identity privacy, users may be unwilling to join in cloud computing systems because their real identities could be easily disclosed to cloud providers and attackers. On the other hand, unconditional identity privacy may incur the abuse of privacy. Second, it is highly recommended that any member in a group should be able to fully enjoy the data storing and sharing services provided by the cloud, which is defined as the multiple-owner manner. Compared with the single-owner manner [3], where only the group manager can store and modify data in the cloud, the multiple-owner manner is more flexible in practical applications.

2. Related Work

In [4], the authors specified a secure data sharing model, Mona, for dynamic groups in a remote storage. In Mona, a data owner can share data with others in the group without announcing their identity. Moreover, Mona supports effective user repudiation and new user registration. More specially, efficient user repudiation can be attained by a public revocation list without ideating the private keys of the remaining users, and new users can directly decrypt files stored in the cloud before their presence.

In [5], Kallahalla et al. proposed a cryptographic storage system that enables secure file sharing on untrusted servers, named Plutus. By dividing files into filegroups and encrypting each filegroup with a unique file-block key, the data owner can share the filegroups with others through delivering the corresponding lockbox key, where the lockbox key is used to encrypt the file-block keys. However, it brings about a heavy key distribution overhead for large-scale file sharing. Additionally, the file-block key needs to be updated and distributed again for a user revocation. Lu et al. [6] proposed a secure provenance scheme, which is built upon group signatures and ciphertext-policy attribute-based encryption techniques. Particularly, the system in their scheme is set with a single attribute. Each user obtains two keys after the

registration: a group signature key and an attribute key. Thus, any user is able to encrypt a data file using attribute-based encryption and others in the group can decrypt the encrypted data using their attribute keys.

3. Problem Statement

3.1: Existing System

To preserve data privacy, a basic solution is to encrypt data files, and then upload the encrypted data into the cloud. Unfortunately, designing an efficient and secure data sharing scheme for groups in the cloud is not an easy task.

Existing System (Conti.)

In the existing System data owners store the encrypted data files in untrusted storage and distribute the corresponding decryption keys only to authorized users.

However, the complexities of user participation and revocation in these schemes are linearly increasing with the number of data owners and the number of revoked users, respectively.

Disadvantages

1. Only the group manager can store and modify data in the cloud.
2. The changes of membership make secure data sharing extremely difficult the issue of user revocation is not addressed.

3.2: Proposed System

1. We propose a secure multi-owner data sharing scheme. It implies that any user in the group can securely share data with others by the untrusted cloud.
2. Our proposed scheme is able to support dynamic groups efficiently. Specifically, new granted users can directly decrypt data files uploaded before their participation without contacting with data owners.
3. We provide secure and privacy-preserving access control to users, which guarantees any member in a group to anonymously utilize the cloud resource.
4. We provide rigorous security analysis, and perform extensive simulations to demonstrate the efficiency of our scheme in terms of storage and computation overhead.

Advantages

1. Any user in the group can store and share data files with others by the cloud.
2. The encryption complexity and size of ciphertexts are independent with the number of revoked users in the system.
3. User revocation can be achieved without updating the private keys of the remaining users.

4. System Architecture

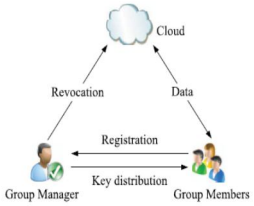


Fig. 1. System model.

5. Modules

1. Cloud Module

In this module, we create a local Cloud and provide priced abundant storage services. The users can upload their data in the cloud. We develop this module, where the cloud storage can be made secure. However, the cloud is not fully trusted by users since the CSPs are very likely to be outside of the cloud users' trusted domain. Similar to we assume that the cloud server is honest but curious.

2. Group Manager Module

Group manager takes charge of followings,

1. System parameters generation,
2. User registration,
3. User revocation, and
4. Revealing the real identity of a dispute data owner

3. Group Member Module

1. Group members are a set of registered users that will
2. Store their private data into the cloud server and
3. Share them with others in the group.

4. File Security Module

1. Encrypting the data file.
2. File stored in the cloud can be deleted by either the group manager or the data owner.

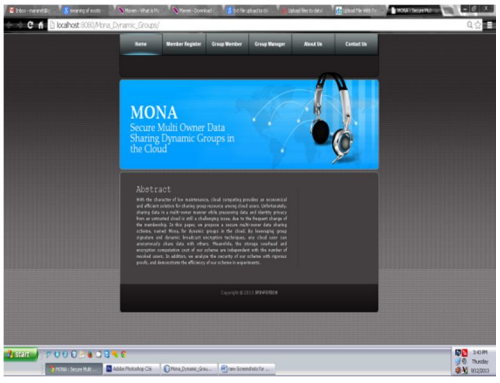
5. Group Signature Module

A group signature scheme allows any member of the group to sign messages while keeping the identity secret from verifiers. Besides, the designated group manager can reveal the identity of the signature's originator when a dispute occurs, which is denoted as traceability.

6. User Revocation Module

User revocation is performed by the group manager via a public available revocation list (RL), based on which group members can encrypt their data files and ensure the confidentiality against the revoked users.

6. Experimental Results



7. Future Enhancement

8. Conclusion:

In this paper, we developed a secure Multi owner Data sharing Group key protocol for an untrusted cloud. In this model, a new user can store data on the cloud storage without communicating with all the data owners. The group key manager grants the key on request to the new data owners directly. The new user revocation and registration is made simple by allowing the user to communicate with the group key manager through the revocation policy. The storage overhead and the encryption computation cost are varied.

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Protect Confidential Information in PPH Cloud Environments by Using End-End Access in Secure Way

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Abstract— In Cloud computing PPH private public and hybrid respectively the cloud environments are available in now a days. Cloud computing has many benefits and security challenges in various cloud environments. But regarding some business-critical applications, the organizations, especially large enterprises, still may not move them to cloud. The market size of the cloud computing shared is still far behind the one's expectation. From the consumer's perspective, cloud computing security concerns, especially protecting critical information in various cloud environment issues, remain the primary inhibitor for adoption of cloud computing services. This paper provides the benefits and security challenges in various cloud environment and techniques and solution for various issues of security challenges of various cloud environments. Finally, this paper describes future research work about protecting critical information in cloud by using all these techniques to overcome time process by using utilities in cloud computing by the reduce cost by performing better way.

Keywords: Cloud Computing, Security, and End – End access.

I. Introduction

Cloud computing introduced new business models, provide more services, and reduce IT costs. Cloud computing technologies can be implemented in a wide variety of architectures, like different service and deployment models, and can coexist with other technologies and software design approaches. The global cloud computing market is grow from a $40.7 billion in 2011 to $241 billion in 2020, according to Forrester Research.

On the way to all of the growth are a few notable reports.

- For starters, the Infrastructure as a service market will peak a $5.9 billion in global revenue in 2014 and then commoditization, price pressure and falling margins.
- Business Process as a service will be notable, but face modest revenue.
- Virtualization will recede to the background as new technologies take over.

To determine whether the increased risks of truly worth the agility and economic benefits. Maintaining control over the critical information is paramount to cloud success. A decade ago, enterprise data typically resided in the organization's physical infrastructure, on its own servers in the enterprise's data center, where the sensitive data in individual physical servers. Today, with virtualization and the cloud, data may be under the organization's logical control, but physically reside in infrastructure owned and managed by another entity.

As we shown in figure 1. This shift in control is the number one reason new approaches and techniques are required to ensure organizations can maintain data security. When an outside party owns, controls, and manages infrastructure and computational resources, how can you be assured that business or regulatory data remains private and secure, and that your organization is protected from damaging data breaches—

and feel you can still completely satisfy the full range of reporting, compliance, and regulatory requirements?

In this paper we describe the following:

- The benefits of cloud computing
- Cloud Computing Security Challenges
- Techniques for Protecting Data in the Cloud
- Cloud Security Solutions

The Benefits of Cloud Computing

In recent years, cloud computing has emerged as an important solution offering enterprises a potentially cost for effective model to ease their computing needs and accomplish business requirements. Considering:

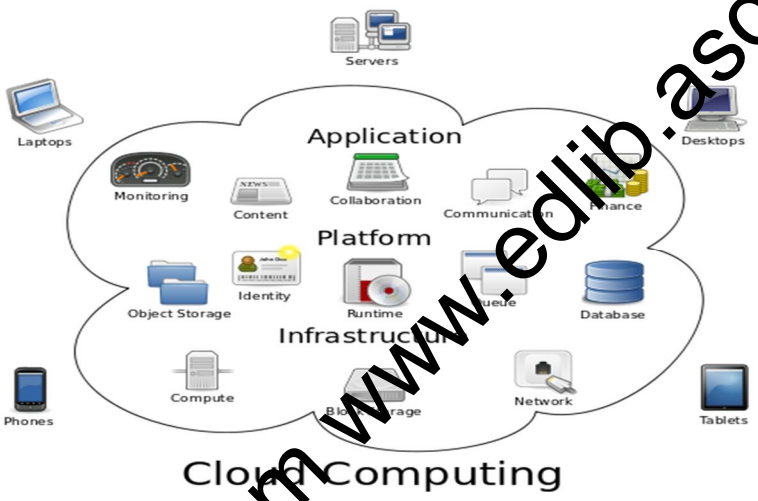

Figure 1 Cloud Environments

As shown in Figure 1

a) **Optimized server utilization –** In most of enterprises typically underutilize their server computing resources, cloud computing will manage the server utilization to an optimum level.
b) **Cost saving -** IT infrastructure costs are almost always minimal and are treated as a capital expense (CAPEX). However if the IT infrastructure usually becomes an operating expense (OPEX). In some countries, this results in a tax advantage regarding income taxes. Also, cloud computing cost saving can be realized via resource pooling.
c) **Dynamic scalability -** many enterprises include a reasonably large buffer from their average computing requirement, just to ensure that capacity in a place to satisfy peak demand. Cloud computing provides an extra processing buffer as needed when a low cost and without the capital investment or contingency fees to the users.

II. Security Reasons in Cloud Area

Data protection tops the list of cloud concerns today. Vendor security capabilities are key to establishing strategic to manage the cloud infrastructure, but are often uneasy about granting them visibility into sensitive data, to use the cloud due to cost savings and new agile business models. But when it comes to cloud security, it's important to understand the various threat landscape that comes into play. There are complex data security challenges in the cloud:

- The need to protect confidential business, government, or regulatory data
- Cloud service models with multiple tenants sharing the same infrastructure
- Data mobility and legal issues relative to such government rules as the EU Data Privacy Directive
- Lack of standards about how cloud service providers securely recycle disk space and erase existing data

Such issues give rise to tremendous anxiety about security risks in the cloud. Enterprises worry whether they can trust their employees or need to implement additional internal controls in the private cloud, and whether third-party providers can provide adequate protection in multitenant environments that may also store competitor data.

Specific security challenges pertain to each of the three cloud service models—Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

Techniques for Protecting Data in the Cloud

In Traditional models of data protection have often focused on network-centric and perimeter security, frequently with devices such as firewalls and intrusion detection systems. But this approach does not provide sufficient protection against APTs, privileged users, or other insidious types of security attacks.

It is important to utilize security controls that protect sensitive data no matter where it lives, as point solutions by their very nature provide only limited visibility. An effective cloud security solution should incorporate three key capabilities:

- Data lockdown
- Access policies
- Security intelligence

First, make sure that data is not readable and that the solution offers strong key management. Second, implement access policies that ensure only authorized users can gain access to sensitive information, so that even privileged users such as root users cannot view sensitive information. Third, incorporate security intelligence that generates log information, which can be used for behavioral analysis to provide alerts that trigger when users are performing actions outside of the norm.

Cloud Security Solutions

Secure access to cloud resources with intelligent authentication tokens—

Ensuring that only authorized users gain access to cloud-based resources is critical for cloud providers and enterprises. Providers need to ensure proper access controls for users at client sites, and for administrators within the service provider's organization.

Secure cryptographic key storage—

Any cryptographic system and trust in the protected data is only as strong as the underlying protection of the keys used to encrypt data. A centralized, hardened security appliance manages cryptographic keys, access control, and other security policies. In addition, a virtualized instance of this appliance is deployed in the cloud to replicate policies and security enforcement on the data.

Secure storage in the cloud across file, application, and database systems—

Driven by a need to use the cloud's elastic storage, enterprises can securely store data in the cloud, effectively using the cloud for the backup, disaster recovery, and archival of data. Protection of stored data

through a hardened appliance that centralizes encryption processing, keys, logging, auditing, and policy administration across file, application, and database systems.

III. Implemented Methodologies in Infrastructure within Public and Hybrid Clouds-

Clouds are a target rich environment for cyber-attacks on the interconnected critical fabric that weaves together the elastic computing, storage and connectivity in the back-end of the cloud data centers.it provides strong Layer 3 and Layer 2 link encryption solutions to harden this critical network infrastructure while maintaining low-latency -- high throughput data exchanges to keep the cloud operating at peak efficiency. Together, these solutions deliver the critical capabilities required for a robust, cost-effective and secure cloud security implementation.

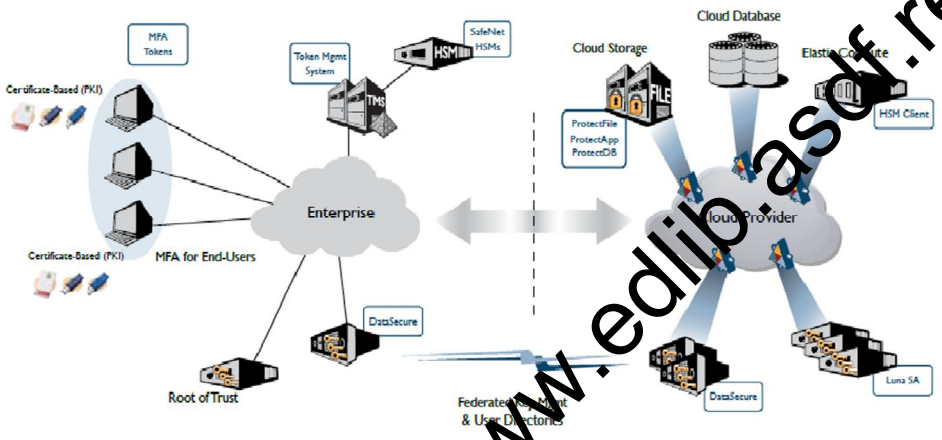

Figure 3. Cloud data providers interaction

SaaS Architectural Maturity Level 4-Scalable: At this fourth SaaS maturity level, scalability is added by using a multitier architecture. This architecture is capable of supporting a load-balanced farm of identical application instances running on a variable number of servers, sometimes in the hundreds or even thousands. System capacity can be dynamically increased or decreased to match load demand by adding or removing servers, with no need for further alteration of application software architecture.

1. Coming to the Key Characteristics of SaaS

a. A Network-based management and access to commercially available software from central locations rather than at each end use customer's site, enabling end user customers to access applications remotely via the Internet.
b. Application delivery from a one-to-many model (single-instance, multitenant architecture), as opposed to a traditional one-to-one model. Centralized enhancement and patch updating that obviates any need for downloading and installing by a user. SaaS is often used in conjunction with a larger network of communications and collaboration software, sometimes as a plug-in to a PaaS architecture.

2. Coming to the Benefits of the SaaS Model

Application deployment cycles inside companies can take years, consume massive resources, and yield unsatisfactory results

i. Streamlined administration
ii. Automated update and patch management services

iii. Data compatibility across the enterprise (all users have the same version of software)
iv. Facilitated, enterprise-wide collaboration
v. Global accessibility

As we have pointed out previously, server virtualization can be used in SaaS architectures, either in place of or in addition to multi tenancy. A major benefit of platform virtualization is that it can increase a system's capacity without any need for additional programming. Conversely, a huge amount of programming may be required in order to construct more efficient, multitenant applications. The effect of combining multi tenancy and platform virtualization into a SaaS solution provides greater flexibility and performance to the end user.

b).End use access in Location of Encryption Devices only

With end-to-end encryption, the encryption process is carried out at the two end systems. The source host or terminal encrypts the data. The data, in encrypted form, are then transmitted unaltered across the network to the destination terminal or host. The destination shares a key with the source and so is able to decrypt the data. This approach would seem to secure the transmission against attacks on the network links or switches. There is, however, still a weak spot.

Thus, with end-to-end encryption, the user data are secure. However, the traffic pattern is not, because packet headers are transmitted in the clear. To achieve greater security, both link and end-to-end encryption are needed, as is shown in

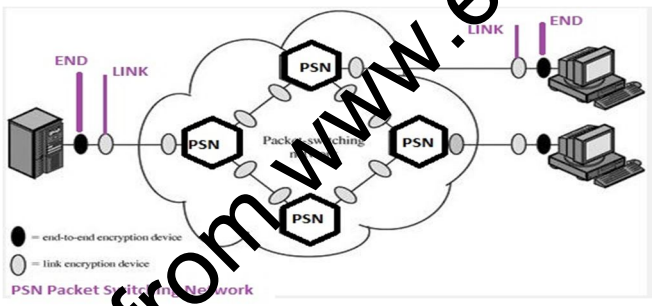

Figure 4 Encryption across a Packet-Switching Network

To summarize, when both forms are employed, the host encrypts the user data portion of a packet using an end-to-end encryption key. The entire packet is then encrypted using a link encryption key. As the packet traverses the network, each switch decrypts the packet using a link encryption key to read the header and then encrypts the entire packet again for sending it out on the next link. Now the entire packet is secure except for the time that the packet is actually in the memory of a packet switch, at which time the packet header is in the clear.

VI. Result

Using all the mentioned techniques in cloud the data is protected by using the end to end connection establishment with encryption and decryption. Validation does not identify the server to the end user. For true identification, the end user must verify the identification information contained in the server's certificate (and, indeed, its whole issuing CA chain). This is the only way for the end user to know the "identity" of the server, and this is the only way identity can be securely established, verifying that the URL, name, or address that is being used is specified in the server's certificate. More important, an understanding of why they have evolved. Standards are important, to be sure, but most of these standards evolved from individuals taking a chance on a new innovation in end user access in best way.

V. Conclusion

By Using all these techniques cloud will provide more securities services for various areas to utilize various contributions from cloud. This paper provided an overview of end-user access to cloud computing. We first talked about key trends we believe will drive collaboration further into the cloud environment. We chose five significant entities to present you with an overview of the types and levels of capability available in the cloud today-things you can use now. YouTube, an online video repository, has an amazing hold on the global audience. Collaboration suites such as Zoho both enhance mobility and allow you to maintain a virtual office in the cloud. Social networking with Facebook has become very popular, especially in academic settings. Zoho is a SaaS vendor to watch. Backed by Google, Zoho offers something for everyone.

Finally by using the Cloud Computing we can Increase the Processing capabilities can be used in a secure manner whenever we using the more effective algorithms. Than End user access quickly. In Cloud Computing SaaS can be utilize more effective manner in various sections as categories.By Using the Cloud Computing We can Smoothly using the algorithms in less burden. By Using Default IP Address to avoid unauthorized whenever IP Spoofing occurs. By Repairing those IP Address it consumes more time so avoid so those thing we can immediately use the next IP Address.

IV. Future work:

For data security and privacy protection issues, the fundamental challenges are separation of sensitive data and access control. Our objective is to design a set of unified identity management and privacy protection frameworks across applications or cloud computing services. As mobility of employees in organizations is relatively large, identity management system should achieve more automatic and fast user account provisioning and de-provisioning in order to ensure no un-authorized access to organizations' cloud resources by some employees who has left the organizations. Authorization and access control mechanisms should achieve a unified, reusable and scalable access control model and meet the need of fine-grained access authorization. Accountability based privacy protection mechanisms will achieve dynamical and real-time inform, authorization and auditing for the data owners when their private data being accessed.

VII. Acknowledgements

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Infant Baby Health Monitoring & High Security System Using GSM Technology Providing Key Lock & Passcode

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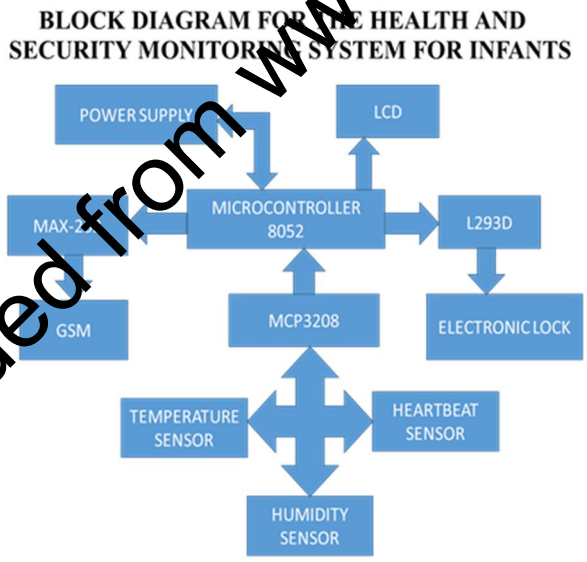
Abstract: In these days of united healthcare, for convenient monitoring of biological signals, the wireless communication technique is necessary. We have investigated several wireless technologies of biological sensor networking for united healthcare. There are some standard techniques such as Bluetooth, wirelesses LAN, ZIGBEE, GSM TECHNOLOGY, etc. We have tested these techniques for biological sensor networking and summarize the advantages and the disadvantages. As a result we decided the GSM TECHNOLOGY to be used as sensor network of patients in the hospital. We developed this patient monitoring system which has several biological parameters. Especially, this system has ability of patient's location awareness in the hospital. The main concept of this project is to provide basic information of the conditions of the just born baby placed in the incubator to the parents by sending SMS through GSM module to the GSM mobile and providing high security such that only authorized medical staff can attend the baby, this information of the baby security is also sent through SMS to the parent. The access to the incubator is authorized through a keypad lock which is entered through a pass code.



Working Description

We have used the microcontroller 8052 in the model as its relatively cheaper and can be used for the tremendous amount of multitasking and the complications which are used in the model. As shown in the block diagram above the microcontroller acts as a source of connection to the sensors, the GSM device and electronic lock which is run by a dc motor. When a certain sensor's preinstalled threshold limits are crossed a message is flashed at the LCD asking for the passcode to open the electronic lock which locks the incubator and when the right password is entered the incubator is opened by the dc motor which has been set by a delay time of 15 seconds after which the lock is automatically closed.

Power Supply

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal.

Micro Controller 8052/8051

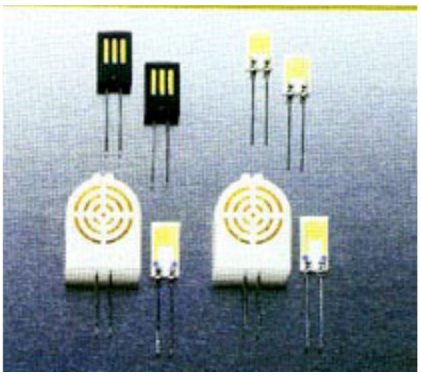
A microcontroller (also MCU or µC) is a functional computer system-on-a-chip. It contains a processor core, memory, and programmable input/output peripherals.

It emphasizes high integration, in contrast to a microprocessor which only contains a CPU (the kind used in a PC). In addition to the usual arithmetic and logic elements of a general purpose microprocessor, the microcontroller integrates additional elements such as read-write memory for data storage, read-only memory for program storage, Flash memory for permanent data storage, peripherals, and input/output interfaces. They consume relatively little power (mill watts), and will generally have the ability to retain functionality while waiting for an event such as a button press or interrupt. Power consumption while sleeping (CPU and peripherals off) may be just nano watts, making them ideal for low power and long lasting battery applications. By reducing the size, cost, and power consumption compared to a design using a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to electronically control many more processes. The **AT89S52** is a low-power, high-performance CMOS 8-bit microcontroller with 8Kbytes of in-system programmable Flash memory.

Humidity Sensors

Humidity sensors are gaining more significance in diverse areas of measurement and Control technology. Manufacturers are not only improving the accuracy and long-term drift of their sensors, they are improving their durability for use in different environments, and simultaneously reducing the component size and the price.

Conventional sensors determine relative air humidity using capacitive measurement technology. For this principle, the sensor element is built out of a film capacitor on different substrates (glass, ceramic, etc.). The dielectric is a polymer which absorbs or releases water proportional to the relative environmental humidity, and thus changes the capacitance of the capacitor, which is measured by an onboard electronic circuit.



Heart beat sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heartbeat. This digital output can

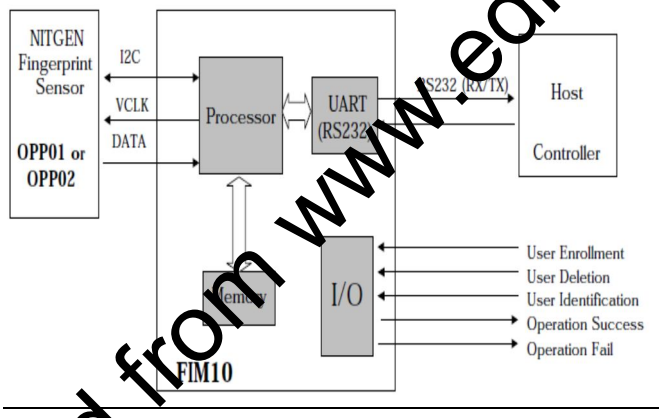
be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

Features

- Microcontroller based SMD design
- Heat beat indication by LED
- Instant output digital signal for directly connecting to microcontroller
- Compact Size

FIM10

The FIM10 (Fingerprint Identification Module) is a stand-alone fingerprint recognition device with built-in CPU. FIM10 is a NITGEN Version 1.0, and it is release at the date of February 11, 2004. FIM10 is a standalone Fingerprint Recognition Device with many excellent features. It provides the high recognition performance, the low power dissipation and the RS-232 serial interface with the simple protocol for easy integration into a wide range of applications. It is a durable and compactable device and made into a fingerprint recognition module with NITGEN optics-based fingerprint sensor.



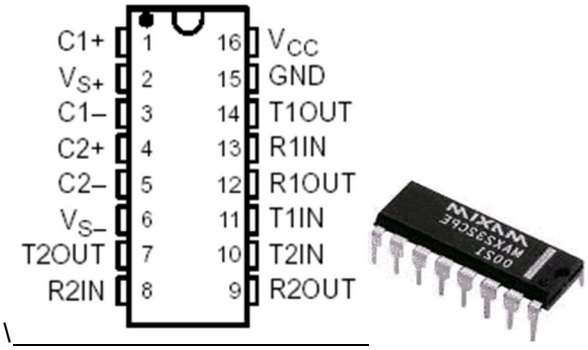
Temperature Sensors (LM35)

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to +150°C temperature range, while the LM35C is rated for a -40° to +110°C range (-10° with improved accuracy).

MAX 232

A standard serial interface for PC, RS232C, requires negative logic, i.e., logic 1 is -3V to -12V and logic 0 is +3V to +12V. To convert TTL logic, say, TxD and RxD pins of the microcontroller thus need a converter chip. A MAX232 chip has long been using in many microcontrollers boards. It is a dual RS232 receiver / transmitter that meets all RS232 specifications while using only +5V power supply. It has two onboard

charge pump voltage converters which generate +10V to -10V power supplies from a single 5V supply. It has four level translators, two of which are RS232 transmitters that convert TTL/CMOS input levels into +9V RS232 outputs. The other two level translators are RS232 receivers that convert RS232 input to 5V. Typical MAX232 circuit is shown below.



GSM (Global System for Mobile communications)

GSM (Global System for Mobile communications) is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in four different frequency ranges. Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. Time division multiplexing is used to allow eight full-rate or sixteen half-rate speech channels per radio frequency channel. There are eight radio timeslots (giving eight burst periods) grouped into what is called a TDMA frame. Half rate channels use alternate frames in the same timeslot. The channel data rate is 270.833 kbit/s, and the frame duration is 4.615 ms.

GSM Advantages

GSM also pioneered a low-cost, to the network carrier, alternative to voice calls, the Shortt message service (SMS, also called "text messaging"), which is now supported on other mobile standards as well. Another advantage is that the standard includes one worldwide Emergency telephone number, 112. This makes it easier for international travelers to connect to emergency services without knowing the local emergency number.

LCD (Liquid Cristal Display)

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

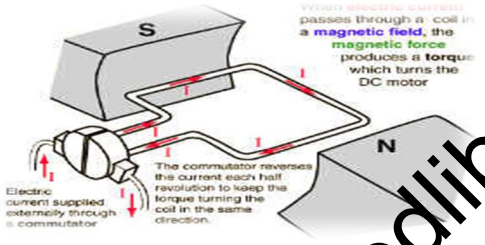
L293, L293D (Quadruple Half H-Drivers)

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source.

Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

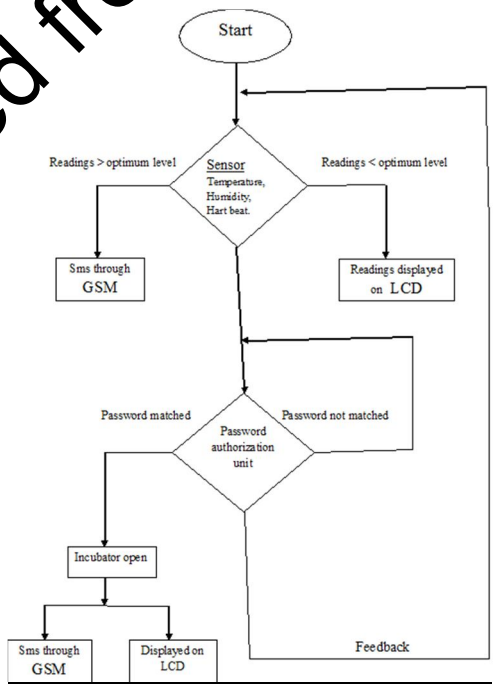
DC Motor

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.



Keypad

A keypad is a set of buttons arranged in a block which usually bear digits and other symbols but not a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, combination locks and telephones which require largely numeric input. An input device, sometimes part of a standard computer keyboard, consisting of a separate grid of numerical and function keys arranged for efficient data entry.



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SEEDING ROBOT

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Abstract: The main aim of the paper is to design a robot to remove the human factor from labor intensive and/or dangerous work. In modern farming applications, so many different types of automation techniques are used for easy and staff less operations that includes the important functions like seeding and spraying fertilizers. Here in this project we implement a robot which automatically sows seeds in the farm ready to be seeded. The project intends to develop a prototype of an autonomous agricultural robot that includes an automated guidance system which helps sow seeds in an efficient manner checking depth in which it is being sowed and inter seed distance. Micro controller user's kinematics algorithms to maintain position control on the motors. PWM channels of micro controller and MOSFET based power amplifiers and power transistors are used to control motors. This robot is developed with two motors which make it more generic about hardware. All the logic is implemented in the software. Microcontroller 8051 is used to intelligently monitor the robot. Keil uVision4 software provides an integrated development environment to develop a program to do the same.

Keywords: Seeding, Fertilization, Hardware, Software

1. Introduction

Many of the tasks associated with horticulture, such as picking, pruning, pest and weed control, are repetitive and arduous and there is a problem in getting and retaining labor to do them. Such tasks seem ideally suited to robots and, in countries where labor costs are high, there is an economic incentive to use automation as a solution to the problem. However, while robots are commonly used for repetitive tasks in industry they have not been successful in horticulture. The industrial environment is clean, well-lit, dry and uniform while the horticultural environment is extremely variable in terms of weather, terrain and light[1]. The components, which are manipulated in industrial settings, are Uniform, un-obscured, stationary and robust whilst those in horticulture are generally very variable in terms of shape, color and size, hidden amongst foliage, moving (for example in the wind) and are soft and easily damaged during handling.

The key problem areas associated with horticultural robotics are:

Path finding- navigation both within the rows of an orchard and in order to get to the orchard. Mapping- keeping track of where the robotic task has already been completed and where it remains to be done. The design of the mechanical agent or arm of the robot, which will perform the task of spraying, and could later be developed for tasks like pruning, pollinating, picking etc. Building a chassis, which is cost effective, can handle rough terrain, sloping ground, muddy soil and rain. Obstacle avoidance: technique for recognition of obstacles such as people, poles, wires, stumps and rocks so that the robot can navigate safely around these[1][2]. Swarm behavior management- to allow multiple robots to function together in one area under remote control without interfering with each other. Overall cost- most of the horticultural tasks, such as seeding and fertilizing, only last for a few months of the year and it is not cost effective to use a robot for such a short period. Ideally, robots should be capable of performing many different operations, such as fertilizing followed by picking of the fruits, bud count followed by pollination followed by fruit count, in order to extend the useful work period of the robot and ensure a reasonable payback time on the robot

This machine consists of a simple electro-mechanical system supported on a chassis, driven by dc motors. User interface portals will help the user to input the type of operation to be performed (fertilizing/seeding operations), and to input other information, like the dimensions of the field. Apparatus to plough the field, seeding tray, and mechanical arms for closing the dug pits are also provided. Special spraying mechanism

for spraying water and fertilizers is also mounted on the chassis. The microcontroller 8051 forms the brain of this machine and controls all the operations mentioned above. Both small and large landholders can implement this prototype machine.

2. Mechanical System Description

The machine set up contains six important parts:

A. Power supply

A variable regulated power supply, also called a variable bench power supply, is one where we can continuously adjust the output voltage to our requirements. This type of regulation is ideal for having a simple variable bench power supply. While a dedicated supply is quite handy, it's much handier to have a variable supply on hand, especially for testing. Most digital logic circuits and processors need a 5 volt power supply. To use these parts we need to build a regulated 5 volt source. Usually we start with an unregulated power supply ranging from 9 volts to 24 volts DC. To make a 5 volt power supply, we use a LM7805 voltage regulator IC (Integrated Circuit).

B. Seeding Motor

Seeds are placed in a seeding tray. The program enables a user to use different types of seeds (3 types of seeds could be selected in this prototype). Timed output signals from the microcontroller are provided to the electromechanical switch, which in turn opens and closes the flap that covers the seeding hole, in the seeding tray.

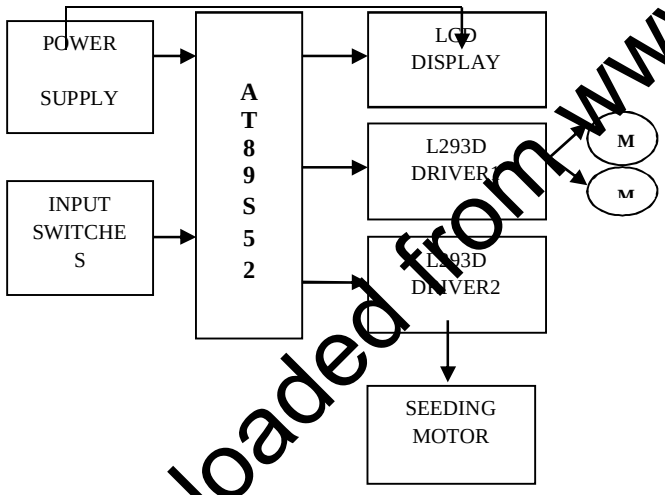

Fig.1. Block diagram representation an seeding robot

C. Input Switches

A switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated elect mechanical device with one or more sets of electrical contacts, which are connected to external circuits. Each set of contacts can be in one of two states: either "closed" meaning the contacts are touching and electricity can flow between them, or "open", meaning the contacts are separated and the switch is non-conducting. The mechanism actuating the transition between these two states (open or closed) can be either a "*toggle*" (flip switch for continuous "on" or "off") or "*momentary*" (push-for "on" or push-for "off") type.

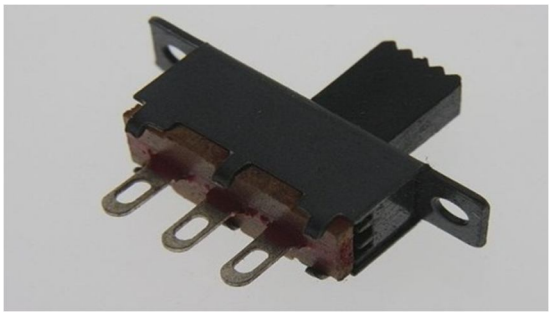

Fig2: Toggle Switch

D. LCD Display

The LCD's used exclusively in watches, calculators and measuring instruments are the simple seven-segment displays, having a limited amount of numeric data. These have resulted in the LCD's is being extensively used in telecommunications and entertainment electronics. The LCD's have even started replacing the cathode ray tubes (CRT's) used for the display of text and graphics, and also in small TV applications. LCD adds a lot to our application in terms of providing a useful interface for the user, debugging an application or just giving it a "Professional" looks. The most common type of LCD controller is the Hitachi 44780, which provides a relatively simple interface between a processor and an LCD.

E. L293, L293D (Quadruple Half-H Drivers)

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

3. Hardware Description

A. ATMEL Microcontroller

Compatible with MCS®-51 Products
4.0V to 5.5V Operating Range
Fully Static Operation: 0 Hz to 33 MHz
Three-level Program Memory Lock
256 x 8-bit Internal RAM
32 Programmable I/O Lines
Three 16-bit Timer/Counters
Eight Interrupt Sources
Full Duplex UART Serial Channel

B.Interfacing

To send any command to the LCD, make pin RS=0. For data, make RS=1.Then place a high to low pulse on the E pin to enable the internal latch of the LCD.

To get the display working requires eight bits of data, a register select line (RS) and a strobe line (E). A third input, R/W, is used to read or write data to/from the LCD. The eight bits of data are supplied from the controller port data lines and two controller port control lines are used for RS ('auto') and E ('strobe'). Basically the LCD has two registers, a data register and a command register. Data is written into the command register when RS is low and into the data register when RS is high. Data is latched into the LCD register on the falling edge of Enable'.

From this description, the interface is a parallel bus, allowing simple and fast reading/writing of data to andfrom the LCD. The ASCII code to be displayed is eight bits long and is sent to the LCD either four or eight

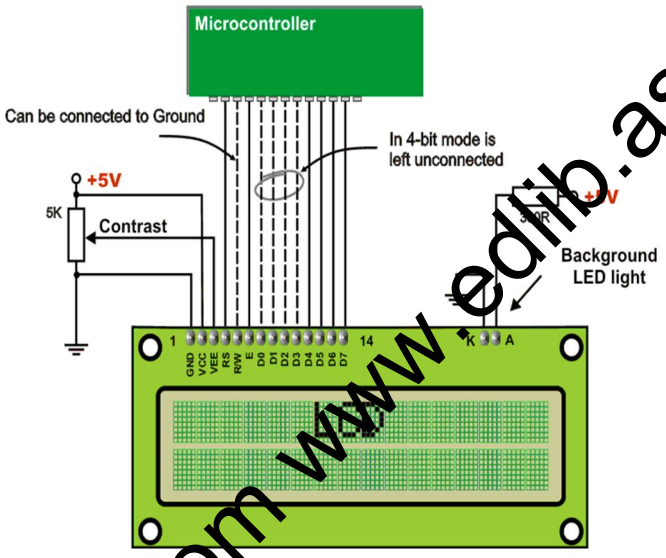

Fig.3. LCD Interfacing

C. Seed Pits Closing Unit

Once the seeds are sown, the soil is replaced on the pits using two horizontal flaps. The flaps are connected to two gear motors, which are controlled by the micro controller. The gear motors at any given instance of time, turn in opposite directions. And this mechanism thus helps in closing the dug pits.

D. System Mobility Control Unit

The gear motors are used for driving the entire machine. The motors are connected to the hind wheels and can offer independent motion with respect to each other. For a straight motion path, both the motors move in uniform speeds in the same direction. But when the machine has to execute alternate left and right turns, it makes use of a simple robotic principle, where one motor runs in direction opposite to the other for making 90° or 180° turns.

E. Power Supply Unit

Power control unit consists of a lead acid battery with specifications of 12V/4.5 AH. It weighs 2.6 Kg approx, and constitutes around 28% of the total unit weight. A low weight power supply unit can be proposed for better system performance.

F. Driver Circuits

I) Motor driving circuit using IC l293

Gear motor cannot be connected to the microcontroller directly because of its low current output. An external driver is used which increases the current output and drives the motor.

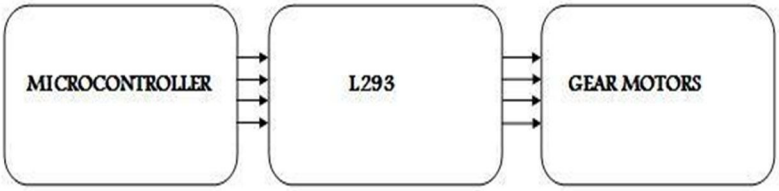

Fig.4. Block diagram for implementation using l293

The motor driving circuit using IC L293 is implemented with the help of 4 resistors of value 4.7 K and 3.3 K on each side.

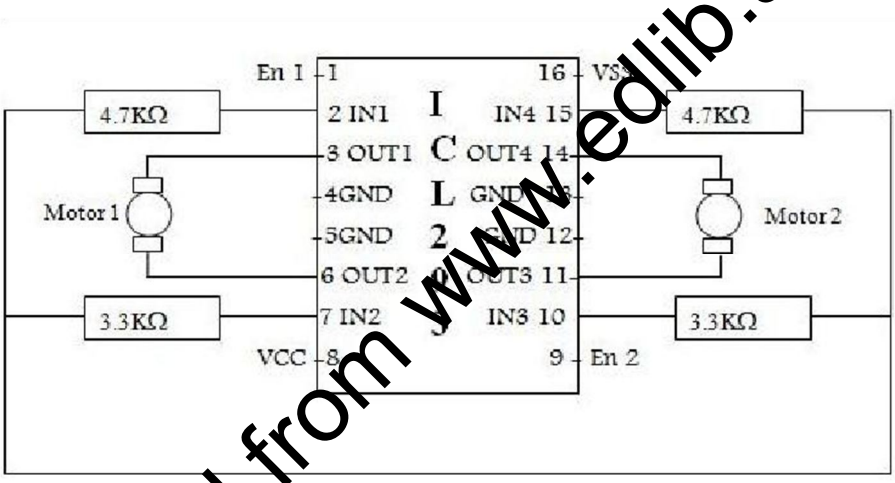

Fig.5. Motor driving circuit IC L293

II) Driving IC for Seeding (ULN 2803)

The electromagnetic switch cannot be connected to the microcontroller directly because of its low current output. An external driver is used which increases the current output and hence for efficient working of the switch. The switch is connected to the pin number 11 of the ULN 2803

II) Infra-Red Object Detector

The receiver block uses an infrared sensor module, which is commonly used in color television, for sensing the IR signals reflected from obstacles. The sensor module shown incorporates a detector diode, and SMD IC which consists a band pass filter, an amplifier and a demodulator on a small PCB placed inside a small tin cube enclosure to get rid of unwanted electromagnetic interference.

The two IR receiver modules are connected to pin 2.3 and 2.4 of 8051 micro-controller to service the signal of the presence of obstacle. The pins of port 2 are polled continuously for the presence of obstacle. The circuit diagram of IR receiver is shown in Fig.6.

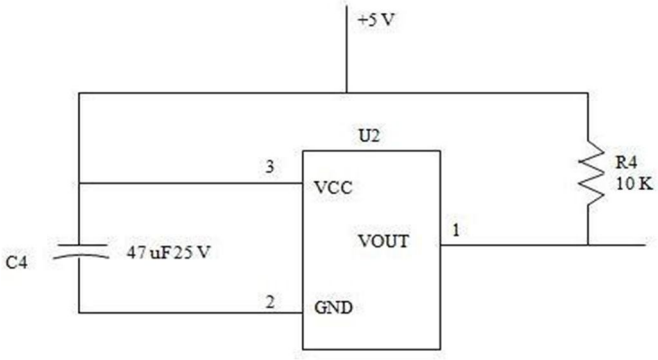

Fig.6. IR receiver circuit

IV) Liquid Crystal Display

A liquid crystal display (LCD) is a thin, flat device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

Without the liquid crystals between them, light passing through one would be blocked by the other [11][12]. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other. For an 8-bit data bus, the display requires a +5V supply plus 11 I/O lines. For a 4-bit data bus it only requires the supply lines plus 7 extra lines. When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the micro-controller. Data can be placed at any location on the LCD. For 16x2 LCD, the address locations are given in Fig.7.

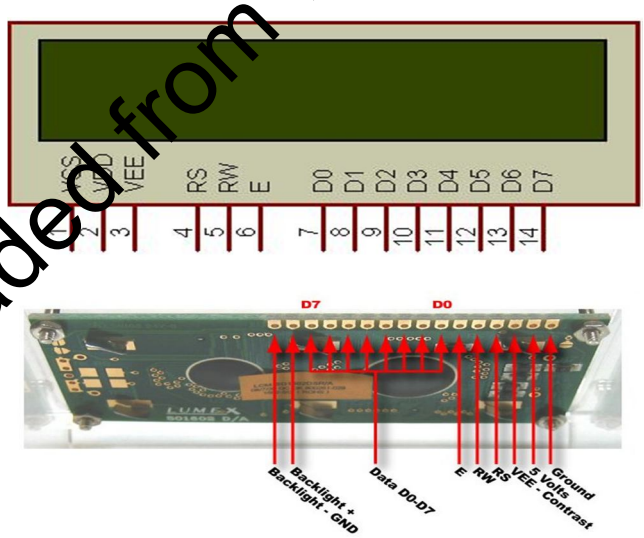

Fig.7. Address locations for 14 lines LCD

Enable (E)

This line allows access to the display through R/W and RS lines. When this line is low, the LCD is disabled and ignores signals from the R/W and RS. When (E) line is high, the LCD checks the state of the two control lines and responds accordingly.`

Read/Write (R/W)

This line determines the direction of data between the LCD and micro-controller. When it is low, data is written to the LCD. When it is high, data is read from the LCD.

Register Select (RS)

With the help of this line, the LCD interprets the type of data on data lines. When it is low, an instruction is being written to the LCD. When it is high, a character is being written to the LCD.

D. Logic status on control lines

E - 0 Access to LCD disabled	- 1 Access to LCD enabled
R/W – 0 Writing data to LCD	- 1 Reading data from LCD
RS – 0 Instruction	- 1 Character

E. Writing data to the LCD

Writing data to the LCD is done in several steps
Set R/W bit to low
Set RS bit to logic 0 or 1 (Instruction or character) Set data to data lines (If it is writing)
Set E line to high Set E line to low
Software Description
Keil uVision4 software provides an integrated development environment to develop a program for the embedded system.

4. Advantages

The model Eliminates human intervention in some of the most labor-intensive parts of an agriculture procedure. The simplicity of the model enables even an illiterate user to use it with ease. It enables clean seeding pattern. The usage of DC battery enables the user to be free of constrains of ever rising electricity bills and the dependency on normal electricity. Simple and lightweight design makes the transportation of the apparatus easy. Minimal hardware usage helps in the easy maintenance of the system.

5. Limitations

The machine takes considerably long duration of time while executing the right and left turns. Current model does not have provision for using an AC power source. The program makes use of time delay technique for determining the effective seeding distance between two consecutive seeds. This technique compromises the system accuracy for different type of terrains and soil types. From the tests conducted, it is evidently noted that the apparatus works best for dry clayish (fine) soil. The seeding accuracy obtained is 94.827% as compared to seeding on a perfect flat surface. The machine moves at a speed of 55RPM compared to 58-60 RPMs` perfect flat surface. The seeding accuracy obtained for sandy (medium course) soil is 82.75% as compared to seeding on a perfect flat surface. The machine moves at a speed of 48-50RPM compared to 58-60 RPMs` perfect flat surface. The seeding accuracy obtained for very coarse soil is 72.41% as compared to seeding on a perfect flat surface. The machine moves at a speed of 40-45RPM compared to 58-60 RPMs` perfect flat surface.

6. Application

The prototype can be modified for any type of crop seed. It can also be modified in ways so that it could be used in different soil types and terrains.

7. Scope for Future Improvement

The model can be modified to fit in extra features, namely a mechanism for weeding, and planting the saplings. Hydraulics could be used so that the level of the digger could be adjusted automatically. Solar cells can replace the DC battery to reduce the recharging cost and improve the overall efficiency. Ultrasonic detectors could replace IR sensors for better performance. An optocoupler coupled with the wheel motors can help in improving the overall system accuracy when it comes to effective seeding distance between two consecutive seeds to effective seeding distance between two consecutive seeds

8. Conclusion

In this paper we have integrated the features of all the hardware components used and have been developed in it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully designed and tested.

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Remote Monitoring of Protection System for VIP'S with GPRS

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Abstract: The system is composed of two parts, which are portable remote medical monitoring unit and the monitoring center. The portable remote medical monitoring unit consists of Advanced RISC Machines (ARM) with the embedded operating system, wearable, GPS and a GPRS (Gsm) module capable of transmitting information to processing centers. The monitoring centre is composed of the monitoring station and the information processing system.

1. Formulation of the Problem

This chapter discussed about how the problems are formulated when compared with the existing system.

a) Existing System

Present works tend to use emerging wireless transmission solutions like Bluetooth and ZigBee technology to improve mobility and minimize power consumption of the wearable part. These inventions carries out some advantages: the patients often are released from the hospital to give the priority to other heart patients on the waiting list, whom need to be hospitalized immediately. It does not only have an important positive economic impact, but it also produces an increment of the social wellbeing. These types of communication will only work for shorter distance and duration. It might also face more difficulties while monitoring the status in online

b) Proposed System

The proposed work of this project is to develop a system that can be supplemented with real-time wireless monitoring systems which are designed and implemented through GPRS network and are able to record and transmit bio-signals of patients. The aim of this project is to provide an ECG medical monitoring for the user at any time and any place, if there is any abnormal change of ECG data. It also explains the advanced relief measures for the soldiers such as automatic injection system and Vibrotactile system which is used for oxygen pumping this all contain one robot section in the robot we are going to control from the base station

2. System Architecture

It is composed of three parts

a) Person unit
b) Military base station.
c) Robot section

Person Unit

This unit consists of three types of sensors such as temperature sensor, pressure sensor and heart beat sensor. These sensors are used to measure the signals from the human body such as heat signal, human

body pressure and ECG signal respectively. After measurement, these analog signals are converted into digital signals and compared with the actual signals stored in the EPROM device. If any discrepancy occurs between the measured signals and the actual signals, then it is considered as an emergency.

The ARM 7 LPC2148 processor plays an important role in controlling all the devices. It has an inbuilt A\D convertor. when it detects the emergency(discrepancy in signal), it just skip over the control to relief measures such as automatic injection system and automatic oxygen pumping system. But these relief measures are temporary to maintain the pressure rate, temperature rate and oxygen sufficiency rate of the soldiers.

GPRS transmitter is used to transmit the signals from the sensors which are controlled by the ARM7 microprocessor. So to provide a permanent and immediate relief to the soldier, GPS system is used to locate the position of the soldier. It is very helpful for the relief team to rescue the soldier as soon as the emergency signal is received.

1. ARM7 Family

The ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications.

The ARM7TDMI-S core is the synthesizable version of the ARM7TDMI core, available in both VERILOG and VHDL, ready for compilation into processes supported by in-house or commercially available synthesis libraries. Optimized for flexibility and featuring an identical feature set to the hard macro cell, it improves time-to-market by reducing development time while allowing for increased design flexibility, and enabling >>98% fault coverage. The ARM720T hard macro cell contains the ARM7TDMI core, 8kb unified cache, and a Memory Management Unit (MMU) that allows the use of protected execution spaces and virtual memory. This macro cell is compatible with leading operating systems including Windows CE, Linux, palm OS, and SYMBIAN OS.

The ARM7EJ-S processor is a synthesizable core that provides all the benefits of the ARM7TDMI – low power consumption, small size, and the thumb instruction set – while also incorporating ARM's latest DSP extensions and Jazelle technology, enabling acceleration of java-based applications. Compatible with the ARM9™, ARM9E™, and ARM10™ families, and Strong-Arm® architecture software written for the ARM7TDMI processor is 100% binary-compatible with other members of the ARM7 family and forwards-compatible with the ARM9, ARM9E, and ARM10 families, as well as products in Intel's Strong ARM and xscale architectures. This gives designers a choice of software-compatible processors with strong price-performance points. Support for the ARM architecture today includes:

- Operating systems such as Windows CE, Linux, palm OS and SYMBIAN OS
- More than 40 real-time operating systems, including qnx, wind river's vx works

2. LPC2148 Microcontroller

LPC2148 Microcontroller Architecture. The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

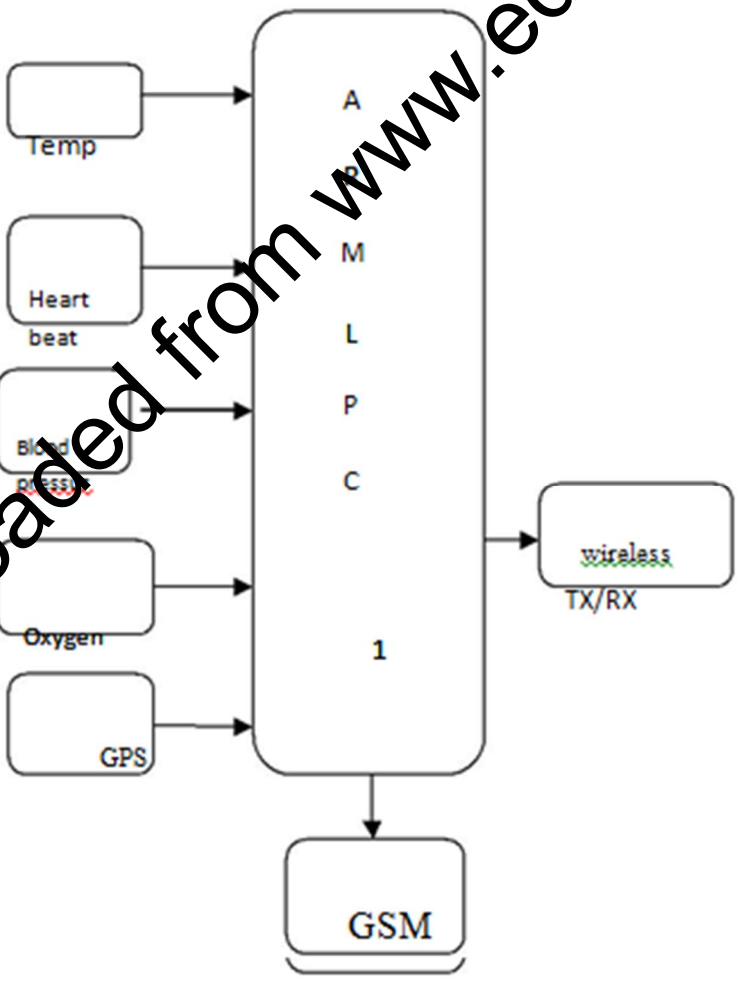
Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue.

The key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI- S processor has two instruction sets:

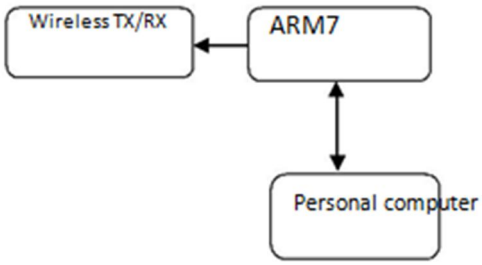
- The standard 32-bit ARM set. S processor has two instruction sets:
- The standard 32-bit ARM set.
- A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code. Thumb code is able to provide up to 65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system.

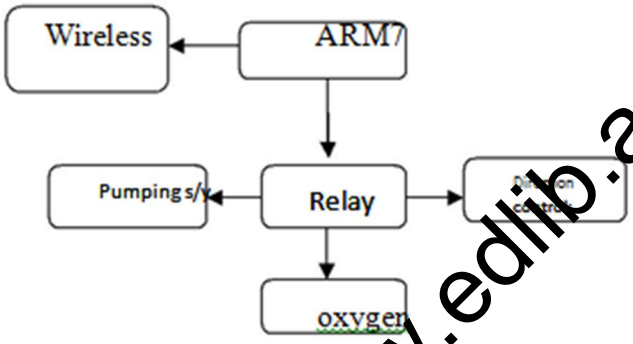
Medical monitoring system



Control room section

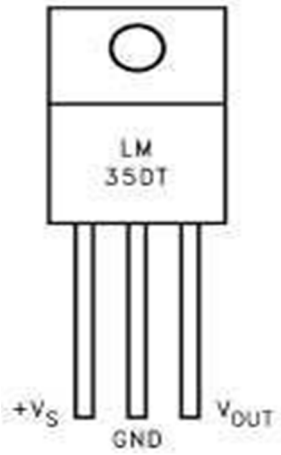


Robo section



Monitoring centre block will have the server to monitor the Sensor node values received via GPRS. Each server will be assigned an IP address. GPS receiver is used here to locate the position of the soldiers. GPS receiver is used here to locate the position of the soldiers. The continuous ambulatory monitoring is done in the base station to provide the immediate relief measures. The monitoring centre is composed of the monitoring station and the information processing system which realizes information management, real-time analysis, wireless transmission, a warning mechanism for emergency.

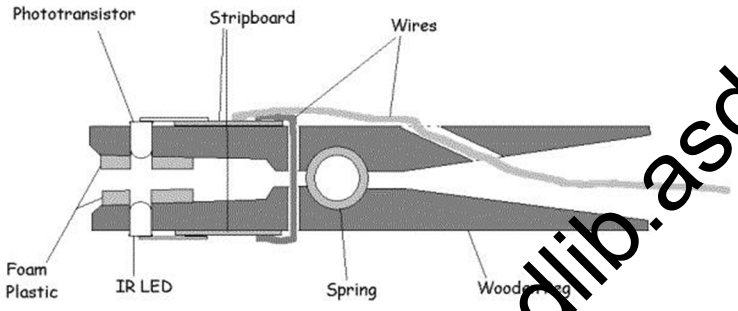
Temperature Sensor:



The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration

or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Heart Beat Sensor:



The heartbeat sensor, also known as the heart rate sensor or heartbeat detector, is a device used in different fields for different reasons. For medical use, it measures the heart rate of an individual. In terms of security it can detect people hidden in vehicles.

1. Heart Rate Sensor

Medical heart sensors are capable of monitoring vascular tissue through the tip of the finger or the ear lobe. It is often used for health purposes, especially when monitoring the body after physical training.

2. Heavy Security

The heartbeat detector was created by the U.S. Department of Energy's Oak Ridge National Laboratory as a way to detect the presence of hidden personnel in vehicles around laboratories [2]

3. Military Equipment

According to a PowerPoint presentation about Micropower Impulse Radio given by the Lawrence Livermore National Laboratory and be found on the Defense Advanced Research Projects Agency's website, there are patents and research applications for military use of a heartbeat sensor. Among such uses are those that enable detection of people through solid obstructions.

4. Gaming

Some video games use weapons with a special attachment, called a heartbeat sensor. These weapon attachments can detect both friend and foe even through walls.

5. Vehicle Options

Some vehicles are capable of utilizing heartbeat sensors inside the vehicle. This sensor can tell if there is an intruder still in the car by detecting his heartbeat.

GPS Module:

The Global Positioning System (GPS) comprises three segments:

- The space segment (all functional satellites)
- The control segment (all ground stations involved in the monitoring of the system master control station, Monitor stations, and ground control stations)
- The user segment (all civil and military GPS users).

GPS Was developed by the U.S. Department of Defense (DOD) and can be used both by civilians and military Personnel. The civil signal SPS (Standard Positioning Service) can be used freely by the general public, whilst the Military signal PPS (Precise Positioning Service) can only is used by authorized government agencies. The first Satellite was placed in orbit on 22nd February 1978, and there are currently 28 operational satellites orbiting the Earth at a height of 20,180 km on 6 different orbital planes. Their orbits are inclined at 55° to the equator, ensuring that at least 4 satellites are in radio communication with any point on the planet.

During the development of the GPS system, particular emphasis was placed on the following three aspects:

a) It had to provide users with the capability of determining position, speed and time, whether in motion at rest.
b) It had to have a continuous, global, 3-dimensional positioning capability with a high degree of accuracy, Irrespective of the weather.
c) It had to offer potential for civilian use civil use. System accuracy had been intentionally degraded up until May 2000 for political and tactical reasons by the U.S. Department of Defense (DOD), the satellite operators. It was shut down in May 2000 but it can be started up again, if necessary, either on a global or regional basis.

B. Base Station RF transmitter and receiver RF Module (Radio Frequency)

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation Radio Frequency: The 10 kHz to 300 GHz frequency range that can be used for wireless communication. Also used generally to refer to the radio signal generated by the system transmitter, or to energy present from other sources that may be picked up by a wireless receiver.

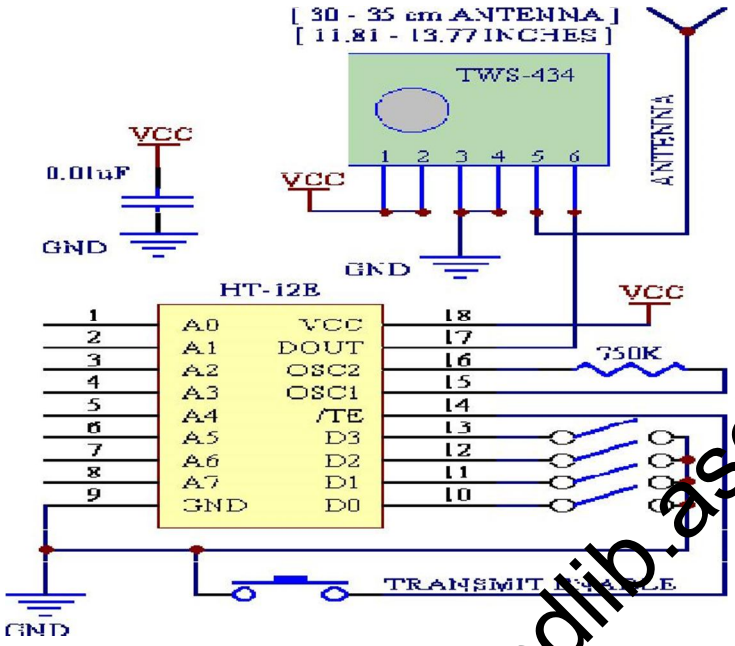
Transmitter

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter module is only 1/3 the size of a standard postage stamp, and can easily be placed inside a small plastic enclosure.

TWS-434: The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The TWS-434 is approximately 1/3 the size of a standard postage stamp.

Application Circuit



Receiver

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs

Generating Data

The TWS-434 modules do not incorporate internal encoding. If you want to send simple control or status signals such as button presses or switch closures, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functions. Motorola and Holtek make these chips. They are an excellent way to implement basic wireless transmission control.

Receiver Data Output

A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances, when no carrier is present the output will remain low.

Decoding Data

The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above Decoders with momentary and latched outputs are available.

Transmitting and Receiving

Full duplex or simultaneous two-way operation is not possible with these modules. If transmit and receive module are in close proximity and data is sent to a remote receive module while attempting to simultaneously receive data from a remote transmit module, the receiver will be overloaded by its close proximity transmitter. This will happen even if encoders and decoders are used with different address

settings for each transmitter and receiver pair. If two way communications is required, only half duplex operation is allowed

C. Robo section

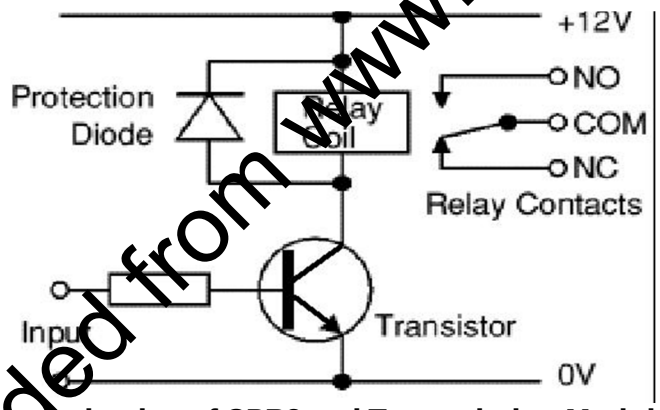
In the robo section the relay connection is going to control the robots direction, injection section, oxygen pumping system

Relay Circuit

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Hence a CB amplifier is used to achieve the current rating of the relay.

Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. The diagram shows how a signal diode (e.g. 1N4148) is connected 'backwards' across the relay coil to provide this protection.

Current flowing through a relay coil creates a magnetic field which collapses suddenly when the current is switched off. The sudden collapse of the magnetic field induces a brief high voltage across the relay coil which is very likely to damage transistors and ICs. The protection diode allows the induced voltage to drive a brief current through the coil (and diode) so the magnetic field dies away quickly rather than instantly. This prevents the induced voltage becoming high enough to cause damage to transistors and ICs.



Introduction of GPRS and Transmission Module

The General Packet Radio Service (GPRS) is a connectivity solution based on Internet Protocols supporting a wide range of enterprise and consumer applications available now with almost every GSM network. GPRS is a method of enhancing 2G phones to enable them to send and receive data more rapidly. It promises data rates from 56up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. GPRS supports a number of data services such as Short Message Service (SMS), Multimedia Messaging Service (MMS), Wireless Application Protocol (WAP) access, as well as Internet communications services. Additionally GPRS customers enjoy a number of advanced, feature-rich data services such as colour Internet browsing, e-mail on the move, video streaming, multimedia messages and location-based services. GPRS data transfer is typically charged per megabyte of traffic transferred, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user actually is using the capacity or is in an idle state. GPRS is a best-effort packet switched service, as opposed to circuit switching, where a certain quality of service (QoS) is guaranteed during the connection for non-mobile users. 2G cellular systems combined with GPRS are often described as "2.5G", that is, a technology between the second and third generations of mobile telephony

Prioritizing easy operation, a GPRS module SIM300 provided by Simcom is chosen to be the transmitter/receiver so that the user could send his/her ECG signals at any time wherever GSM coverage is present.

SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300 provides GPRS multi-slot class 10 capability and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space requirement in your industrial application, such as M2M, Telematics and other mobile data communication systems. SIM300 provides all hardware interfaces between the module and customers' boards except the RF antenna interface. The two serial ports can help you easily develop your applications. It is designed with power saving technique, the current consumption to as low as 2.5mA in SLEEP mode. Also the SIM300 is integrated with the TCP/IP protocol, Extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications. Communication between the microcontroller and the SIM300 is made through an UART interface. It has been set to 57600bps, 8-bit data, 1 stop bit and non-parity. The module transmits the data grouped in logical frames. And it can be used as a modem in a computer system to connect to Internet; even there is no TCP/IP protocol stack in the software. These ensure the security of data transmission. GPRS facilitates instant connections whereby information can be sent or received immediately as the need arises.

In order to develop the ECG related software just like developing application software in Personal Computer (PC), the system uses an Operating System (OS) named uClinux. uClinux is a Linux derivative intended for microcontrollers without Memory Management Unit (MMU). It's free and open source software under GNU Public License. The original uClinux is a derivative of Linux 2.0 kernel intended for microcontrollers without Memory Management Units (MMUs). However, the Linux/Microcontroller Project has grown both in brand recognition and coverage of processor architectures. Today's uClinux as an operating system includes Linux kernel releases for 2.0 2.4 and 2.6 as well as a collection of user applications, libraries and tool chains. The uClinux is much smaller than Linux kernel while retaining the main advantages of Linux OS: stability, superior network capability and excellent file system support. We ported uClinux operating system on the NXP LPC2148 platform and the Embedded Operating System (EOS) supports a lot of kernel functions to handles interrupt, timer, task schedule and resources management of hardware. First of all, the firmware system will do initialization of UART, A/D conversions, LCD controller, and then create ECG data acquisition task, data transmission task, timer task, ISR task and so on.

7. Conclusion

The current technology I have used in our paper is remote monitoring the soldiers with GPRS based protection system. It measures the heart beat rate, pressure range, temperature range and compared with the actual value stored in the EPROM. If any discrepancy occurs, then ARM7 processor will shift the control over to the relief system such as automatic injection system and Vibrotactile system to simulate the oxygen pumping and also transmit the Bio-Signals to the base station through GPRS

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Handmote: Hand Gesture Based Remote Control for Home Appliances

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Abstract - Controlling the home appliances and electronics gadgets through an Infrared remote control is now in general. But the same controlling tasks can be done more easily. Primary motive of proposing the new system of hand gesture remote control is to remove the need to look in to the hand held remote and to search for a specific key for specific function. This paper presents a novel system to control home appliances through hand gesture as a remote control device. The system will referred to as Handmote in this paper. It uses real time image processing for hand gesture recognition in infrared vision using Blobscanner [1] library and microcontroller development board , Arduino[2]. This paper proposes a possible solution to control the gadgets for physically challenged and blind people.

Keywords– gesture recognition, Hand gesture, Infrared vision, Java, Arduino, Human computer interaction

1. Introduction

Among the rising age of technology in the field of gesture recognition for hand gesture or human computer interaction many research are done. Here the Handmote is referred to as use of hand gesture recognition to control the home or office gadgets that are operated through an infrared remote control in general. Simple remote controlled gadgets can be operated to change a TV channel or to tune radio by finding the key on hand held remote control and pressing it. But in this paper author puts effort to control the same but using hand gesture. Simply a hand gesture or showing number of fingers TV channel can be changed or it can be On/Off . By showing a cross fingered gesture to the camera, TV can be muted, rotating the hand in clockwise or counter clockwise can change the volume level or TV channels.

II. Proposed Concept

There is a computer application designed in Java Processing[5] to have real time image processing. An infrared camera is giving images in infrared vision to the computer application. After processing the images and recognizing the hand gesture, decision data is send to a microcontroller hardware based on Arduino environment [2]. This hardware sends the data to the gadgets in same way as a remote control does for general use. Gesture recognition solutions can be divided regard to the type of gesture used for controlling a computer. Gesture can be considered as a change of the hand position (hand movement) in a particular time interval with a given velocity or as a change of the hand shape (forming ellipse with thumb and the index finger). Gesture that belong to the first group are typically called dynamic gestures while those from the second group are often referred to as static gesture.

Software

To implement the algorithm and its logic for run time image processing, a JAVA Processing environment [5] is used. Processing is a Java based programming structure. To process the images, an open source image processing library under GNL GPL v3 license named as Blobscanner processing library is used. Once the data or frame is taken from an infrared web camera. After having the image in software, code will find the hand based on skin detection algorithm. If nothing is available then system will be ideal but if hand part is detected then system will startimplementing the gesture recognition algorithm on the image to recognize the gesture.

There will be always a question of removing background noise to increase the probability of occurrence of correct recognition. But here Authors wants to propose a novel method for recognition environment. In the practice authors used an infrared camera and an infrared LED source to create bright beam of infrared light. This IR source is put just near to the camera in the direction of user's hand. Now whenever user will make a gesture, his hand comes near to camera. Hand will look more bright then other region of image just because camera is infrared visible. Once interested area is more brighter then background noise or unwanted part, it is easy to convert the image in gray-scale based on relative intensity of image. This setup is shown in figure 1.

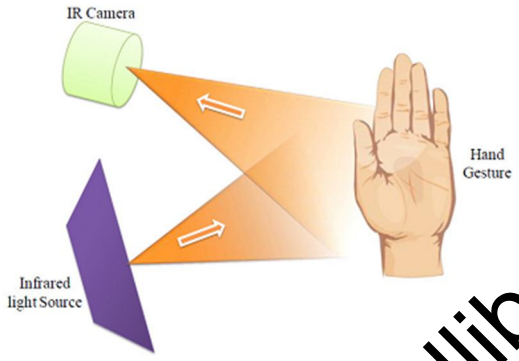


Figure 1. Camera and IR source setup

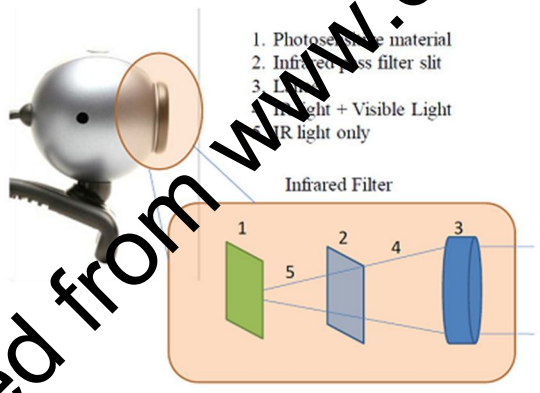


Figure 2, Filtering of IR light

Camera Hardware

Camera used in Handmote prototype is a simple Web-camera. The exact modification did to the camera is shown in figure 2. Light spectrum contains visible light and infrared light as well. Aim is to use infrared spectrum, thus the IR stop filter is replaced with IR pass filter, that is why camera will not see the visible spectrum but only the IR light reflected back from hand as explain in figure 1.Now this camera will give infrared region images of environment to the software application.

Algorithm

First step after taking a frame from camera is to track the hand based on skin detection algorithm using Blobscanner library. Next step is converting the image into binary form and then edge tracing. Once this much part is ready or hand is present in image than application search for gesture behavior by counting the number of fingers and its orientation. Angle between two successive finger gives useful flow to recognize

the hand gesture. Software application reference background frame stored in variable, and every time it compare with upcoming frames. This gives reliable recognition. Algorithm flow is shown in figure 3.

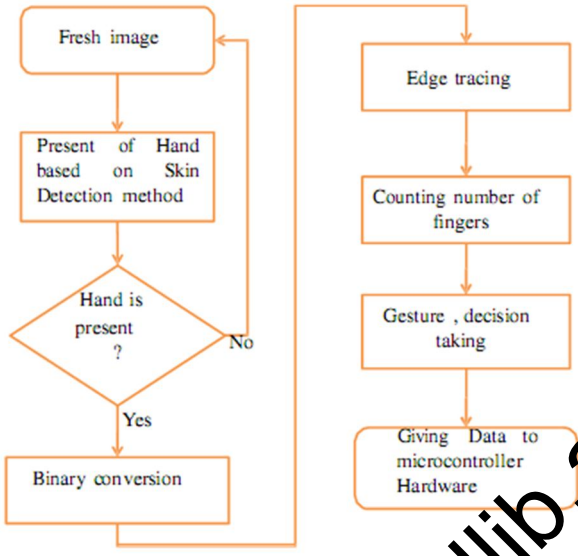


Figure 3 Application algorithm

Microcontroller Hardware

To decode the data coming from software application and send it to the electronic gadget, we used Arduino[2] development board based on microcontroller Atmega328 from ATMEL. Processor of hardware is running at the speed of 16MHz. The communication between software application and Arduino is based Serial port. Software code uses IBM COM port to send the data over serial port. The data rate for communication is 115,200 bauds/second. Based on the decision taken by software flow that which gesture is made, it will send a unique code related to a gesture. Now at hardware side, a program written on microcontroller will first receive the unique code, decode it and then transmit the related data to gadget by means of Infrared LED same as a remote control do.

In showcase of figure 4, picture A is showing binary converted image, picture B and C are showing edge tracing, picture D is showing counted number of fingers in image. Figure 4 shows final look of software.

Figure 4. Processing flow

III. Handmote, Proposed System

Handmote is a prototype model to control the electronics gadgets through hand gesture. It is a wearable device suggest as Hand + Remote, Handmote . It consist of a computer to run software application, an infrared camera to take images, Arduino development board to send commands to the gadgets, IR torch made up of number of IR LEDs to create bright infrared beam front of hand. At this development stage user need to wear the device and carry a laptop bag beside back. Tentative device is shown in figure 7.We integrated all modules on a wearable device, so that user can wear it and interact with gadgets just by making a hand gesture.

IR camera and Arduino board are powered up through USB port its self , rest the IR torch is using 12V battery supply to have very bright illumination. Question is, We always need to carry a laptop computer with it. Solution is briefed in section V.

Each remote control keys has its own unique code based on manufacturer, that is transmitted through modulated infrared light at 38 KHz at very low baud rate, 300-600 bauds/second. Herein our prototype, if user wants to turn ON the TV, he/she will simply make predefined gesture, software recognizes it and tells the microcontroller to send TURN-ON data to TV through IR LED. Only the TV would be able to decode it and respond to the same, rest gadgets will neglect it. As TV of Company A can only be operated through remote control by Company A. rest gadget will neglect it. Conclusively no modification at gadget side required, while in home automation system it is. Data flow from software to Arduino then to the gadget is shown in Figure 5.

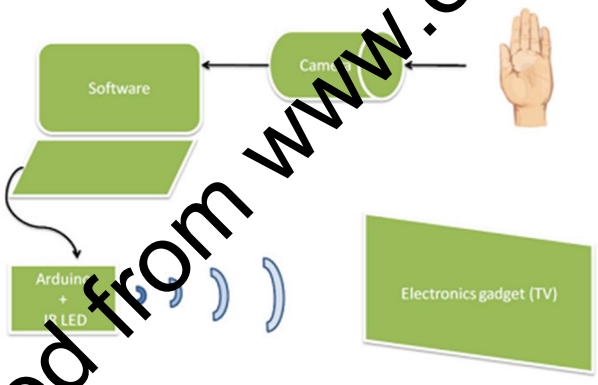
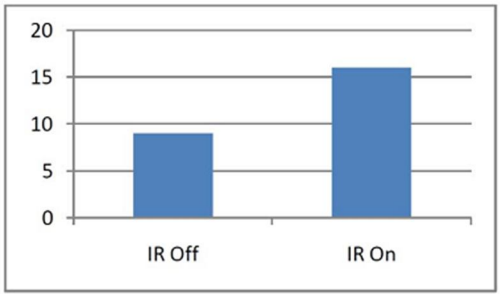


Figure 5 Processing flow

4. Testing and Experimental Results

We tested this Handmote device in both the conditions, 1. IR illumination off and 2. IR illumination on. An attractive result we got for 20 successive takes is here, It shows correctly recognized gesture out of 20.



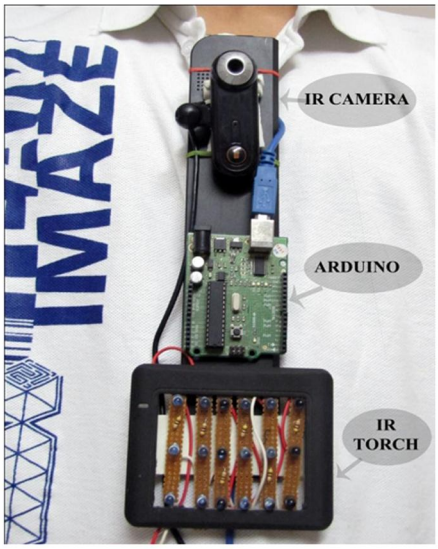
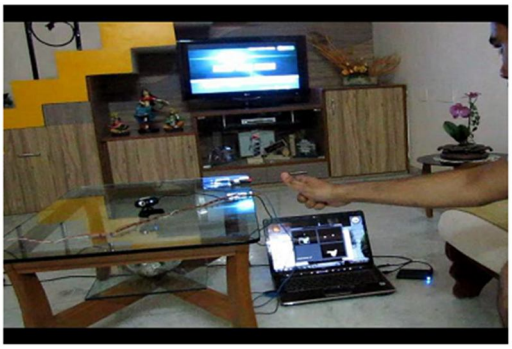


Figure 6, Wearable device

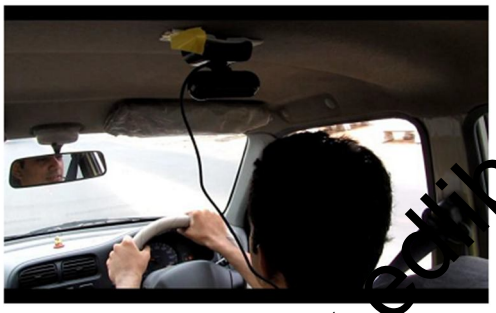
Use of Handmote device is not limited to Television On/Off. The device is tested on TV to change channels through up/down thumb gesture. Showing 4 fingers opened to power on/off TV. Even, Air conditioner temperature can be changed through gesture. We tested the device in car, suggesting that while driving the car user can change the tuned radio or song on music player. Here in practice we are replacing the traditional remote control with Handmote device so that, blind people or physically challenged people can operate the electronics appliances through simply a hand gesture, and no worry about which key press should do what ? Experimental testing of device is show in below images.

Testing at TV showroom-A[6].

Testing at TV showroom-B[6]



Testing of device for home appliances



Testing of stereo system for car use

V. Future Work and Acknowledgement

One disadvantage to this prototype is that, user should always keep a Laptop computer to run software application, however the application is written in JAVA processing environment, same software application can be made for Mobile phone device so that , processing power of software will be given by Mobile phone. Authors are working to develop same application in Android environment and making application open source, and available to all user so that Interaction between home gadgets and human become cost effective.

Authors would like to thank Dr. Chintan K. Modi, head, department of Electronics & Communication engineering, GCET for his helpful comments.

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Cancellation of Power Line Interference in ECG using Adaptive LMS Algorithm

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Abstract: The electrocardiogram (ECG) has the considerable diagnostic significance, and applications of ECG monitoring are diverse and in wide use. Noises that commonly disturb the basic electrocardiogram are power line interference (PLI), instrumentation noise, external electromagnetic field interference, noise due to random body movements and respiration movements. It is essential to reduce these disturbances in ECG signal to improve accuracy and reliability. it is difficult to apply filters with fixed filter so efficient to reduce these noises. Adaptive filter technique is required to overcome this problem as the filter coefficients can be varied to track the dynamic variations of the signals. Adaptive filter based on the least mean square (LMS) algorithm is applied to noisy ECG to reduce 50 Hz power line noise and motion artifact noise. The removal of power line interference from most sensitive medical monitoring equipments can also be removed by implementing various useful techniques. The power line interference (50/60 Hz) is the main source of noise in most of bio-electric signals. the removal of power line interference and other single frequency tones from ECG signal using the advanced adaptive filtering technique with LMS (least mean square) algorithm. it is based on digital signal processing (DSP) techniques with MATLAB package, with the emphases on design of adaptive LMS algorithm.

Keywords: Electrocardiogram (ECG), Adaptive Noise Canceller (ANC), Adaptive filter, least mean square (LMS) algorithm, MATLAB/SIMULINK.

1. Introduction

The medical monitoring devices are more sensitive for the biomedical signal recording and need more accurate results for every diagnosis. It is complicated to get accurate result for every biomedical signal's recording while patient is diagnosis by medical monitoring equipments such as ECG, EEG and EMG. The low frequency signal is destroyed by power line interference of 50/60 Hz noise, this noise is also source of interference for biomedical signal recording. The signal can also be corrupted by electromagnetic field (EMF) by the machinery which is placed nearby. The frequency of power line interference 50/60 Hz is nearly equal to the frequency of ECG, so this 50/60 Hz noise can destroyed the output of ECG signal while the patient is diagnosis at hospital or somewhere else. The recording of ECG signal cannot give accurate result due to the power supply or by environment.

There are many reasons for the corruption of ECG signal while recording in hospital or some other place due to the external interference which comes from power transformer or high voltage electric power lines and internal interference comes from the internal power supplies. Other problem occurs by harmonics and high frequency noises. In a noise signal, the signal component holds harmonics with different amplitude and frequency. The harmonics frequency is integral multiple of fundamental frequency such as 50Hz. Due to these interferences the quality of ECG signal cannot be ideal so it is needed to improve the quality of required output of ECG signal.

2. Adaptive Filter

Concept of adaptive filter

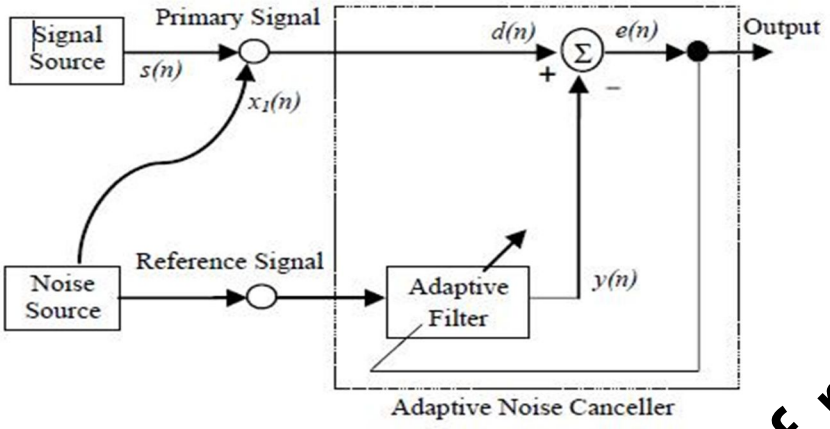

Figure1. Adaptive Noise Canceller

S(n)- source signal d(n)-primary signal $x_1(n)$-noise signal x(n)-noise reference input

y(n)-output of adaptive filter e(n)-system output signal

Fig. 1 shows the adaptive power line setup. In this application, the corrupted signal passes through a filter that tends to suppress the noise while leaving the signal unchanged. This process is an adaptive process, which means it cannot require a priori knowledge of signal or noise characteristics. Adaptive noise cancellation algorithms utilize two signal it can vary in (sensor). One signal is used to measure the ECG + noise signal while the other is used to measure the noise signal alone.

The technique adaptively adjusts a set of filter coefficients so as to remove the noise from the noisy signal. This technique, however, requires that the noise component in the corrupted signal and the noise in the reference channel have high coherence. Unfortunately this is a limiting factor, as the microphones need to be separated in order to prevent the speech being included in the noise reference and thus being removed. With large separations the coherence of the noise is limited and this limits the effectiveness of this technique. In summary, to realize the adaptive noise cancellation, we use two inputs and an adaptive filter. One input is the signal corrupted by noise (Primary Input, which can be expressed as $s(n)+ x_1(n)$). The other input contains noise related in some way to that in the main input but does not contain anything related to the signal (Noise Reference Input, expressed as x(n)). The noise reference input pass through the adaptive filter and output y(n) is produced as close a replica as possible of $x_1(n)$. The filter readjusts itself continuously to minimize the error between x_1 (n) and y (n) during this process. Then the output y(n) is subtracted from the primary input to produce the system output $e(n)=s(n)+x_1(n)–y(n)$.

In the system shown in Fig. 1 the reference input is processed by an adaptive filter. An adaptive filter differs from a fixed filter in that it automatically adjusts its own impulse response. Thus with the proper algorithm, the filter can operate under changing conditions and can readjust itself continuously to minimize the error signal. The error signal used in an adaptive process depends on the nature of the application. In noise cancelling systems the practical objective is to produce a system output $e(n)=s(n)+ x_1(n) –y(n)$ that is a best fit in the least squares sense to the signal s. This objective is accomplished by feeding the system output back to the adaptive filter and adjusting the filter through an LMS adaptive algorithm to minimize total system output power. In an adaptive noise cancelling system, in other words, the system output serves as the error signal for the adaptive process. It might seem that some prior knowledge of the signal s or of the noises x1 and x would be necessary before the filter could be designed, or before it could adapt, to produce the noise cancelling s, x1 and x signal y. Assume that s, x1 , x and y are statistically stationary and have zero means. Assume that s is uncorrelated with x1 and x , and suppose that x is correlated with x1 .The output e is

$e=s+x_1–y$ (1)

Squaring, one obtains $e^2=s^2+(x_1-y)^2+2s(x_1-y)$ (2)

Taking expectations of both sides of (2), and realizing that s is uncorrelated with x1 and with y, yields

$E[e^2]=E[s2]+E[(x_1-y)^2]+2E[s(x_1-y)]=E[s^2]+E[(x_1-y)2]$ (3)

The signal power $E[s^2]$ will be unaffected as the filter is adjusted to minimize E[e2]. Accordingly, the minimum output power is mine $[e^2]=E[s^2]$ + mine$[(x_1-y)^2]$ (4)

When the filter is adjusted so that $E[e^2]$ is minimized, $E[(x_1-y)^2]$ is, therefore, also minimized. The filter output y is then a best least squares estimate of the primary noise no. Moreover, when $E[(x_1-y)^2]$ is minimized[(e-s)2] is also minimized, since, from (1), $(e-s)=(x_1-y)$ (5)

Adjusting or adapting the filter to minimize the total output power is thus tantamount to causing the output e to be a best least squares estimate of x1 the signal s for the given structure and adjustability of the adaptive filter and for the given reference input. The output z will contain the signal s plus noise. From (l),the output noise is given by(x1-y). Since minimizing E[e2] minimizes E[(x1-y)2], minimizing the total output power minimizes the output noise power. Since the signal in the output remains constant, minimizing the total output power maximizes the output signal-to-noise ratio.

3. LMS Algorithm

The LMS algorithm is a widely used algorithm for adaptive filtering. The algorithm is described by the following equations:

$$(M-1)y(n)=\sum_{I=0} wi(n)*x(n-i) \quad (1)$$

$$E(n)=d(n)-y(n) \quad (2)$$

$$wi(n+1)=wi(n)+2ue(n)x(n-i) \quad (3)$$

In these equations, the tap inputs x(n),x(n-1),.....,x(n-M+1) form the elements of the reference signal x(n), where M-1 is the number of delay elements. d(n) denotes the primary input signal, e(n) denotes the error signal and constitutes the overall system output. wi(n) denotes the tap weight at the nth iteration. In equation (3), the tap weights update in accordance with the estimation error. And the scaling factor u is the step-size parameter u controls the stability and convergence speed of the LMS algorithm. The LMS algorithm is convergent in the mean square if and only if u satisfies the condition: 0 < u < 2 / tap-input power

$$\text{M-1, where tap-input power} = \sum_{K=0} E[|u(n-k)2|]. \quad (4)$$

The condition of the satisfaction can be checked and LMS algorithm's condition must be satisfied if the step size parameter satisfies the condition. The autocorrelation matrix Rx is necessary for the convergence. The condition which is important for the convergence criterion and the convergence factor of LMS algorithm must be chosen in the range is $o< \mu < 1 / \lambda \max$

Where λ max is the largest eigen value of the correlation matrix Rx. The speed of the LMS algorithm's convergence is dependent on Eigen value.

4. Simulation Results

The ECG signal has been taken and LMS adaptive filter algorithm has been developed. The ECG signal of 50 Hz is displayed in MATLAB environment as ECG Signal and then the noise of 50 Hz is generated and then

mixed with the ECG Signal, which is displayed as mixed signal. The adaptive filter is implemented by using LMS algorithm, FIR filter has been designed. The ECG Signal, 50 Hz Noise signal, mixed signal, Error signal and Adaptive LMS filtered output signal have been displayed. The output is nearly same as the ECG inputted signal.

The first input signal to the adaptive filter is white noise. This demo uses the adaptive filter to remove the noise from the signal output. When you run this demo, you hear both noise and ECG signal. Over time, the adaptive filter in the model filters out the noise so you only hear the ECG signal (Original signal).The two signals were added and subsequently fed into the simulation of LMS adaptive filter. The order of the filter was set to M = 32. The parameter μ is varied. Various outputs are obtained for various step size i.e.μ = 0.005, 0.009 system reaches steady state faster when the step size is larger. Fig.2. Original signal, Noisy signal and filter signal for LMS step size i.e.μ= 0.005.

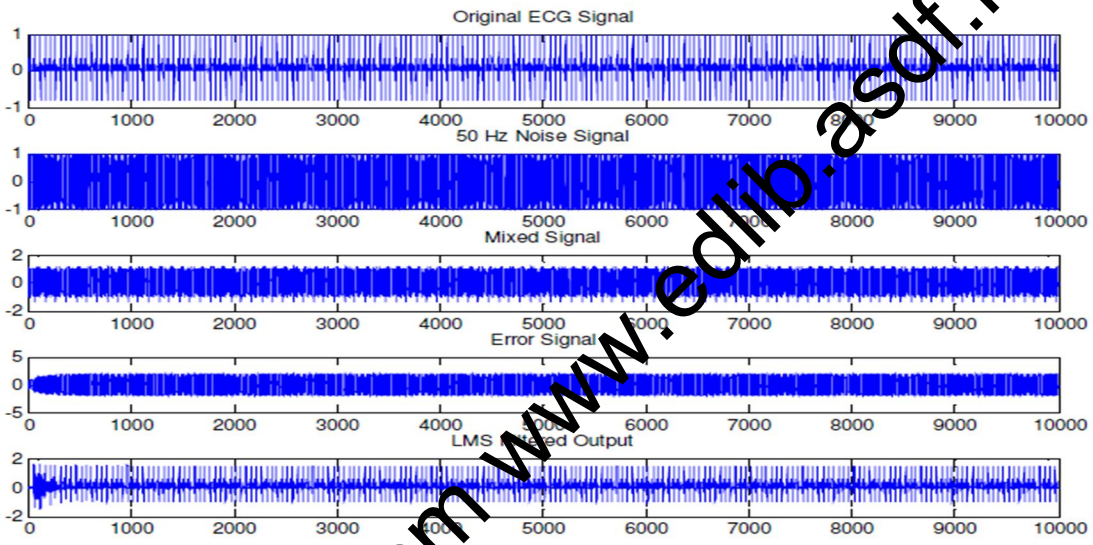

Figure2. Simulation ECG Signal

Conclusion

It has been proposed a solution for the power line interference its respective harmonics and noise interferences from original ECG signal. The results have been obtained which were required in purpose statement of the report. The value of step size μ play an important role in determining the convergence speed, stability and residual error after convergence. The convergence rate was controlled by LMS step size μ. The ECG signal graphs described in the simulation results verify the adaptation of the LMS adaptive algorithm by changing various parameters like step size, convergence value (μ) and filter taps have various effects on the output graphs. By increasing the filter order it shows a convergence rate but makes the results more precise and by decreasing the step size value it creates the slower convergence but improves the stability and accuracy. The recovered signal closely resembles to the original simulated signal minus the noise. It can be seen that the implementation of the algorithm functions as correctly and efficiently. By comparing the graphs of the input signal of ECG and output signal, it is noticed that the simulation program performs satisfactorily and that noise cancellation from original ECG signal is acquired. Furthermore the general notch rejection filters method also performs the correct operation while filtering the noise from original ECG signal. This technique for the investigation, implemented and analysis of removal of harmonics and high frequency noise from original ECG signal performed satisfactory. It is concluded that the low frequency noise (hum) and high frequency noise can be removed from original ECG signal by the implementation of general notch rejection filters method and the desired result can be achieved accurately.

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Embedded Software Component Technologies for Real time Systems - An Industrial Perspective

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Abstract: In this paper , we compare existing software component technologies for embedded systems with respect to requirements captured from the vehicle industry. The vehicular industry wants to make use of the advantages with component based design ; however they also need to address non-functional properties of their products, such as reliability and timeliness. Several component technologies addressing such properties have recently been proposed. In this paper, we present initial findings from an ongoing evaluation concerning some of these technologies with respect to the requirements stated by industrial actors.

We conclude that none of the studied technologies is a perfect match for the industrial requirements. Furthermore, no single technology stands out as being a significantly better choice than the others; each technology has its own pros and cons

1 Introduction

During the last few years, component-based software engineering for embedded real-time systems has received a large amount of attention in the research community. However, industrial software developers are still, to a large extent, using monolithic and platform dependent software development technologies.

Often companies can achieve considerable business benefits in terms of reduced costs, shortened time -to-market and increased software quality by applying component-based software engineering. There is however significant risks and costs associated with the adoption of a new development technique. These must be carefully evaluated before introduced in the development process.

Our approach in this paper is to study some of the existing component technologies suitable for distributed embedded real-time systems, and to compare these technologies with industrial requirements from manufacturers of heavy vehicles [1]. The main purpose of this work in progress paper is to disclose our initial findings and to solicit feedback on which techniques to study and what requirements are of interest.

2 Industrial Requirements

The benefits of using a component based technique can be divided into two different aspects, the operational benefits (e.g. analysability and portability) and the development benefits (e.g. reusability and maintainability). The requirements on such a component based technique can, in the same way, be divided into technical- and development requirements.

Apart from the requirements addressed in the paper, safety and robustness are evident requirements on a vehicular system. The system should function correctly in stressful environmental conditions and perform its required functions under stated conditions for a specified period of time without any catastrophic consequences to the environment. However, safety and robustness are not easy for a component technology to consider, since these requirements are mainly related to system design and implementation.

The requirements are obtained from interviews with senior technical staff at two Swedish companies, CC Systems [1] and Volvo Construction Equipment [2]. These companies develop control software for large, low-series vehicles (e.g. wheel loaders and forest harvesters) and their systems are characterized as safety

critical distributed embedded real-time systems with limited hardware resources.

Our definitions of the elicited requirements, listed below, include important aspects of the introduction of a component-based development technique. These definitions, including both technical merits and demerits, are somewhat different, or should be seen as an extension, of the generally used definitions.

2.1 Technical Requirements

Analysable – the chosen technique should be easy to analyse with respect to non -functional properties, such as the timing behaviour and the memory consumption. It is important to be able to both verify if the tasks meet their deadlines and to be able to analyse the end-to-end timing behaviour of the complete system.

The components should be configured at compile - time, to make them smaller and easier to analyse off-line.

Modelling and Computation – based on information extracted during the interviews, the technique should be based on a standard modelling language like UML [3]. The components should preferably be passive, focusing on a pipe-and-filter computation model [4]. The reason to be that restrictive in the choices concerning the modelling and computations is related to simplicity and the use of mature techniques.

Open - a component should be source code, i.e., no binaries. The reasons for this include that companies are used to have access to the source code, to find functional errors, and enable support for white box testing. The possibility to look into the components does not necessary mean that you are allowed to modify them.

Portable – the components, and the infrastructure surrounding them, should be platform independent to the highest degree possible. In order to support platform independency, the components should not use the operating system primitives or the processor features directly. This is an important requirement because of the frequently shifting hardware and operating system needs.

Resource Constrained – the systems considered, i.e. distributed embedded real-time systems, are usually resource constrained, when it comes to the CPU and the memories. Therefore, the software systems should be light-weighted and the components infrastructure should be minimised.

2.2 Development Requirements

Maintainable - the component should be easy to change and maintain, e.g., for use in new applications or environments than those for which it was originally designed.

Introducible - the possibility for companies to gradually migrate into the chosen technique, not jumping in to the new technique to fast, is important, to make the change in technique as safe and inexpensive as possible.

Reusable - the components should be easy to reuse and the technique, and its supporting tools, should offer support for component version management. To have good support for version and variant management is a very important requirement, because it reduces the risk of reinventing components – after all, software reuse is one of the most important aspects when introducing a component based development technique.

Understandable - the system should be easy to understand, to simplify evaluation, and verification both on the system level and on the component level. This should also include making the technology easy and

intuitive to use in a development project.

3 Existing Component Technologies

In this section, existing component technologies for embedded systems are described. The technologies considered originate both from academia and industry. The selection criterion for a component technology has firstly been that there is enough information available, secondly that the authors claim that the technology is suitable for embedded systems, and finally we have tried to achieve a combination of both research and industry examples. The technologies described and evaluated are PECT, Koala, Rubus Component Model, PBO, PECOS and CORBA.

3.1 PECT

Prediction-Enabled Component Technology (PECT) [5] is a development infrastructure that incorporates development tools and analysis techniques. PECT is an ongoing research project at the Software Engineering Institute (SEI) at Carnegie Mellon University.

PECT defines that any component technology can be used if composition rules guarantee runtime properties, by enforcing that predictable construction patterns are used. What is allowed by a user, and what is required by the underlying component technology, is determined by the available analysis methods and prediction goals.

PECT focuses mainly on analysis. Assumed that the prediction framework contain prediction techniques for the desired properties; a high grade is motivated on this requirement. PECT is also portable and introducible, because of its independence of the underlying technology.

As PECT is highly analysable, portable and introducible, it is not very understandable. In order to understand the model, the mapping to the underlying component technology must be understood as well.

3.2 Koala

The Koala component technology [6] is tailored for development of software in consumer electronics, and it is developed and used by Philips [7].

Consumer electronics are often resource constrained since they use cheap hardware to keep development costs low. Koala pays special attention to resource usage through a thread sharing technique. The thread sharing technique keeps the number of threads low, which in turn keep the memory utilisation low. The implementation is realised with message queues which have a function to process messages in the context of a thread.

All components in Koala are source code components and are therefore totally open for inspection. This makes it easier for companies to find functional errors and enables white-box testing. The technology is also understandable; it builds on simple and mature techniques.

An obvious problem with Koala, compared to the requirements is that it seems hard to gradually introduce the technology. Koala components are tightly coupled to the Koala compiler, and the underlying operating system. The components use the same interaction mechanisms in between each other's as towards the operating system.

3.3 Rubus Component Model

Rubus is developed by Arcticus systems [8] and is, e.g., used by Volvo Construction Equipment.

The Rubus component model is tailored for resource constrained systems with real-time requirements. Rubus has a red and a blue part for hard and soft real-time respectively. The red kernel is used for time-critical applications and is therefore time - triggered. The blue kernel is event-triggered, and used for less time-critical applications.

The computation model provided by Rubus is the desired pipe and filter model, very simple and suitable for control applications. Like Koala, Rubus also has source-code components. The components are hence open for inspection and white-box testing.

A requirement that is not met is the constraint of portability. The Rubus component model is too tightly coupled to the Rubus operating system since it is shipped with, and developed on top of, the Rubus operating system.

3.4 PBO

Port Based Objects (PBO) [9] combines object oriented design, with port automaton theory. PBO was developed as a part of the Chimera RTOS project [10] at the Advanced Manipulators Laboratory at Carnegie Mellon University. Together with Chimera, PBO forms a framework aimed for development of sensor-based control systems, with specialisation in reconfigurable robotics applications.

An explicit design goal for a system based on PBO is to minimise communication and synchronisation, thus facilitating reuse. PBO is a simple and intuitive model which is highly understandable, both at system level and within the components themselves; hence the requirement of understandability is satisfied.

While PBO is very intuitive, it is also tightly coupled with its RTOS, Chimera. Therefore it is hard to introduce parts of PBO in present system configurations. Because of the dependencies on the RTOS, PBO can not be considered very portable.

3.5 PECOS

PECOS [11] is a collaborative project between industrial and research partners. The goal for the PECOS project is to enable component-based technology for embedded systems, especially for field devices, i.e. embedded reactive systems . The project tries to consider non-functional properties very thoroughly in order to enable assessment of the properties during construction time.

There is no special run-time environment developed in the PECOS project. Instead there are requirements on platform independence, or at least on portability.

The PECOS project has incorporated the Unified Modelling Language (UML) for modelling the system. This makes the model attractive considering the requirement of model and computation.

Furthermore, PECOS is a research project and much focus has been put on non-functional properties such as memory consumption, timeliness etc. which makes PECOS analysable .

The requirement of openness is not considered fulfilled, due to the fact that PECOS uses black-box components. In later releases, the PECOS project is considering to use a more open component model [12].

3.6 CORBA Based Technologies

The Common Object Request Broker Architecture (CORBA) is a standard that provides a set of rules for writing platform independent applications. The CORBA standard is developed by the Object Management Group (OMG) [13].

A major drawback with CORBA is that it requires a lot of functionality in order to connect diverse platforms within a heterogonous system. Because of this, variants of CORBA exist, two major are Minimum CORBA [14] for resource constrains systems, and RT-CORBA [15] for time -critical systems.

OMG has also defined a CORBA Component Model (CCM) . CCM extend the CORBA object model by defining features and services that enable application developers to implement, manage, configure and deploy components that integrate commonly used CORBA services.

Because CORBA is a middleware architecture that defines communication between nodes, it becomes highly portable . While CORBA is portable, and powerful, it is also very run-time demanding. In CORBA, bindings are performed during run-time. Therefore the requirement of analysability cannot be considered fulfilled. Dynamic binding is very computation intense; hence CORBA is not suitable for resource constrained systems. CORBA is using binary components, i.e. the components are closed, and inspection or white-box testing is out of the question.

4 Summary of Evaluation

Table 1, shows a summary of the initial evaluation of component technologies for embedded vehicular systems presented in the paper. The evaluation of the different technologies is based on the requirements defined in section 2.

3 = *Good, the requirements are very well satisfied.*
2 = *Satisfactory, the requirements are to some extent satisfied* **1** = *Bad, the requirements are not or very little satisfied* **NA**= *Not Applicable, requirement is not addressed*
IN = *Inconclusive, not determined*

Require. Technology	Koala	Rubus	PECT	PBO	Corba	PECOS
Analysable	1	2	3	2	1	3
Model and computation	2	2	NA	2	1	3
Open	3	3	NA	IN	1	1
Portable	1	1	3	1	3	IN
Resource constrains	3	2	NA	2	1	2
Maintainable	3	2	2	2	1	1
Introducible	1	2	3	1	3	1
Reusable	3	2	1	2	1	2
Understandable	3	2	1	3	1	2

Table 1: A summary showing how well existing component technologies fulfil industrial requirements.

5 Conclusions and Future Work

Our conclusion, based on the industrial requirements, is that there is no one component technology

available that fulfils all the requirements listed in section 2. However, some of the technologies are based on interesting techniques and concepts.

We have noticed that, for a component technology to be fully accepted by industry, the whole systems development context needs to be considered. It is not only the technical properties, such as modelling, computation model, and openness, that needs to be addressed, but also development requirements like maintainability, reusability, and to which extent it is possible to gradually introduce the technology. It is however important to keep in mind that a component technology alone cannot be expected to solve all these issues.

We will continue to investigate the industrial requirements in more detail, and also continue to capture requirements by cooperating with other industrial partners . We will also assess to what extent existing technologies can be adapted in order to fulfil the requirements, or whether selected parts of existing technologies can be reused if a new component technology needs to be developed.

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Implementation of Novel Reversible Multiplier Architecture Using Reversible 4*4 TSG Gate

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Abstract: In the recent years, reversible logic has emerged as a promising technology having its applications in low power CMOS, quantum computing, nanotechnology, and optical computing. The classical set of gates such as AND, OR, and EXOR are not reversible. Recently a 4 * 4 reversible gate called "TSG" is proposed. The most significant aspect of the proposed gate is that it can work singly as a reversible full adder, that is reversible full adder can now be implemented with a single gate only. This paper proposes a NXN reversible multiplier using TSG gate. It is based on two concepts. The partial products can be generated in parallel with a delay of d using Fredkin gates and thereafter the addition can be reduced to log $_2$N steps by using reversible parallel adder designed from TSG gates. Similar multiplier architecture in conventional arithmetic (using conventional logic) has been reported in existing literature, but the proposed one in this paper is totally based on reversible logic and reversible cells as its building block. A 4x4 architecture of the proposed reversible multiplier is also designed. It is demonstrated that the proposed multiplier architecture using the TSG gate is much better and optimized, compared to its existing counterparts in literature; in terms of number of reversible gates and garbage outputs. Thus, this paper provides the initial threshold to building of more complex system which can execute more complicated operations using reversible logic.

1. Introduction

This section provides an effective background of reversible logic with its definition, the motivation behind it, and some key features of the proposed work.

1.1. Definitions

Researchers like Landauer have shown that for irreversible logic computations, each bit of information lost generates kTln2 joules of heat energy, where k is Boltzmann's constant and T the absolute temperature at which computation is performed [1]. Bennett showed that kTln2 energy dissipation would not occur, if a computation is carried out in a reversible way [2], since the amount of energy dissipated in a system bears a direct relationship to the number of bits erased during computation. Furthermore, voltage-coded logic signals have energy of $E_{sig} = ½CV^2$, and this energy gets dissipated whenever switching occurs in conventional (irreversible) logic implemented in modern CMOS technology. It has been shown that reversible logic helps in saving this energy using charge recovery process [13]. Reversible circuits are those circuits that do not lose information. Reversible computation in a system can be performed only when the system comprises of reversible gates. These circuits can generate unique output vector from each input vector, and vice versa, that is, there is a one-to-one mapping between input and output vectors. Thus, an NXN reversible gate can be represented as Iv=(I1,I2,I3,I4,.....IN) Ov=(O1,O2,O3,.....ON).

Where Iv and Ov represent the input and output vectors respectively. Classical logic gates are irreversible since input vector states cannot be uniquely reconstructed from the output vector states. There are a number of existing reversible gates such as Fredkin gate[3,4,5], Toffoli Gate (TG) [3, 4] and New Gate (NG) [6].

1.2. Motivation behind Reversible Logic

The reversible logic operations do not erase (lose) information and dissipate very less heat. Thus, reversible

logic is likely to be in demand in high speed power aware circuits. Reversible circuits are of high interest in low-power CMOS design, optical computing, quantum computing and nanotechnology. The most prominent application of reversible logic lies in quantum computers. A quantum computer can be viewed as a quantum network (or a family of quantum networks) composed of quantum logic gates; each gate performs an elementary unitary operation on one, two or more two–state quantum systems called qubits. Each qubit represents an elementary unit of information corresponding to the classical bit values 0 and 1. Any unitary operation is reversible, hence quantum networks effecting elementary arithmetic operations such as addition, multiplication and exponentiation cannot be directly deduced from their classical Boolean counterparts (classical logic gates such as AND or OR are clearly irreversible).Thus, Quantum Arithmetic must be built from reversible logic components [10].

1.3. Proposed Contribution

In this paper, the focus is on the application of new reversible 4*4 TSG gate [12] and its implementation for designing novel reversible multiplier. A NXN reversible multiplier is also proposed in this paper. A similar multiplier in conventional arithmetic (using conventional logic) has been reported in . It is based on two concepts. The partial products can be generated in parallel with a delay of one using Fredkin gates and thereafter the addition can be reduced to $\log_2 N$ steps by using reversible parallel adder designed from TSG gates. A 4x4 architecture of the proposed reversible multiplier is also designed. It has been proved that the proposed multiplier architecture using the proposed TSG gate is better than the existing ones in literature, in terms of number of reversible gates and garbage outputs. The reversible circuits designed and proposed in this paper form the basis of the ALU of a primitive quantum CPU.

2. Proposed 4* 4 Reversible Gate

The authors recently proposed a 4*4 one through reversible gate called TS gate (TSG) [12] which is shown in Figure 1. It can be verified that the input pattern corresponding to a particular output pattern can be uniquely determined. The proposed TSG gate is capable of implementing all Boolean functions and can also work singly as a reversible Full adder. Figure 2 shows the implementation of the proposed gate as a reversible Full adder.

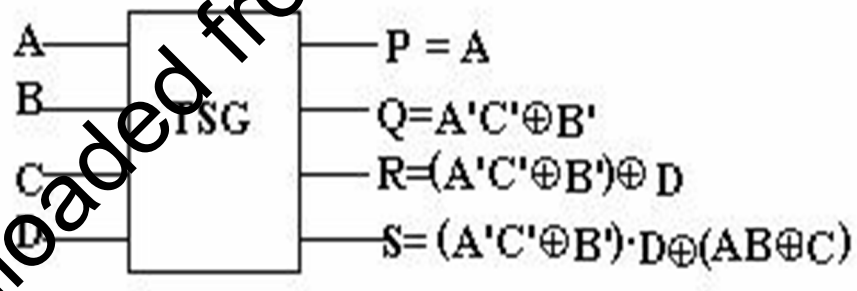

Figure 1. Proposed TSG Gate

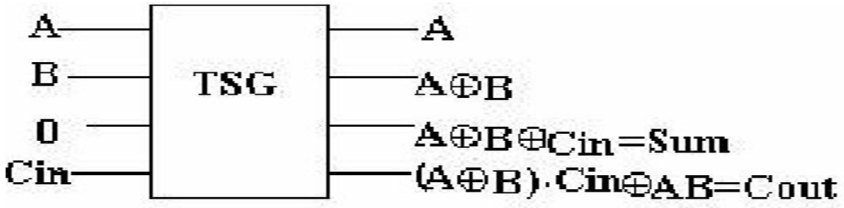

Figure 2. TSG gate Implemented as a Full Adder

A number of reversible full adders were proposed in [6,7,8,9]. The reversible full adder circuit in [6] requires three reversible gates (two 3*3 new gates and one 2*2 Feynman gate) and produces three garbage outputs (garbage output refers to the output that is not used for further computations. In other words, it is not used as a primary output or as an input to other gate) . The reversible full adder circuit in [7,8] requires three reversible gates (one 3*3 new gate, one 3*3 Toffoli gate and one 2*2 Feynman gate) and produces two garbage outputs. The design in [9] requires five reversible Fredkin gates and produces five garbage outputs. The proposed full adder using TSG in Figure 2 requires only one reversible gate (one TSG gate) and produces only two garbage outputs. Hence, the full-adder design in Figure 2 using TSG gate is better than the previous full-adder designs of [6,7,8,9]. A comparison of various full adders is shown in Table 1.

Table 1. Comparison of Various Reversible Full Adder Circuits

	Number of Gates	Number of Garbage Outputs	Unit Delay
Proposed Circuit	1	2	1
Existing Circuit[6]	3	3	3
Existing Circuit [7,8]	3	2	3
Existing Circuit[9]	5	5	5

3. Novel Reversible Multiplier Architecture

The proposed reversible NXN bit parallel multiplier architecture is an improvement over reversible array multiplier [11]. Similar multiplier architecture in conventional arithmetic (logic) has been reported in, but the proposed one in this paper is totally based on reversible logic and reversible cells as its building block. It is based on two concepts. The partial products can be generated in parallel with a delay of d using Fredkin gates and thereafter the addition can be reduced to $\log_2 N$ steps by using reversible parallel adder designed from TSG gates. Each two adjacent partial products will be added together with an N-bit reversible parallel adder. A number of interesting and optimized parallel adders are proposed in [12]. The addition of adjacent partial products will generate the first level of computation with N/2 partial sums. These partial sums are added again in the aforesaid fashion to create a second level of computation with N/4 partial sums. The final product will be obtained at the $\log_2 N$ level. The working of the multiplier can be deeply understand by considering a binary tree having N leaf nodes (equivalent to N partial sums) which are merged to form their N/2 parents (equivalent to N/2 Partial Sums). These N/2 parents are again added in the aforesaid fashion and finally this process will be successively repeated to the get at the root of the tree(final product). Thus, the required number of levels to compute the multiplication result will be $\log_2 N$.

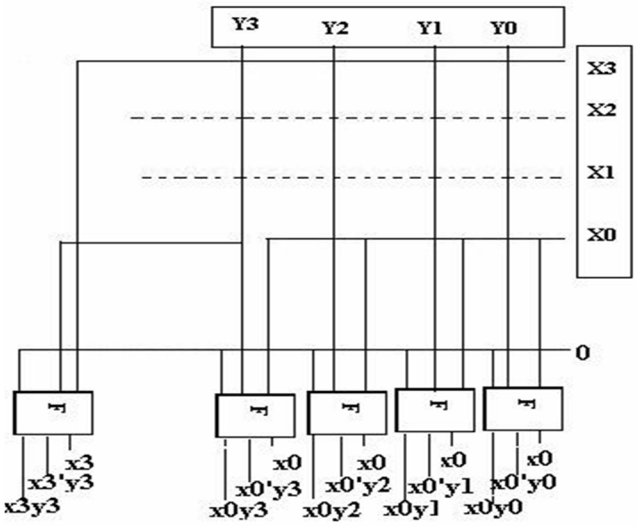

Figure 3. Parallel generation of Partial Products using Fredkin Gate

Since this architecture requires (N-1) of N-bit reversible adders, it needs a total of N *(N-1) reversible full adder cells. So, the worst propagation delay of the proposed multiplier architecture can be computed as: -d+N*d'[$\log_2$N] where d and d' are the propagation delays of a Fredkin gate and reversible TSG gate (adder) respectively. By changing the type of adder such as reversible CLA (Carry Look Ahead Adder) to reversible CPA (Carry Propagate Adder) will make a substantial change in the propagation delay.

The proposed NXN reversible multiplier is designed for 4x4 bit. In the 4x4 multiplier, the partial products are generated in parallel using Fredkin gates as shown in Figure 3. Thus, we have 4 partial products generated as shown in Figure 4. Each 2 partial products are added using 4-bit reversible parallel adder creating the first level of computation which has 2 partial sums. These two partial sums are fed to the second level of 4- bit reversible parallel adder resulting in the formation of the final product. The proposed reversible multiplier efficiency significantly depends on the type of reversible parallel adders used in addition operation. The proposed reversible multiplier is shown in Figure 5 for 4x4 bit. The multiplier uses the proposed TSG gates as reversible full adder units.

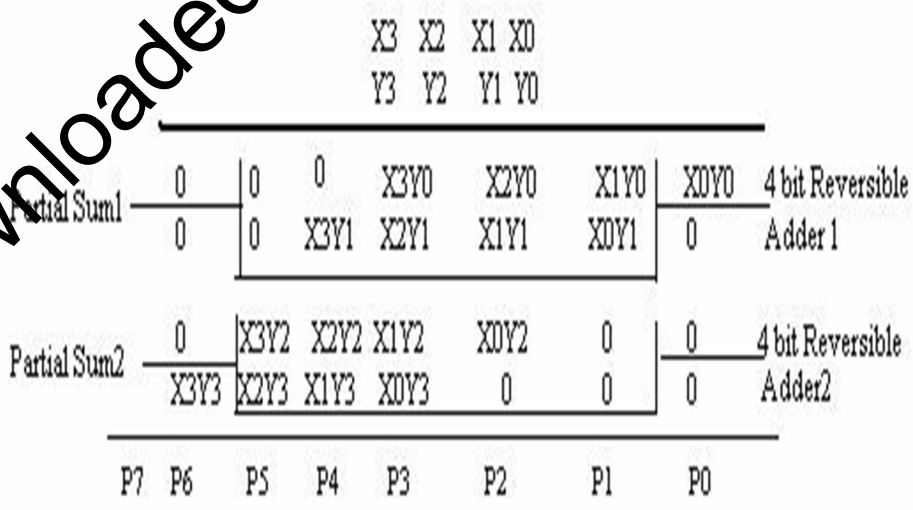

Figure 4. Methodology of 4x4 reversible Multiplier

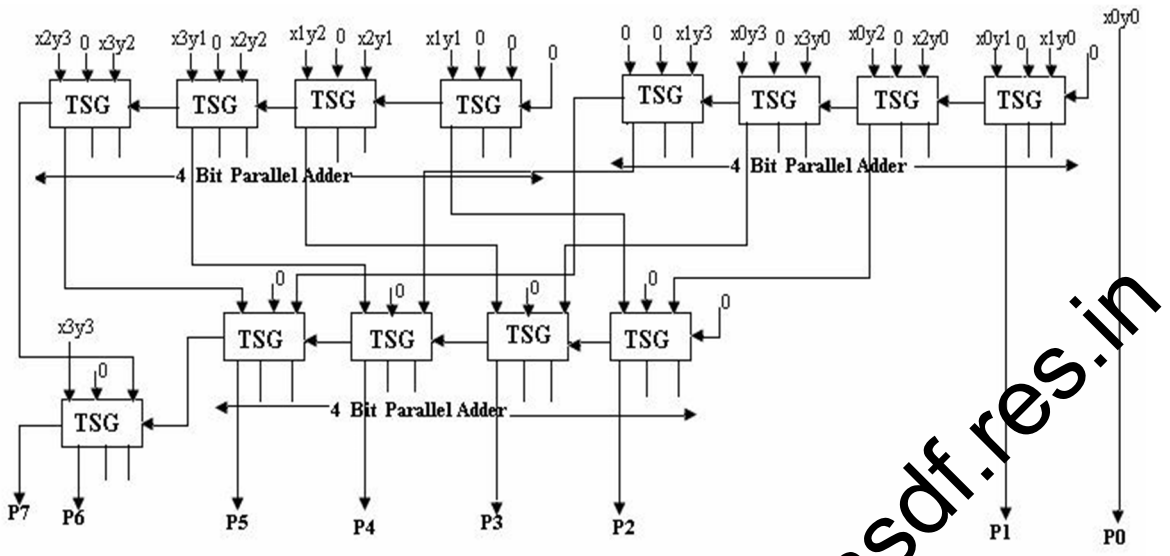

Figure 5. Proposed 4 x4 Novel Reversible Multiplier

3.1. Evaluation of the Proposed Reversible Multiplier

The efficiency of the proposed reversible multiplier greatly depends on the choice of the reversible parallel adder. The efficient parallel adders proposed in [12] will significantly improve the multiplier efficiency. The proposed architecture can further be optimized through a control circuitry. As we have decomposed all the operations into levels, we can significantly reduce the power consumption by employing a control circuitry which will switch off those levels which have done their computations. Therefore, switching off the levels as the computations proceed in the multiplier will lead to a great reduction in power consumption. Furthermore, the multiplier can be optimized for power by having leading zeroes count for both the multiplicand and the multiplier, thus reducing the power consumption by running less number of adders and switching off those adders which are not in use. The multiplier is most optimized compared to its existing reversible counterpart in literature [11]. The proposed 4x4 bit multiplier is designed with bare minimum of 29 reversible gates while its existing counterpart in [11] has 40 reversible gates. The results can be generalized for NXN bits. The numbers of garbage outputs are nearly same for both the multiplier. Table 2 shows the comparison efficiency of the reversible multipliers.

4. Conclusions

The focus of this paper is the application of the recently proposed reversible 4*4 TSG gate. A NXN reversible multiplier is also proposed in this paper. It is proved that the proposed multiplier architecture using the proposed TSG gate is better than the existing counterpart in literature in terms of reversible gates and garbage outputs. All the proposed architectures are analyzed in terms of technology independent implementations. The technology independent analysis is necessary since quantum or optical logic implementations are not available. There are a number of significant applications of reversible logics such as low power CMOS, quantum computing, nano-technology, and optical computing and the proposed TSG gate and efficient multiplier architecture are one of the contributions to reversible logic. The proposed circuit can be used for designing large reversible systems. In a nutshell, the advent of reversible logic has contributed significantly in reducing the power consumption. Thus, the paper provides the initial threshold to build more complex systems which can which can execute more complicated operations. The reversible circuits designed and proposed here form the basis of the ALU of a primitive quantum CPU.

Table 2. Comparison Efficiency of different 4x4 reversible Multipliers

	Proposed Reversible 4x4 Multiplier	Existing 4x4 Counter Parts[11]
Number of Gates Used	29	40
Switching of the levels (Power Saving)	Yes	No
Efficiency depends on reversible Parallel Adder	Yes	No
Overall Speed	Fast As Parallel Adder Can be Used	Slow as no parallel Adders

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OFDM Modulation Using Verilog

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Abstract : In order to improve the transmission velocity in multipath fading wireless channel, the high speed OFDM technology receives increasing attentions in mobile communication. The growth of mobile communications and wireless Internet access has produced a strong demand for advanced wireless techniques. The challenges for wireless communication designs come from the detrimental characteristics of wireless environments, such as multipath fading, Doppler effect, co-channel interference, and intentional jamming in military communications. In this OFDM base band modulation consists of error scrambler, encoder, Serial to Parallel converter, interleaver and Sub carrier modulation (mapping). Sub carrier modulation mostly uses three modes that are BPSK (Binary phase shift keying), QPSK (QuadriPhase Shift Keying) and QAM QAM-4, QAM-6. Interleaver is to disperse lost information to decrease error bit rate, in other words, when user information bits are lost among transmission process. Experimental results indicate that setup time corresponding to transmission velocity and steady time is approximately doubled as setup time, that is, not only achieving the high speed transmission, but also supplying adequate modulation time.

I. Introduction

OFDM requires very accurate frequency synchronization between the receiver and the transmitter; with frequency deviation the sub-carriers will no longer be orthogonal, causing inter-carrier Orthogonal frequency-division multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies. OFDM has developed into a popular scheme for wideband digital communication, whether wireless or over copper wires, used in applications such as digital television and audio broadcasting, DSL broadband internet access, wireless networks, and 4G mobile communications. interference (ICI) (i.e., cross-talk between the sub-carriers). Frequency offsets are typically caused by mismatched transmitter and receiver oscillators, or by Doppler shift due to movement. While Doppler shift alone may be compensated for by the receiver, the situation is worsened when combined with multipath, as reflections will appear at various frequency offsets, which is much harder to correct. This effect typically worsens as speed increases, and is an important factor limiting the use of OFDM in high-speed vehicles. Several techniques for ICI suppression are suggested, but they may increase the receiver complexity.

The growth of mobile communications and wireless internet access has produced a strong demand for advanced Wireless techniques. The challenges for wireless communication designs come from the detrimental Characteristics of wireless environments, such as multipath fading, Doppler Effect, co-channel interference, and intentional jamming in military communications. The objective of this paper is to provide an approach to solve the problem of transmission velocity of multipath fading by means of orthogonal frequency division multiplexing. OFDM is a special form of multicarrier modulation, which was originally used in high frequency military radio. An efficient way to implement OFDM by means of a discrete Fourier transform (DFT) was found by Weinstein in 1971. The computational complexity could be further reduced by a fast Fourier transform (FFT). However, OFDM was not popular at that time because the implementation of large-size FFTs was still too expensive. Recent advances in VLSI technologies have enabled cheap and fast implementation of FFTs and IFFTs. In the 1980s, Cimini first investigated the use of OFDM for mobile communications. Since then, OFDM has become popular. In the 1990s, OFDM was adopted in the standards of digital audio broadcasting (DAB), digital video broadcasting (DVB), asymmetric digital subscriber line (ADSL), and IEEE802.11a. OFDM is alsoconsidered in the new fixed broadband wireless access system specification.

II. Verilog Implementation

Verilog is language that describes electron circuitry and systemic behaves. Based on the description and interrelated software tools, one can gain anticipant circuitry or system. In the article, ISE9.2i achieves various operations of SPARTAN 3 FPGA such as program, synthesis, implement, restriction and simulation

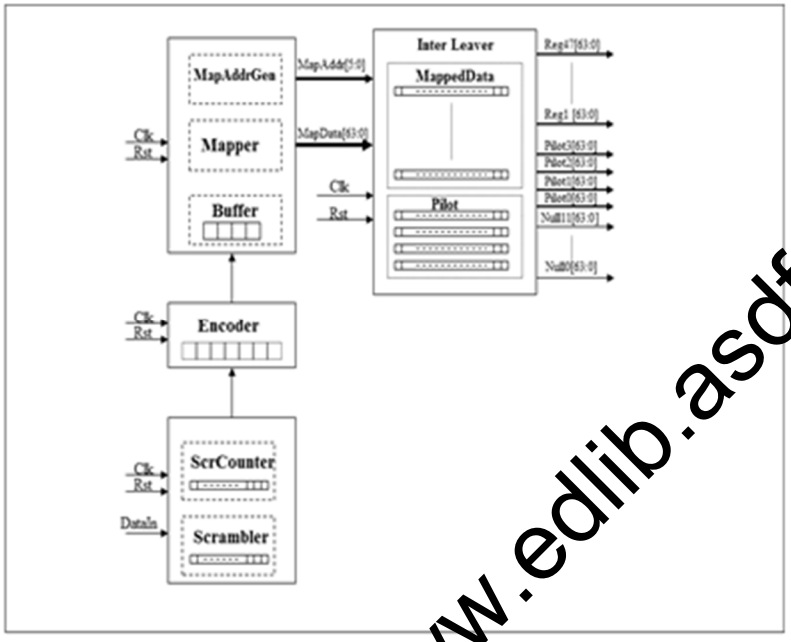

Figure: Block Diagram of OFDM 64 –bit data processor.

In this project we are using QAM-64 modulation technique for implementation of the OFDM data processor. Quadrature amplitude modulation (QAM) is both an analog and a digital modulation scheme. It conveys two analog message signals, or two digital bit streams, by changing (modulating) the amplitudes of two carrier waves, using the amplitude-shift keying (ASK) digital modulation scheme or amplitude modulation (AM) analog modulation scheme. The two carrier waves, usually sinusoids, are out of phase with each other by 90° and are thus called quadrature carriers or quadrature components hence the name of the scheme. The modulated waves are summed, and the resulting waveform is a combination of both phase-shift keying (PSK) and amplitude-shift keying (ASK), or (in the analog case) of phase modulation (PM) and amplitude modulation. In the digital QAM case, a finite number of at least two phases and at least two amplitudes are used. PSK modulators are often designed using the QAM principle, but are not considered as QAM since the amplitude of the modulated carrier signal is constant. QAM is used extensively as a modulation scheme for digital telecommunication systems. Spectral efficiencies of 6 bits/s/Hz can be achieved with QAM. It is being used in optical fiber systems as bit rates increase QAM16 and QAM64 can be optically emulated with a 3-path interferometer.

This research presents an FPGA technique to gain approach in the problem of OFDM system implementation. The proposed design is synthesized by using high-level design tools .The design flow is optimized for fast prototype, which is implemented on the latest generation of FPGA chips. Such an FPGA implementation has the added advantage to modify for changes and improved system performance. The total needed area for the transmitter is taken into account. The total power of OFDM system is 105mw. The proposed design is suitable for low power portable wireless communication in order to obtain long battery life.

The overall System Architecture will be designed using HDL language and simulation, synthesis and implementation (Translation, Mapping, Placing and Routing) will be done using various FPGA based EDA

Tools(). Finally the proposed system architecture performance (speed, area, power and throughput) will be compared with already existing system implementations.

A. Scrambler

Scrambler is used to randomize the given data i.e; reduce the error rate from the given data. The internal circuit of scrambler consists of LFSR (linear feedback shift register) and a counter. LFSR generates CRC code for error reduction, and the counter is used for counting purpose here we used is a 3 bit counter.

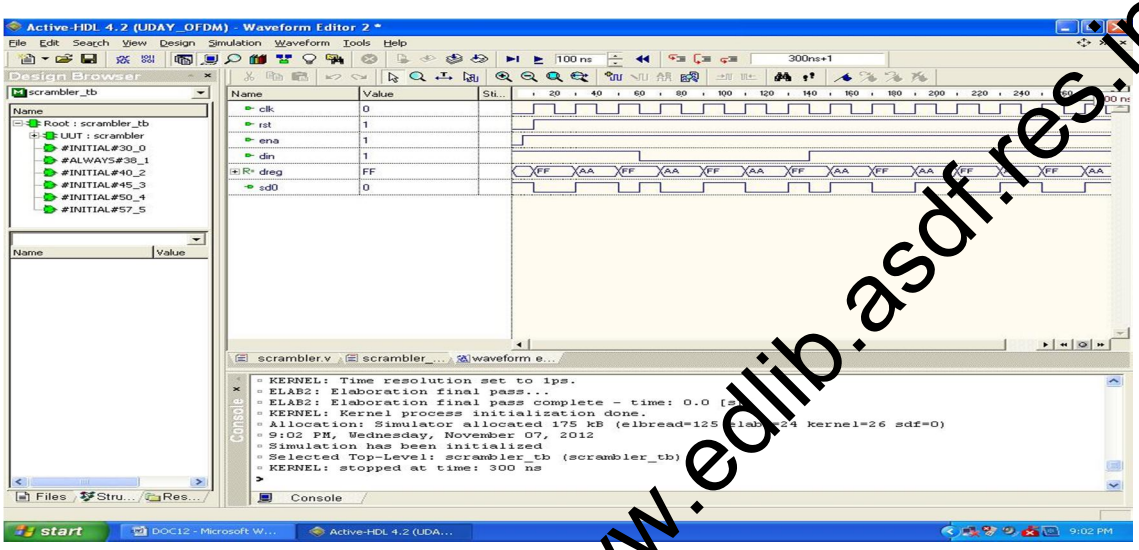

Figure: Simulation results for Time sequence of scrambler.

B. Encoder

We are using convolution encoder for modulation purpose. The main difference between the encoder and lock used here stores the 64 bit data which is comingconvolution encoder is that, for the convolution encoder we are giving 1 bit input then it produces matrix form of output. An internal block of the convolution encoder is shift registers. If rst=0 every rising edge of the clock internal registers are loaded by input bit, then we perform the XOR operation. At the output we get 2 bits of data.

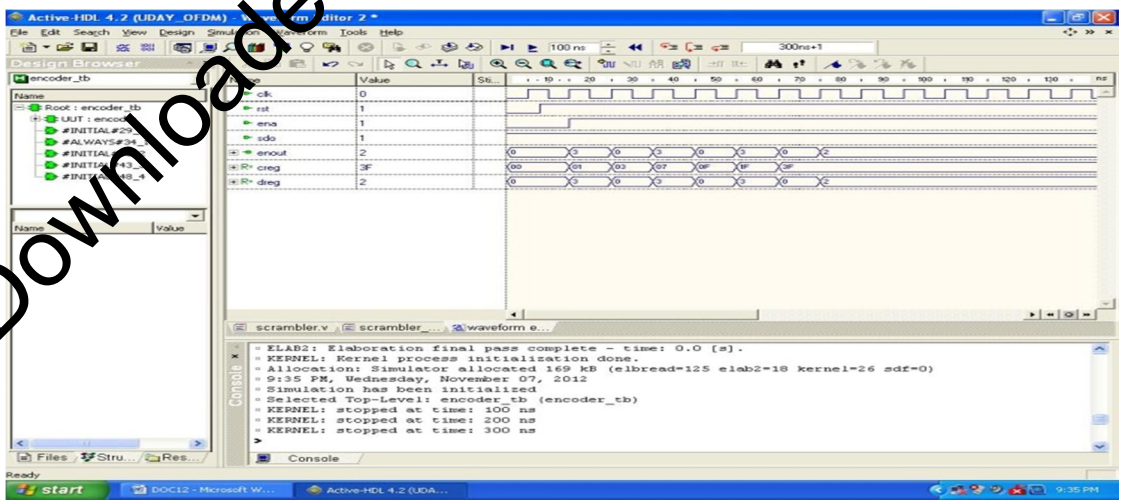

Figure: Simulation results for Time sequence of Encoder.

C. Mapper

Mapper is used to generate the address for data.it maps useful data and remaining data will be kept a side. Here we are using QAM 6 bit modulation technique. finally we get mapped data and mapped address. When rst=0 then for every rising edge of the clock, 2bits of data is converted into 64 bit data by the mapper and it also generates address for the 64 bits.

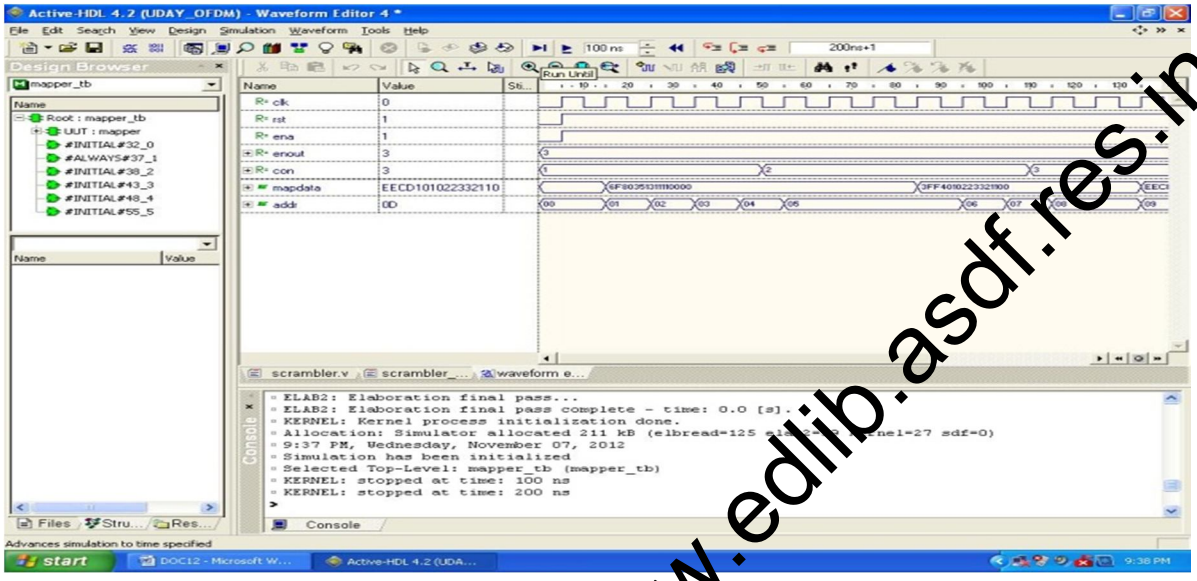

Fig 5: Simulation results for Time sequence of mapper.

D. Interleaver

Register block is also called as Interleaver. It acts as a memory storage device. Register b from a mapper, by using the 64 registers present in it stores the 64bit data and corresponding address of the data.

When rst=0, then for every rising edge of the clock the data from the mapper is loaded into this register block. Finally we get 64 bit data.

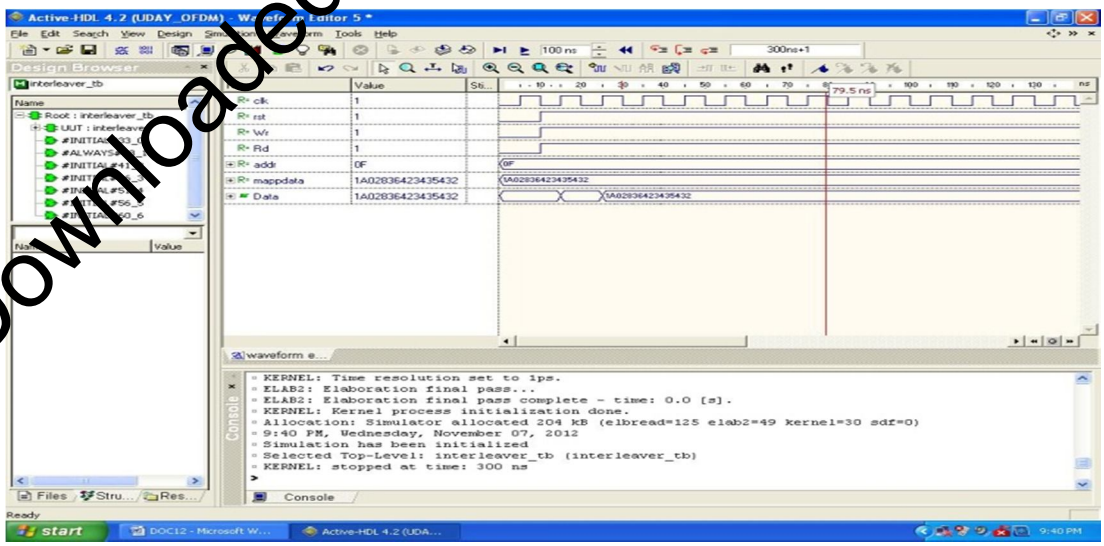

Fig 6: Simulation results for Time sequence of interleaver.

VI. Conclusion

In this paper, This Paper presents an FPGA technique to gain approach in the problem of OFDM system implementation. The proposed design is synthesized by using high-level design tools .The design flow is optimized for fast prototype, which is implemented on the latest generation of FPGA chips. Such an FPGA implementation has the added advantage to modify for changes and improved system performance. The total needed area for both the transmitter and the receiver is taken into account. The total power of OFDM system is 105mw. The proposed design is suitable for low power portable wireless communication in order to obtain long battery life.

OFDM has various advantages over the previous generation's access techniques. In OFDM, interference's within the cell are averaged by using allocation with cyclic permutations. OFDM enables orthogonality in the uplink by synchronizing users in time and frequency, multi path mitigation without using Equalizers and training sequences, enables Single Frequency Network coverage, where coverage problem exists and gives excellent coverage, spatial diversity by using antenna diversity at the Base Station and possible at the Subscriber Unit.

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X-Ray Diffraction and Characterization of Crystalline Materials

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Abstract: X-ray crystallography is a tool used for determining the atomic and molecular structure of a crystals .Although Bragg's law $n\lambda = 2d \sin\Theta$ was used to explain the interference pattern of X-rays scattered by crystals, diffraction has been developed to study the structure of all states of matter with any beam, e.g., ions, electrons, neutrons, and protons, with a wavelength similar to the distance between the atomic or molecular structures of interest.The method also revealed the structure and function of many biological molecules, including vitamins, drugs, proteins and nucleic acids such as DNA. X-ray crystallography is still the chief method for characterizing the atomic structure of new materials and in discerning materials that appear similar by other experiments.

Key Words: X-ray diffraction. Crystals , Characterization, Bragg's law

1 Introduction

X-ray crystallography is a tool used for determining the atomic and molecular structure of a crystal, in which the crystalline atoms cause a beam of incident X-rays to diffract into many specific directions. By measuring the angles and intensities of these diffracted beams, a crystallographer can produce a three-dimensional picture of the density of electrons within the crystal. From this electron density, the mean positions of the atoms in the crystal can be determined, as well as their chemical bonds, their disorder and various other information.

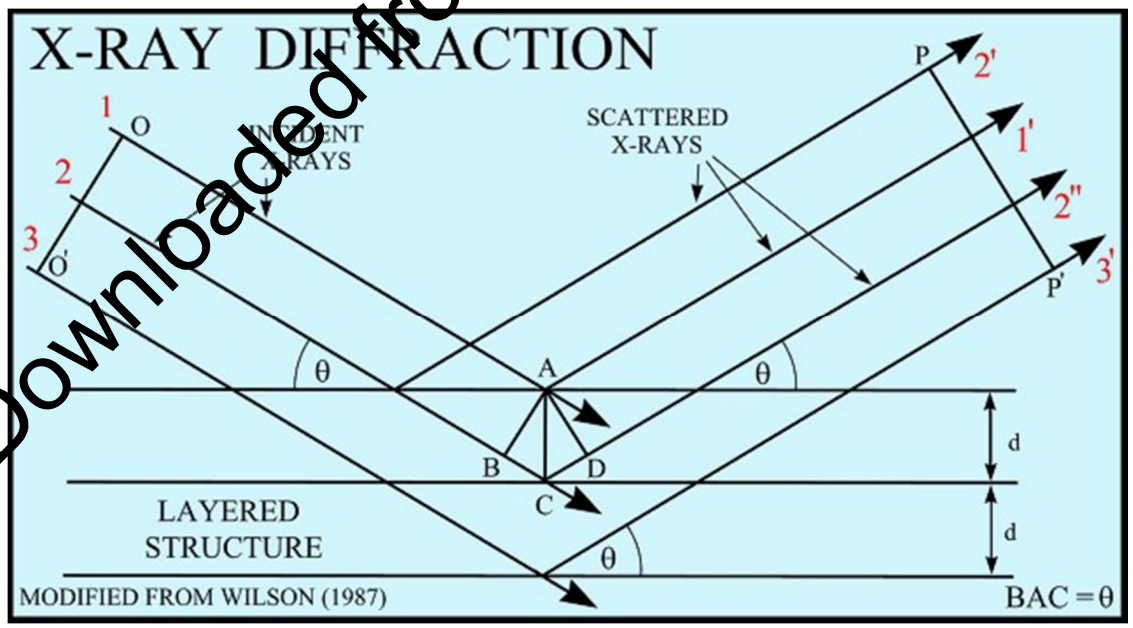


Figure 1: X-ray wave interference or superposition

2 Principles

Bragg's Law $n\lambda = 2d \sin\Theta$ derived by the English physicists Sir W.H. Bragg and his son Sir W.L. Bragg in 1913 to explain why the cleavage faces of crystals appear to reflect X-ray beams at certain angles of incidence (Θ, λ). The variable *d* is the distance between atomic layers in a crystal, and the variable lambda is the **wavelength** of the incident X-ray beam n is an integer.

This observation is an example of X-ray **wave interference** (Roentgenstrahlinterferenzen), commonly known as X-ray diffraction (XRD), and was direct evidence for the periodic atomic structure of crystals postulated for several centuries. The Braggs were awarded the Nobel Prize in physics in 1915 for their work in determining crystal structures beginning with NaCl, ZnS and diamond. Although Bragg's law was used to explain the interference pattern of X-rays scattered by crystals, diffraction has been developed to study the structure of all states of matter with any beam, e.g., ions, electrons, neutrons, and protons, with a wavelength similar to the distance between the atomic or molecular structures of interest.

Figure 2 : Bruker D5005 Wide angle X-ray diffractometer with variable temperature for the study of crystallinity and detection of polymorphisms**.**

3. Experimental Procedure

In an X-ray diffraction measurement, a crystal is mounted on a goniometer and gradually rotated while being bombarded with X-rays, producing a diffraction pattern of regularly spaced spots known as *reflections*. The two-dimensional images taken at different rotations are converted into a three-dimensional model of the density of electrons within the crystal using the mathematical method of Fourier transforms, combined with chemical data known for the sample. Poor resolution (fuzziness) or even errors may result if the crystals are too small, or not uniform enough in their internal makeup.

X-ray crystallography is related to several other methods for determining atomic structures. Similar diffraction patterns can be produced by scattering electrons or neutrons, which are likewise interpreted as a Fourier transform. If single crystals of sufficient size cannot be obtained, various other X-ray methods can be applied to obtain less detailed information; such methods include fiber diffraction, powder diffraction and small-angle X-ray scattering (SAXS). If the material under investigation is only available in the form of nanocrystalline powders or suffers from poor crystallinity, the methods of electron crystallography can be applied for determining the atomic structure. Since many materials can form crystals—such as salts, metals, minerals, semiconductors, as well as various inorganic, organic and biological molecules

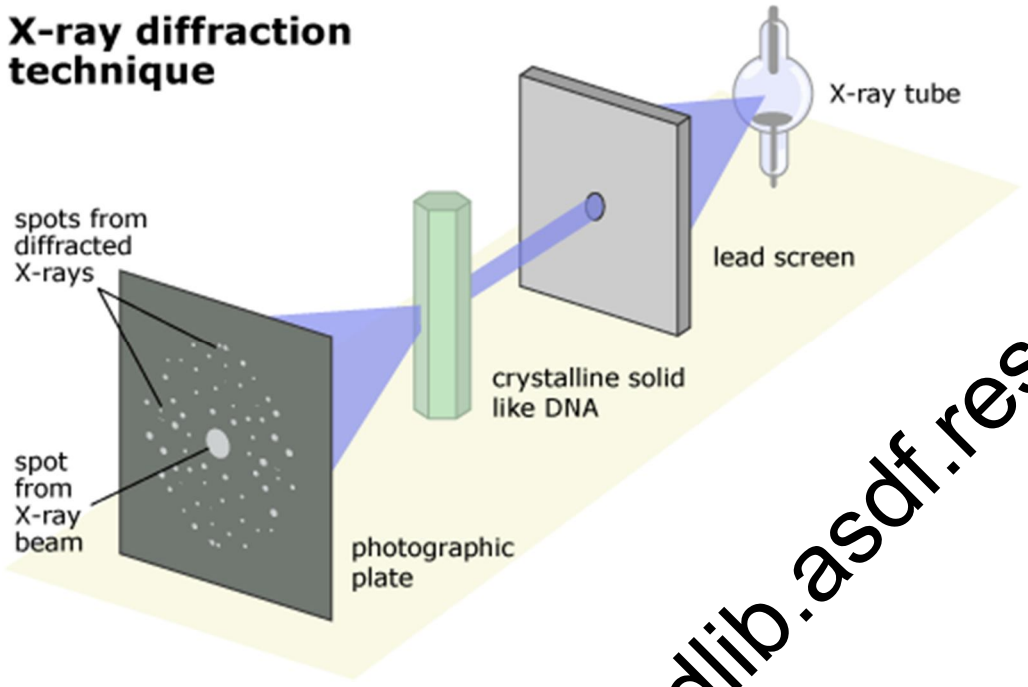


Figure 3: X-Ray diffraction technique

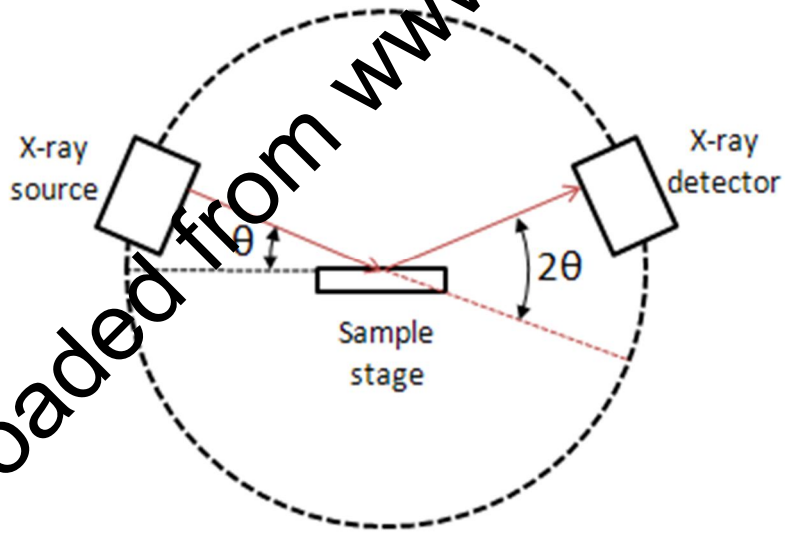
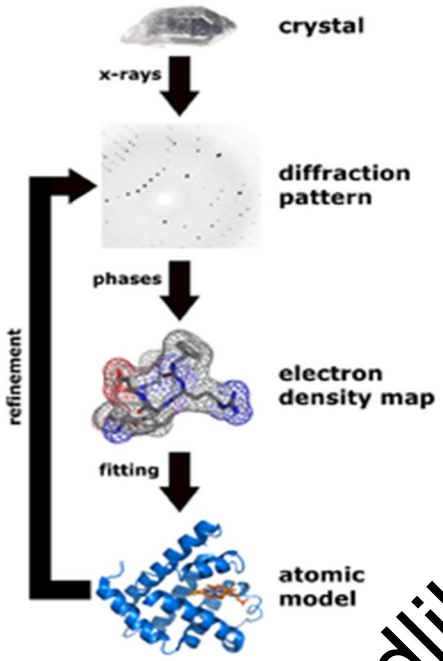


Figure 3: X-Ray Diffraction Principle

X-ray crystallography has been fundamental in the development of many scientific fields. In its first decades of use, this method determined the size of atoms, the lengths and types of chemical bonds, and the atomic-scale differences among various materials, especially minerals and alloys. The method also revealed the structure and function of many biological molecules, including vitamins, drugs, proteins and nucleic acids such as DNA. X-ray crystallography is still the chief method for characterizing the atomic structure of new materials and in discerning materials that appear similar by other experiments. X-ray crystal structures can also account for unusual electronic or elastic properties of a material, shed light on chemical interactions and processes, or serve as the basis for designing pharmaceuticals against diseases.



Workflow for solving the structure of a molecule by X-ray crystallography.

The oldest and most precise method of X-ray crystallography is *single-crystal X-ray diffraction*, in which a beam of X-rays strikes a single crystal, producing scattered beams. When they land on a piece of film or other detector, these beams make a *diffraction pattern* of spots; the strengths and angles of these beams are recorded as the crystal is gradually rotated.[93] Each spot is called a *reflection*, since it corresponds to the reflection of the X-rays from one set of evenly spaced planes within the crystal. For single crystals of sufficient purity and regularity, X-ray diffraction data can determine the mean chemical bond lengths and angles to within a few thousandths of an angstrom and to within a few tenths of a degree, respectively. The atoms in a crystal are not static, but oscillate about their mean positions, usually by less than a few tenths of an angstrom. X-ray crystallography allows measuring the size of these oscillations.

5. Results & Discussion

The technique of single-crystal X-ray crystallography has three basic steps. The first—and often most difficult—step is to obtain an adequate crystal of the material under study. The crystal should be sufficiently large (typically larger than 0.1 mm in all dimensions), pure in composition and regular in structure, with no significant internal imperfections such as cracks or twinning.

In the second step, the crystal is placed in an intense beam of X-rays, usually of a single wavelength (*monochromatic X-rays*), producing the regular pattern of reflections. As the crystal is gradually rotated, previous reflections disappear and new ones appear; the intensity of every spot is recorded at every orientation of the crystal. Multiple data sets may have to be collected, with each set covering slightly more than half a full rotation of the crystal and typically containing tens of thousands of reflections.

In the third step, these data are combined computationally with complementary chemical information to produce and refine a model of the arrangement of atoms within the crystal. The final, refined model of the atomic arrangement—now called a *crystal structure*—is usually stored in a public database.

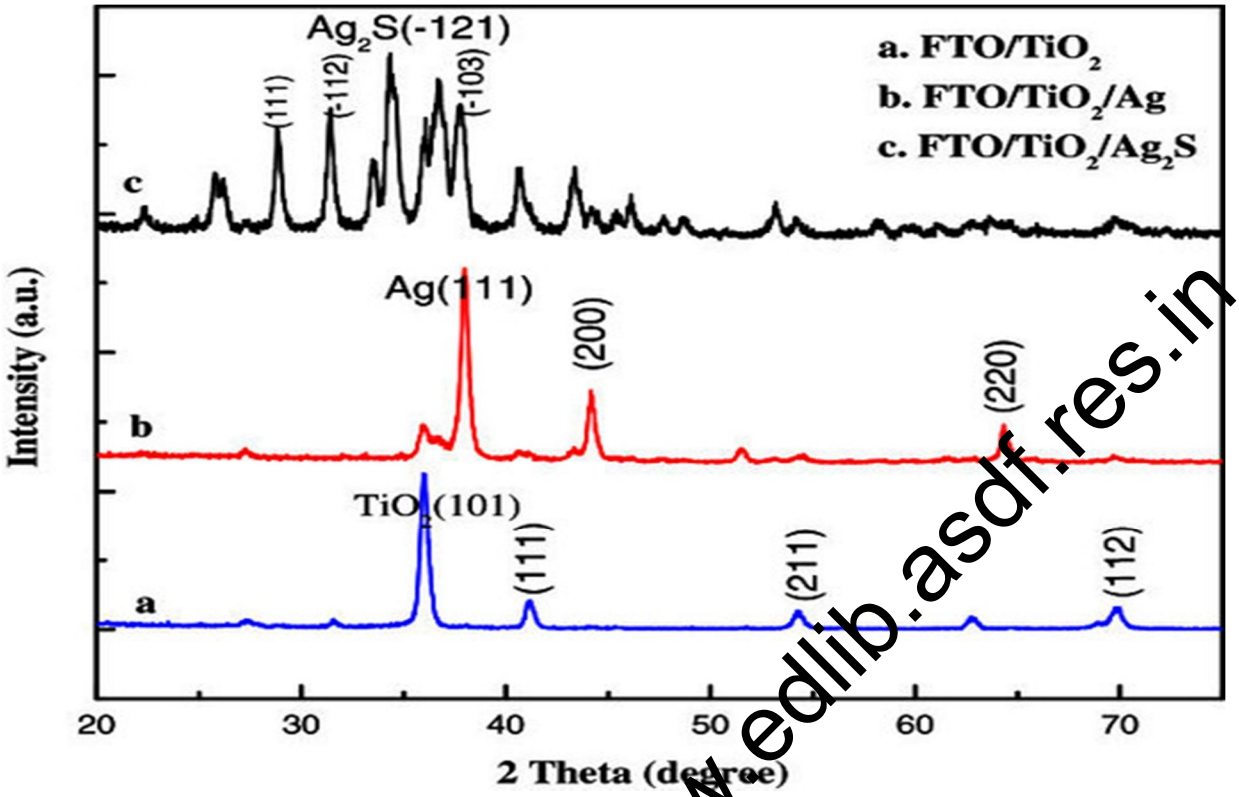


Figure4: X-Ray diffractogram with reflections

Applications of XRD

XRD is a nondestructive technique, fast, easy sample preparation To identify crystalline phases and orientation To determine structural properties Lattice parameters (10 Å), strain, grain size, expitaxy, phase composition, preferred orientation (Texture) order disorder transformation, thermal expansion. To measure thickness of thin films and multi layers to determine atomic arrangement High accuracy ford spacing calculations Single crystal, poly, and amorphous materials

Acknowledgment

It's a great privilege to express my sincere gratitude to the management of Christu Jyothi institute of technology and science, Jangaon,506167 Warangal(A.P.) India , Most Rev. Fr. Y Papi Reddy , Director for his constant encouragement and , Principal Dr.JBV Subrhamanyam for his valuable support .

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Power Quality Improvement Using DVR

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Abstract- Voltage sags and swells in the medium and low voltage distribution grid are considered to be the most frequent type of power quality problems based on recent power quality studies. Their impact on sensitive loads is severe. The impact ranges from load disruptions to substantial economic losses up to millions of dollars. Different solutions have been developed to protect sensitive loads against such disturbances but the DVR is considered to be the most efficient and effective solution. Its appeal includes lower cost, smaller size and its dynamic response to the disturbance. This paper described DVR principles and voltage restoration methods for balanced and/or unbalanced voltage sags and swells in a distribution system. Simulation results were presented to illustrate and understand the performances of DVR under voltage sags/swells conditions.

Key words: Dynamic Voltage Restorer (DVR), voltage sags, voltage swells, power quality.

I. Introduction

In the early days of power transmission in the late 19th century problems like voltage deviation during load changes and power transfer limitation were observed due to reactive power unbalances. Today these Problems have even higher impact on reliable and secure power supply in the world of Globalization and Privatization of electrical systems and energy transfer. The development in fast and reliable semiconductors devices (GTO and IGBT) allowed new power electronic configurations to be introduced to the tasks of power Transmission and load flow control. The FACTS devices offer a fast and reliable control over the transmission parameters, i.e. Voltage, line impedance, and phase angle between the sending end voltage and receiving end voltage. On the other hand the custom power is for low voltage distribution, and improving the poor quality and reliability of supply affecting sensitive loads. Custom power devices are very similar to the FACTS. Most widely known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system [3].

The performance of the DSTATCOM depends on the control algorithm i.e. the extraction of the current components. For this purpose there are many control schemes which are reported in the literature and some of these are instantaneous reactive power (IRP) theory, instantaneous compensation, instantaneous symmetrical components, synchronous reference frame (SRF) theory, computation based on per phase basis, and scheme based on neural network [4- 10]. Among these control schemes instantaneous reactive power theory and synchronous rotating reference frame are most widely used. This paper focuses on the compensating the voltage sag, swells and momentary interruptions. The dynamic performance is analyzed and verified through simulation.

II. Dynamic Voltage Restorer (DVR)

A dynamic voltage restorer is a PE converter-based D-SSSC, which can protect sensitive loads from all supply side disturbances other than outages. It is connected in series with a distribution feeder and also is capable of generating or absorbing real and reactive power at its AC terminals. The basic principle of a DVR is simple: by inserting a voltage of the required magnitude and frequency, the DVR can restore the load-side voltage up to the desired amplitude and waveform even when the source voltage is either unbalanced or distorted. Usually, a DVR, as a cost-effective solution when compared to very costly UPS agreements, is connected in order to protect loads and can be implemented at both a LV level and a MV level; which gives an opportunity to protect high-power applications from voltage sags during faults in the supply system.

A typical location in the distribution system and the operation principle of the DVR is shown in Fig. 1 [7], where UT – terminal supply voltage, U'L – the load side voltage after restore; UC – the inserted voltage by the DVR, IL and IS are the load and feeder currents, PC – the real power generated or absorbed by the D-SSSC. DVR was commercially introduced in 1994 for the first time, and its first important installation was in North Carolina, for the rug manufacturing industry [8]. Since then, the number of installed DVR has increased continuously. Obviously, it is implemented especially in those industry branches where supply-side disturbances can lead to dangerous situations personnel or serious production losses.

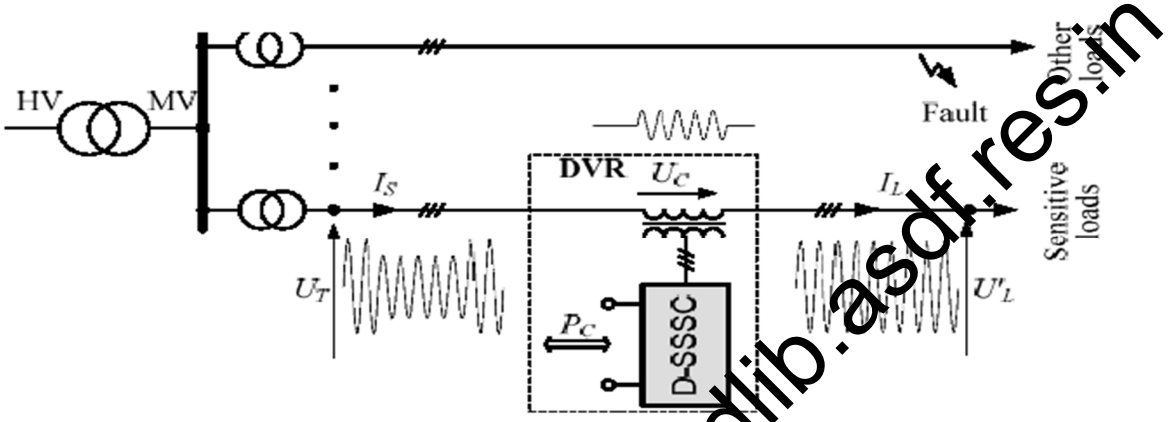
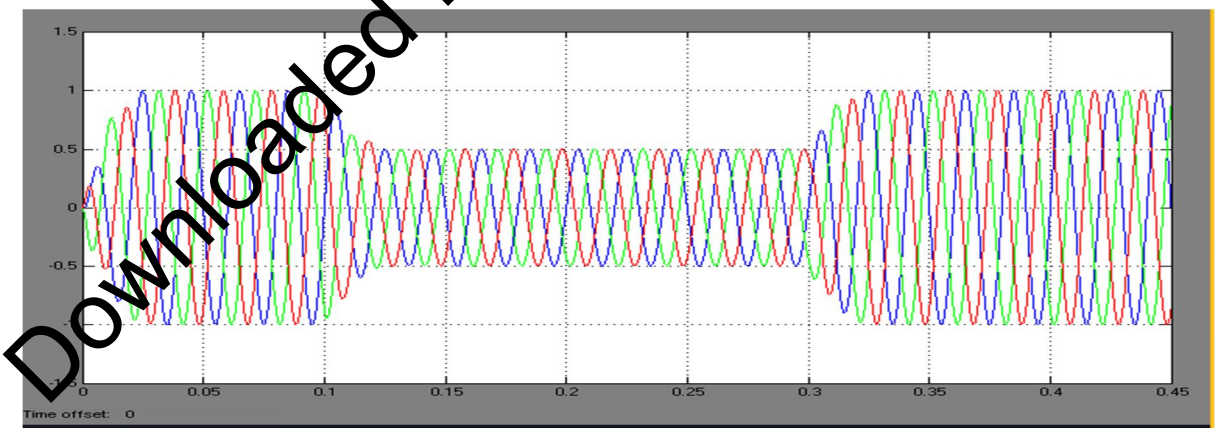


Figure 1 . A typical location and operation principle of the DVR

III. Results and Analysis

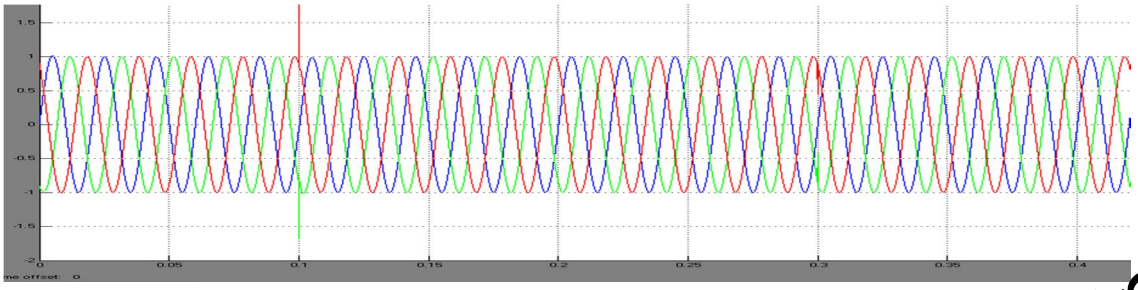
In order to show the performance of the DVR in voltage sags and swells mitigation, a simple distribution network was simulated using MATLAB. A DVR was connected to the system through a series transformer with a capability to insert a maximum voltage of 50% of the phase to ground system nominal voltage. In this simulation the In-Phase Compensation (IPC) method was used. The load considered in the study is a 5.5 MVA capacity with 0.92 p.f, lagging.

Voltage sags:



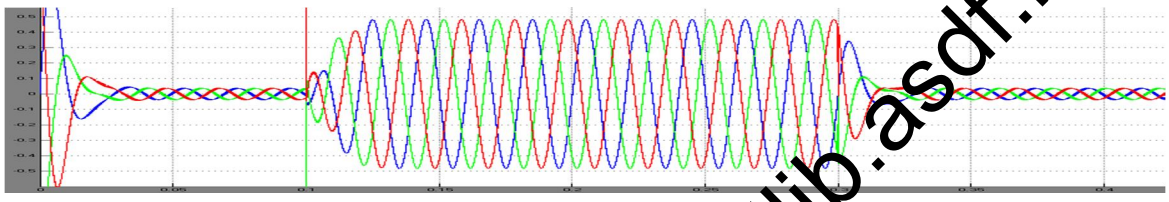
Time in Seconds

A case of Three-phase voltage sag was simulated and the results are shown in voltage sag initiated at 100 ms and it is kept until 300 ms, with total voltage sag duration of 200 ms. voltage injected by the DVR and the compensated load voltage, respectively. It quickly injects necessary voltage components to smooth the load voltage upon detecting voltage sag.



Time in Seconds

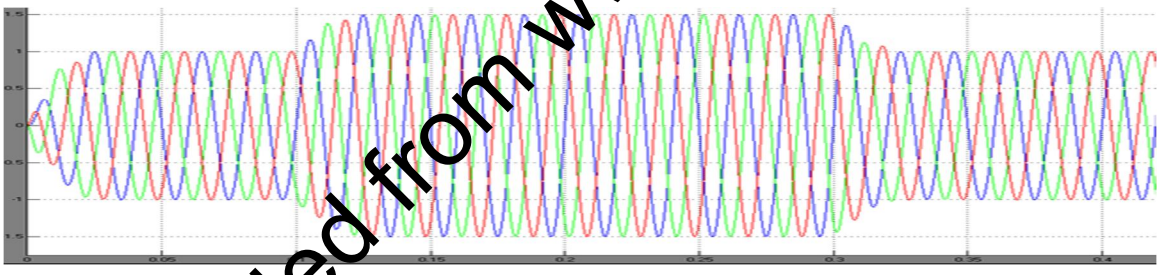
As a result of DVR, the load voltage is kept at 1 p.u. throughout the simulation, including the voltage sag period



Time in Seconds

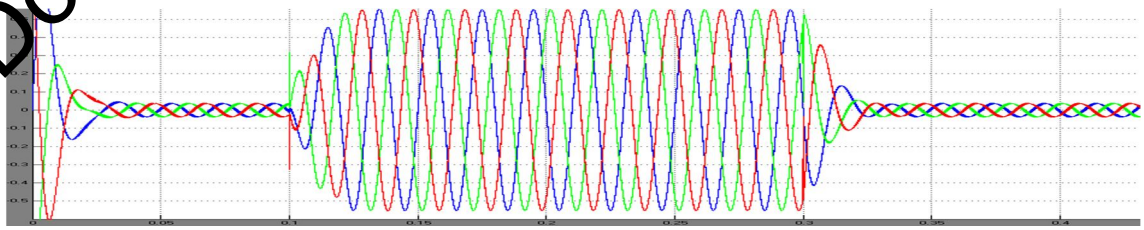
Voltage Swells:

The performance of DVR for a voltage swell condition was investigated. Here, the supply voltage swell was generated as shown in below.

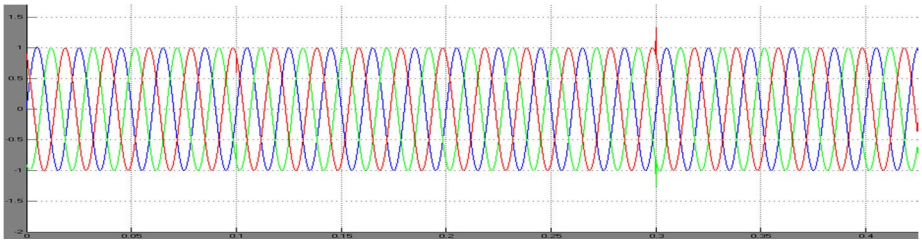


Time in Seconds

The supply three-phase voltage amplitudes were increased about 125% of nominal voltage. The injected threes phase voltage that was produced by DVR in order to correct the load voltage and the load voltage are shown below respectively. As can be seen from the results, the load voltage was kept at the nominal value with the help of the DVR. Similar to the case of voltage sag, the DVR reacted quickly to inject the appropriate voltage component (negative voltage magnitude) to correct the supply voltage.

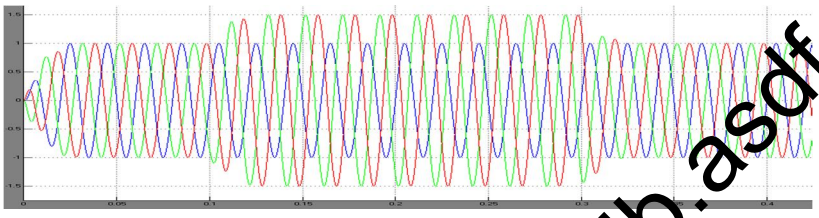


Time in Seconds



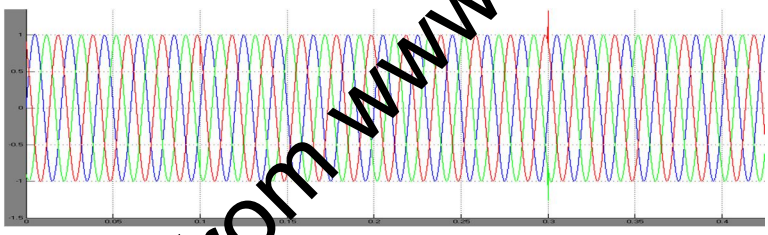
Time in Seconds

The performance of the DVR with an unbalanced voltage swell is shown. In this case, two of the three phases are higher by 25% than the third phase as shown.

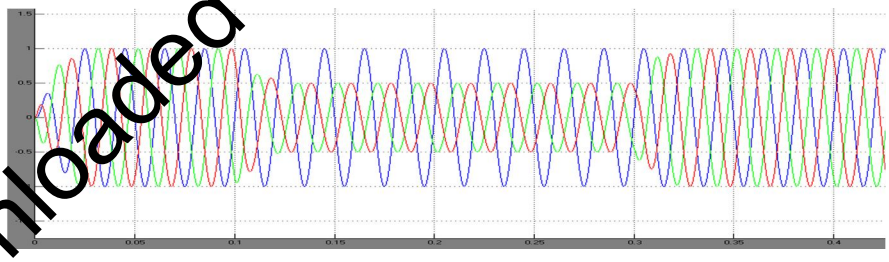


Time in Seconds

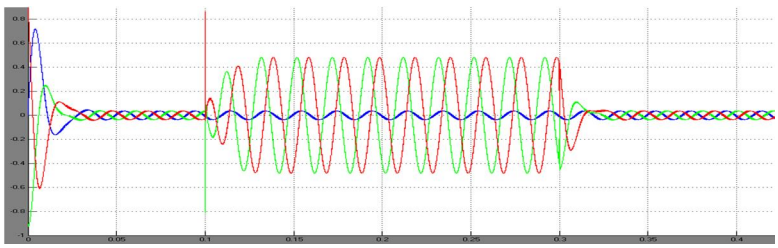
The injected voltage that was produced by DVR in order to correct the load voltage and the load voltage are shown.



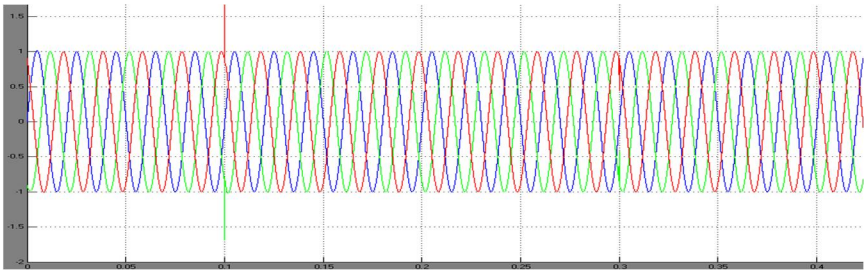
Time in Seconds



Time in Seconds



Time in Seconds



Time in Seconds

Two-phase voltage sag; (a): Source voltages;(b): Injected voltages; (c): Load voltages

IV. Conclusions

The simulation results showed clearly the performance of the DVR in mitigating voltage sags and swells. The DVR handled both balanced and unbalanced situations without any difficulties and injected the appropriate voltage component to correct rapidly any anomaly in the supply voltage to keep the load voltage balanced and constant at the nominal value. The efficiency and the effectiveness in voltage sags/swells compensation showed by the DVR makes him an interesting power quality device compared to other custom power devices

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Power Quality Improvement Using UPQC

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Abstract—This paper introduces a new concept of optimal utilization of a unified power quality conditioner (UPQC). The series inverter of UPQC is controlled to perform simultaneous 1) voltage sag/swell compensation and 2) load reactive power sharing with the shunt inverter. The active power control approach is used to compensate voltage sag/swell and is integrated with theory of power angle control (PAC) of UPQC to coordinate the load reactive power between the two inverters. Since the series inverter simultaneously delivers active and reactive powers, this concept is named as UPQC-S (S for complex power). A detailed mathematical analysis, to extend the PAC approach for UPQC-S, is presented in this paper. MATLAB/SIMULINK-based simulation results are discussed to support the developed concept. Finally, the proposed concept is validated with a digital signal processor-based experimental study.

Key Words—Active power filter (APF), power quality, reactive power compensation, unified power quality conditioner (UPQC), voltage sag and swell compensation.

I. Introduction

In the early days of power transmission in the late 19th century problems like voltage deviation during load changes and power transfer limitation were observed due to reactive power unbalances. Today these Problems have even higher impact on reliable and secure power supply in the world of Globalization and Privatization of electrical systems and energy transfer. The development in fast and reliable semiconductors devices (GTO and IGBT) allowed new power electronic Configurations to be introduced to the tasks of power Transmission and load flow control. The FACTS devices offer a fast and reliable control over the transmission parameters, i.e. Voltage, line impedance, and phase angle between the sending end voltage and receiving end voltage. On the other hand the custom power is for low voltage distribution, and improving the poor quality and reliability of supply affecting sensitive loads. Custom power devices are very similar to the FACTS. Most widely known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system [3].

The performance of the DSTATCOM depends on the control algorithm i.e. the extraction of the current components. For this purpose there are many control schemes which are reported in the literature and some of these are instantaneous reactive power (IRP) theory, instantaneous compensation, instantaneous symmetrical components, synchronous reference frame (SRF) theory, computation based on per phase basis, and schemes based on neural network [4- 11]. Among these control schemes instantaneous reactive power theory and synchronous rotating reference frame are most widely used. This paper focuses on the compensating the voltage sag, swells and momentary interruptions. The dynamic performance is analyzed and verified through simulation.

II. Unified Power Quality Conditioner

Power quality issues are becoming more and more significant in these days because of the increasing number of power electronic devices that behave as nonlinear loads. A wide diversity of solutions to power quality problems is available for both the distribution network operator and the end use. The power processing at source, load and for reactive and harmonic compensation by means of power electronic devices is becoming more prevalent due to the vast advantages offered by them. The shunt active power

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filter (APF) is usually connected across the loads to compensate for all current related problems such as the reactive power compensation, power factor improvement, current harmonic compensation and load unbalance compensation, whereas the series active power filter is connected in a series with a line through series transformer. It acts as controlled voltage source and can compensate all voltage related problems, such as voltage harmonics, voltage sag, voltage swell, flicker, etc. UPQC is a Custom Power Device and consists of combined series active power filter that compensates voltage harmonics, voltage unbalance, voltage flicker, voltage sag/swell and shunt active power filter that compensates current harmonics, current unbalance and reactive current.Unified Power Quality Conditioner is also known as universal power quality conditioning system, the universal active power line conditioner and universal active filter. UPQC system can be divided into two sections: The control unit and the power circuit. Control unit includes disturbance detection, reference signal generation, gate signal generation and voltage/current measurements. Power circuit consists of two Voltage source converters, standby and system protection system, harmonic filters and injection transformers.

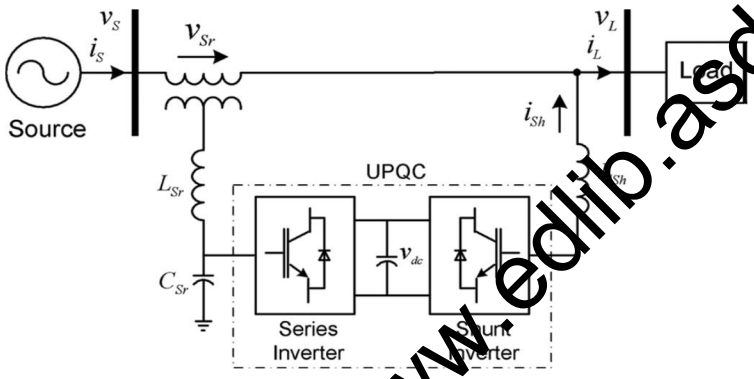

Fig:1. Unified power quality conditioner (UPQC) system configuration.

The voltage sag/swell on the system is one of the most important power quality problems. The voltage sag/swell can be effectively compensated using a dynamic voltage restorer, series active filter, Unified power quality conditioner, etc., among the available power quality enhancement devices, the Unified power quality conditioner has better sag/swell compensation capability. Three significant control approaches for Unified power quality conditioner can be found to control the sag on the system: 1) active power control approach in which an in-phase voltage is injected through series inverter, popularly known as UPQC-P; 2) reactive power control approach in which a quadrature voltage is injected [4], [5], known as UPQC-Q; and 3) a minimum VA loading approach in which a series voltage is injected at a certain angle, in this paper called as UPQC-VAmin.

III. Results and Analysis

A UPQC is one of the most suitable devices to control the voltage sag/swell on the system. The rating of a UPQC is governed by the percentage of maximum amount of voltage sag/swell need to be compensated. However, the voltage variation (sag/swell) is a short duration power quality issue. The performance of the proposed concept of simultaneous load reactive power and voltage sag/swell compensation has been evaluated by simulation. To analyse the performance of UPQC-S, the source is assumed to be pure sinusoidal. Further more, for better visualization of results the load is considered as highly inductive. The supply voltage which is available at UPQC terminal is considered as three phase, 60 Hz, 600 V (line to line) with the maximum load power demand of 15 kW + *j* 15 kVAR (load power factor angle of 0.707 lagging).The simulation results for the proposed UPQC-S approach under voltage sag and swell conditions are given Before time t_1 , the UPQC-S system is working under steady state condition, compensating the load reactive power using both the inverters. A power angle δ of 21° is maintained between the resultant load and actual

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source voltages. The series inverter shares 1.96 kVAR per phase (or 5.8 kVAR out of 15 kVAR) demanded by the load. Thus, the reactive power support from the shunt inverter is reduced from 15 to 9.2 kVAR by utilizing the concept of PAC. In other words, the shunt inverter rating is reduced by 25% of the total load kilovolt ampere rating. At time t_1 = 0.6 s, a sag of 20% is introduced on the system (sag last till time t = 0.7 s). Between the time period t = 0.7 s and t = 0.8 s, the system is again in the steady state. A swell of 20% is imposed on the system for a duration of t_2 = 0.8–0.9 s.

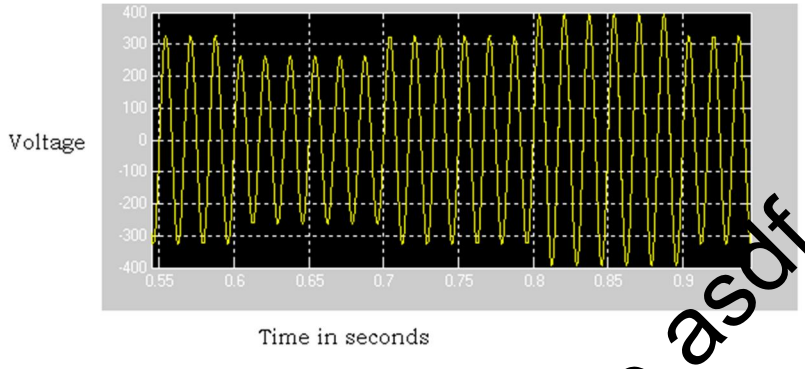

Fig: 2 Supply voltage

In the above Supply Voltage The sag occurs in the time period of 0.6sec to 0.7sec and 07.sec to 0.8sec stead state occurs. 0.8sec to 0.9sec the swell occurs. here voltage decreases current increases.

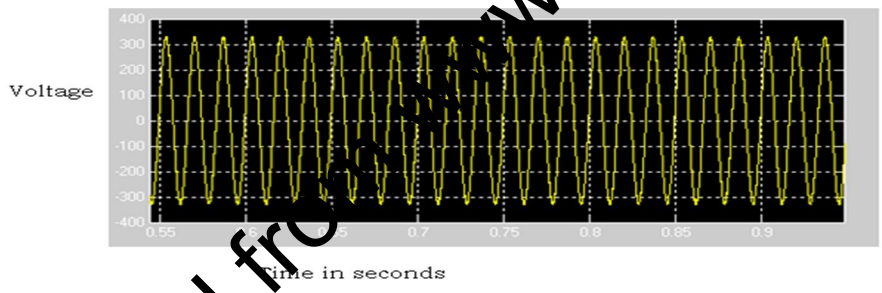

Fig:3 Load voltage

In the above simulation of load voltage is pure sinusoidal wave form occurs because any faults occurs in the Load side the .UPQC compensate the faults.

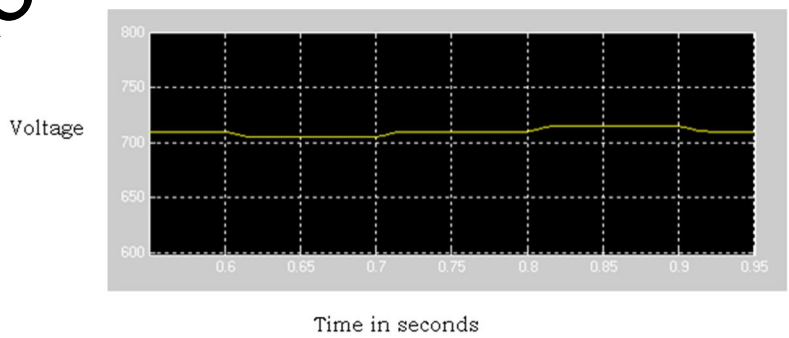

Fig:4 Self supporting dc bus voltage

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In the above dc bus voltage sag occurs 0.6sec to 0.7sec and swell occurs 0.8sec to 0.9sec.

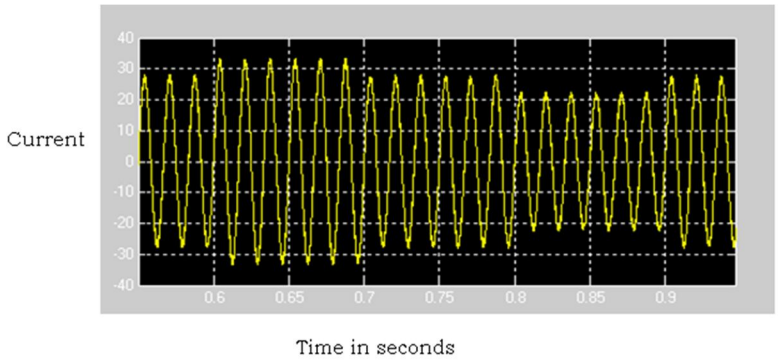

Fig: 5 Supply current

In the supply current swell occurs 0.6sec to 0.7sec.here first swell occurs because voltage decreses and current increases.0.8sec to 0.9sec swell occurs.

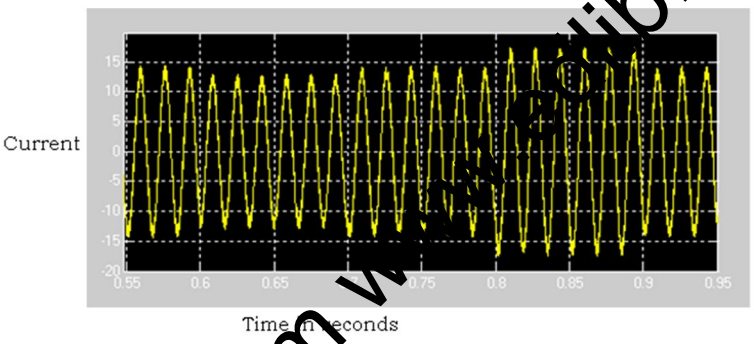

Fig: 6 Shunt inverter injected current

In shunt inverter injected current faults are Occurred.sag occurred in time period of 0.6sec to 0.7sec. swell occurred 0.8sec to 0.9sec.

With VDC Controller Simulation Results:

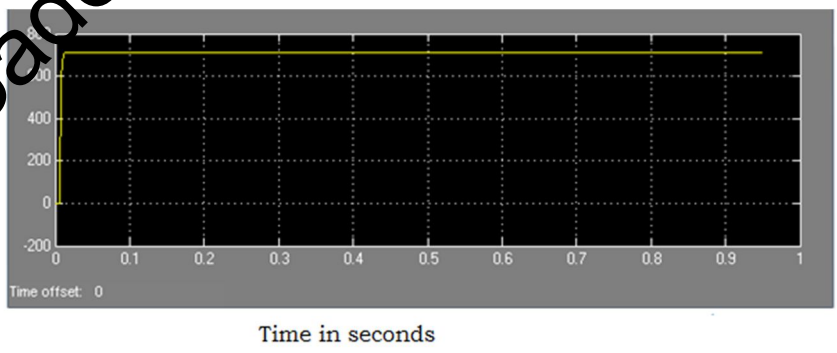

Fig. 7 Self supporting dc bus voltage

In self supporting dc bus voltage using dc regulater transient response is decreased and system dynamic performance increased.

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IV. Conclusions

A new concept of controlling complex power (simultaneous active and reactive powers) through series inverter of UPQC is introduced and named as UPQC-S. The proposed concept of the UPQC-S approach is mathematically formulated and analyzed for voltage sag and swell conditions. The developed comprehensive equations for UPQC-S can be utilized to estimate the required series injection voltage and the shunt compensating current profiles (magnitude and phase angle), and the overall VA loading both under voltage sag and swell conditions.

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Power Quality Improvement of Distribution System Using DSTATCOM

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Abstract-The causes of power quality problems are generally complex and difficult to detect. Technically speaking, the ideal AC line supply by the utility system should be a pure sine wave of fundamental frequency (50/60Hz).Different power quality problems, their characterization methods and possible causes are discussed above and which are responsible for the lack of quality power which affects the customer in many ways. We can therefore conclude that the lack of quality power can cause loss of production, damage of equipment or appliances or can even be detrimental to human health. It is therefore imperative that a high standard of power quality is maintained. This project demonstrates that the power electronic based power conditioning using custom power devices like DSTATCOM can be effectively utilized to improve the quality of power supplied to the customers. The aim of the project is to implement DSTATCOM with different control strategies in the MATLAB, simulink using Simpower systems tool box and to verify and compare the results through various case studies applying different loads and study them in detail.

Key words: DSTATCOM, Compensation, Power quality.

I. Introduction

In the early days of power transmission in the late 19th century problems like voltage deviation during load changes and power transfer limitation were observed due to reactive power unbalances. Today these Problems have even higher impact on reliable and secure power supply in the world of Globalization and Privatization of electrical systems and energy transfer. The development in fast and reliable semiconductors devices (GTO and IGBT) allowed new power electronic Configurations to be introduced to the tasks of power Transmission and load flow control. The FACTS devices offer a fast and reliable control over the transmission parameters, i.e. Voltage, line impedance, and phase angle between the sending end voltage and receiving end voltage. On the other hand the custom power is for low voltage distribution, and improving the poor quality and reliability of supply affecting sensitive loads. Custom power devices are very similar to the FACTS. Most widely known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system [3].

The performance of the DSTATCOM depends on the control algorithm i.e. the extraction of the current components. For this purpose there are many control schemes which are reported in the literature and some of these are instantaneous reactive power (IRP) theory, instantaneous compensation, instantaneous symmetrical components, synchronous reference frame (SRF) theory, computation based on per phase basis, and scheme based on neural network [4- 11]. Among these control schemes instantaneous reactive power theory and synchronous rotating reference frame are most widely used. This paper focuses on the compensating the voltage sag, swells and momentary interruptions. The dynamic performance is analyzed and verified through simulation.

II. Distributed Static Compensator (DSTATCOM)

The Distribution Static Compensator (DSTATCOM) is a voltage source inverter based static compensator (similar in many respects to the DVR) that is used for the correction of bus voltage sags. Connection

(shunt) to the distribution network is via a standard power distribution transformer. The DSTATCOM is capable of generating continuously variable inductive or capacitive shunt compensation at a level up its maximum MVA rating. The DSTATCOM continuously checks the line waveform with respect to a reference ac signal, and therefore, it can provide the correct amount of leading or lagging reactive current compensation to reduce the amount of voltage fluctuations. The major components of a DSTATCOM are shown in Fig. 1. It consists of a dc capacitor, one or more inverter modules, an ac filter, a transformer to match the inverter output to the line voltage, and a PWM control strategy. In this DSTATCOM implementation, a voltage-source inverter converts a dc voltage into a three-phase ac voltage that is synchronized with, and connected to, the ac line through a small tie reactor and capacitor (ac filter).

A. Basic Operating Principle

Basic operating principle of a DSATCOM is similar to that of synchronous machine. The synchronous machine will provide lagging current when under excited and leading current when over excited. DSTATCOM can generate and absorb reactive power similar to that of synchronous machine and it can also exchange real power if provided with an external device DC source.

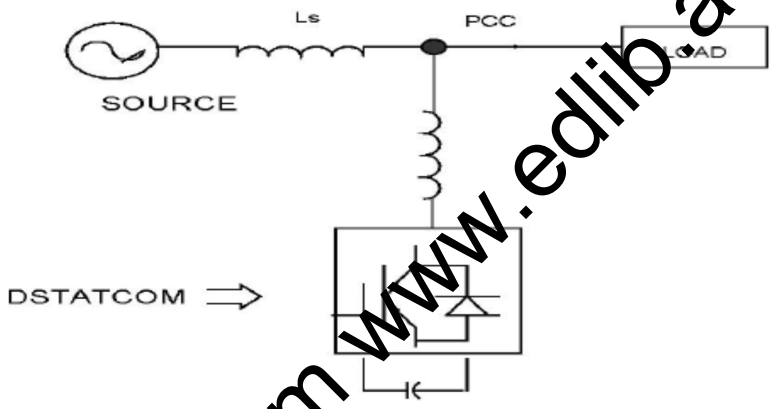

Fig.1 .block diagram of DSTATCOM circuit

1) Exchange of reactive power:- if the output voltage of the voltage source converter is greater than the system voltage then the DSATCOM will act as capacitor and generate reactive power(i.e.. provide lagging current to the system)
2) Exchange of real power: - as the switching devices are not loss less there is a need for the DC capacitor to provide the required real power to the switches. Hence there is a need for real power exchange with an AC system to make the capacitor voltage constant in case of direct voltage control. There is also a real power exchange with the AC system if DSTATCOM id provided with an external DC source to regulate the voltage in case of very low voltage in the distribution system or in case of faults. And if the VSC output voltage leads the system voltage then the real power from the capacitor or the DC source will be supplied to the AC system to regulate the system voltage to the $=1_{p.u}$ or to make the capacitor voltage constant. Hence the exchange of real power and reactive power of the voltage source converter with AC system is the major required phenomenon for the regulation in the transmission as well as in the distribution system.

III. Results and Analysis

In this work, the performance of VSC based power devices acting as a voltage controller is investigated. Moreover, it is assumed that the converter is directly controlled (i.e., both the angular position and the magnitude of the output voltage are controllable by appropriate on/off signals) for this it requires measurement of the rms voltage and current at the load point.The DSTATCOM is commonly used for

voltage sags mitigation and harmonic elimination at the point of connection. The DSTATCOM employs the same blocks as the DVR, but in this application the coupling transformer is connected in shunt with the ac system, as illustrated in Fig.2.. The VSC generates a three-phase ac output current which is controllable in phase and magnitude. These currents are injected into the ac distribution system in order to maintain the load voltage at the desired voltage reference. Active and reactive power exchanges between the VSC connected in shunt with the ac system provides a multifunctional topology which can be used for up to three quite distinct purposes:

1) Voltage regulation and compensation of reactive power; 2) Correction of power factor 3) Elimination of current harmonics.

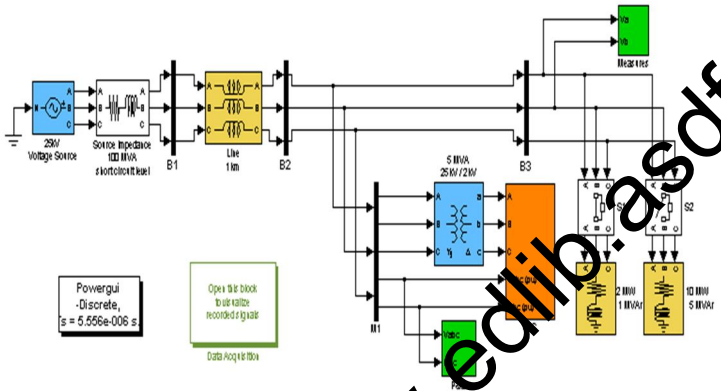

Fig.2. DSTATCOM connected to 25kVdistribution system

The DSTATCOM model developed using the mat lab is allowed to run for .5 seconds. A fixed inductive load is always connected to the source .the increase or decrease in voltage is performed by using circuit breakers with a delay of 0.2second from the start of the simulation.

(a) Balanced Loads:

Without Dstatcom Compensation:

Case: 1 (an inductive load is applied .2seconds after the start of the simulation)
Initially there is a fixed inductive load is connected to the line. After .2 second the circuit breaker .is closed and the terminal voltage is decreased to.8pu. The top window shows the change in the three phase voltage waveforms, the second window shows the changes in the currents when the inductive load is applied after .2seconds and the bottom window shows the magnitude of the voltage.

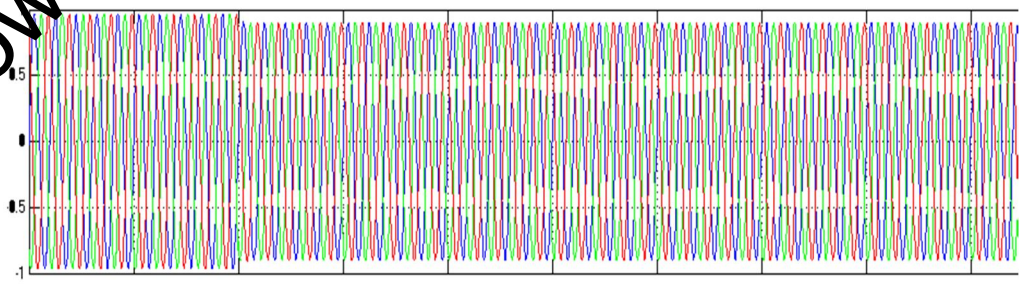

Fig 3.load voltage with inductive load in the uncompensated line

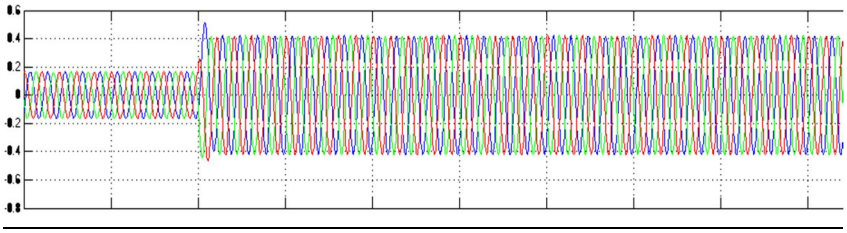

Fig 4. Load current with inductive load in the uncompensated line

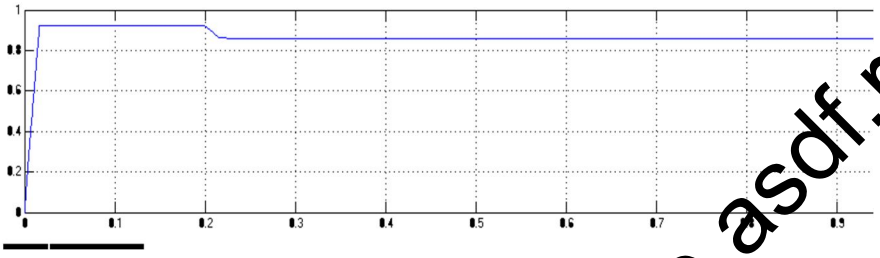

Fig 5. Load voltage magnitude with inductive load in the uncompensated line

Compensation Using Decoupled Current Control

6.2 With DSTATCOM Compensation:

Case: 1 (an inductive load is applied .2seconds after the start of the simulation)
Considering that the DSTATCOM is connected in shunt with the line. Initially there is a fixed inductive load is connected to the line. After 0.2 seconds the circuit breaker is closed an inductive load is applied, but in both the cases we observe that there is no drop in the terminal voltage due to the injection of reactive power by the DSTATCOM .Therefore the load is maintained at unity power factor. The top window shows that there is no change in the voltage waveform and it is maintained at unity power factor. The second window shows the variations in the currents when inductive loads are applied at different instances of the simulation.

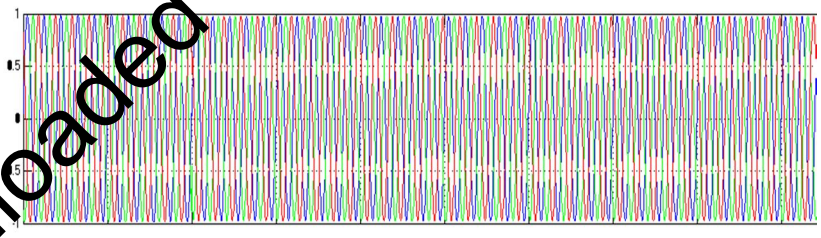

Fig 6..load voltage with inductive load in the compensated line

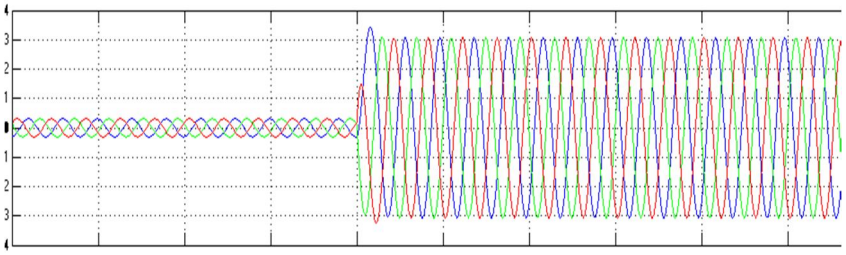

Fig 7.load current with inductive load in the compensated line

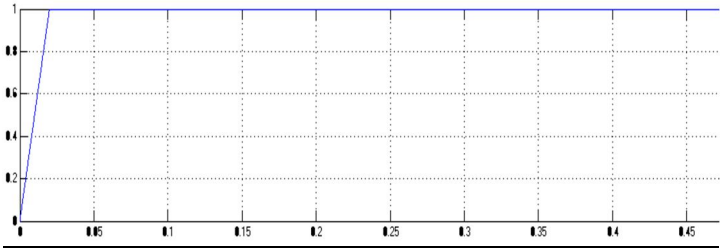

Fig 8.load voltage magnitude with inductive load in the compensated line

(B) Un-Balanced Loads:

6.3 With Out Dstatcom Compensation.

Case: 1 (an inductive load is applied .2seconds after the start of the simulation)
Initially there is a fixed inductive load is connected to the line. After .2 second the circuit breaker is closed and the terminal voltage is decreased to.8pu due to the unbalanced inductive load. The top window shows the change in the three phase voltage waveforms, the second window shows the changes in the currents when the inductive load is applied after .2seconds and the bottom window shows the magnitude of the voltage.

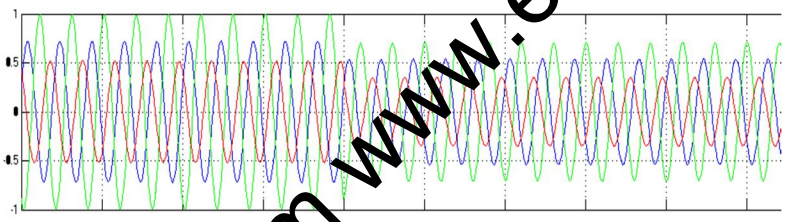

Fig 9.load voltage waveform with unbalanced inductive load in the uncompensated line

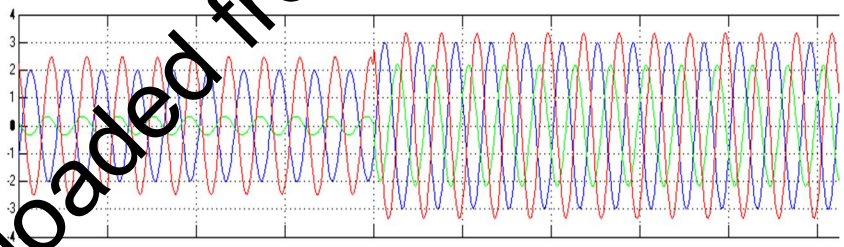

Fig 10 .load current waveform with unbalanced inductive load in the uncompensated

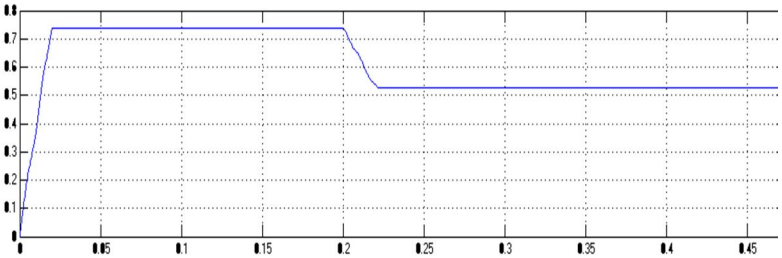

Fig 11 .load voltage magnitude waveform with unbalanced inductive load in the uncompensated line

Compensation Using Decoupled Current Control:

6.4 With Dstatcom Compensation

Case: 1 (an inductive load is applied .2seconds after the start of the simulation)
Considering that the DSTATCOM is connected in shunt with the line. Initially there is a fixed inductive load is connected to the line. After 0.2 seconds the circuit breaker is closed an inductive load is applied, but in both the cases we observe that there is no drop in the terminal voltage due to the injection of reactive power by the DSTATCOM .Therefore the load is maintained at unity power factor. The top window shows that there is no change in the voltage waveform and it is maintained at unity power factor. The second window shows the variations in the currents when inductive loads are applied at different instances of the simulation.

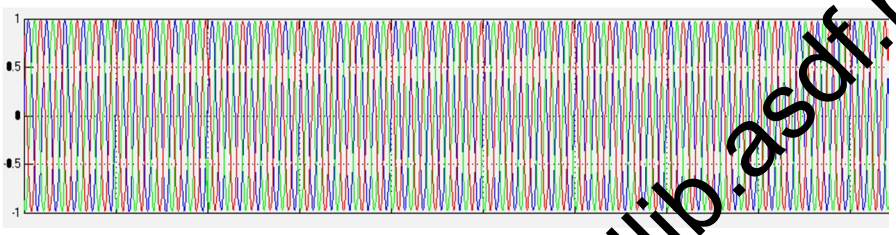

Fig 12 .load voltage magnitude waveform with unbalanced inductive load in the compensated line

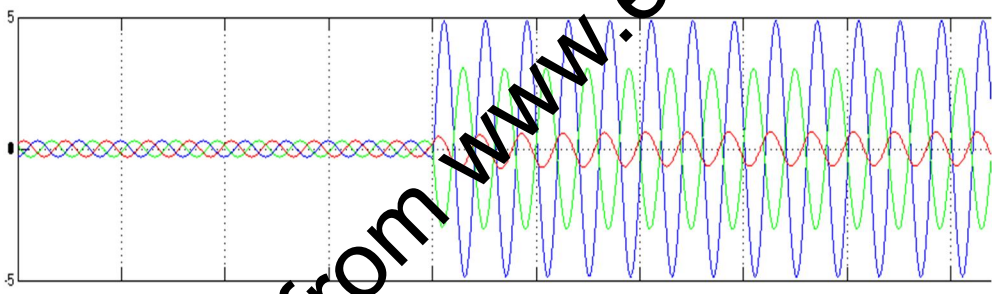

Fig 13..load current waveform with unbalanced inductive load in the compensated line

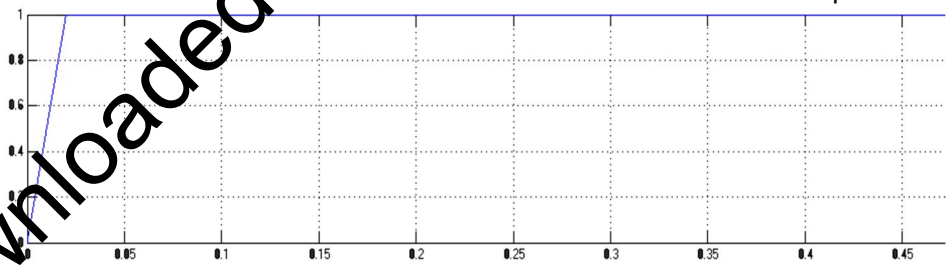

Fig 14 .load voltage magnitude waveform with unbalanced inductive load in the compensated line

IV. Conclusions

CUSTOM POWER (CP) devices can be used, at reasonable cost, to provide high power quality and improved power service. These Custom Power devices provide solutions to power quality at the medium voltage distribution network level. This project presents the detailed modeling of one of the custom power products, DSTATCOM is presented and also a comparative study of two control algorithms, phase shift control and instantaneous P-Q theory, used for the control of DSTATCOM are discussed with their relative

merits and demerits. These control algorithms are described with the help of simulation results under linear loads. The control scheme maintains the power balance at the PCC to regulate the dc capacitor voltages. PWM control scheme only requires voltage measurements. This characteristic makes it ideally suitable for low-voltage custom power applications. The control scheme was tested under a wide range of operating conditions, and it was observed to be very robust in every case. Extensive simulations were conducted to gain insight into the impact of capacitor size on DSTATCOM harmonic generation, speed of response of the PWM control and transient overshooting. It was observed that an undersized capacitor degrades all three aspects. On the other hand, an oversized capacitor may also lead to a PWM control with a sluggish response but it will reduce D-STATCOM harmonic generation and transient overshooting. It is concluded that a DSTATCOM though is conceptually similar to a STATCOM at the transmission level; its control scheme should be such that in addition to complete reactive power compensation, power factor correction and voltage regulation the harmonics are also checked, and for achieving improved power quality levels at the distribution end.

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7. Benefits of SVC and STATCOM for Electric Utility Application" by M. Noroozian, SM IEEE Åke, N Petersson, B. Thorvaldson, Bo A. Nilsson ABB Utilities, FACTS Division, Västerås, Sweden and C.W. Taylor, Fellow IEEE Carson Taylor Seminars Portland, Oregon USA.
8. "An alternative cost effective applications of power factor correction" by Richard A. Flusher, member, IEEE"Operation of a DSTATCOM in Voltage Control Mode" by Mahesh K. Mishra, Student Member, IEEE, Arindam Ghosh, Senior Member, IEEE, and Avinash Joshi
9. "The role, of custom power products In enhancing power quality at industrial facilities" by Michael **D.** Stump, P.E. Westinghouse generation Gerald **J.** Keane Power Westinghouse and Frederick **K. S.** Leong Power Westinghouse Industry Services Asia private limited
10. "Modeling, Analysis and Performance of a DSTATCOM for Unbalanced and Non-Linear Load" by Dinesh Kumar, Rajesh
11. "Voltage Sag and Swell Generator for the Evaluation of Custom Power Devices" by Y.H. Chrmg. G.H Kwon T.B. Park and K. **Y** Lim
12. "Voltage Flicker Mitigation Using PWM-Based Distribution STATCOM" by J. Sun, Student Member, IEEE, D. Czarkowski, Member, IEEE, and Z. Zabar, Senior Member, IEEE
13. " Power Quality enhancement using custom power devices" by Arindam Ghosh and Gerard Ledwich .
14. "Understanding FACTS; Concepts and Technology of Flexible AC Transmission Systems" by N. G. Hingorani, L. Gyugyi

Data Duplication Prevention and Detection

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Abstract: In this project, an image watermarking technique based upon a z transform is proposed and analyzes that, how it is resistant to attacks. The redundant transform provides an over complete representation of the image which facilitates the identification of significant image features via a simple correlation operation across scales. Although the watermarking algorithm is image adaptive, it is not necessary for the original image to be available for successful detection of the watermark. The performance and robustness of the proposed technique is tested by applying common image-processing operations such as filtering, re-quantization, and JPEG compression. A quantitative measure is proposed to objectify performance; under this measure.

Introduction

Digital image authentication is increasingly becoming more important with the tremendous development of the Internet. The ability of fragile watermarking to detect changes in the watermarked image to provide authenticity and integrity of the image makes it go a long way toward solving the image authentication problem.

In contrast to a semi fragile watermark, which only seeks to detect a predefined set of illegitimate distortions to the host image, a fragile watermark is designed to detect any change to the host image. Hence, a variety of fragile watermarking methods has been proposed by embedding identifying information in the least-significant bits (LSBs) of the image. Unfortunately, these methods are somewhat unsecured as the use of LSBs could be easily detected and manipulated. In a fragile watermarking scheme using a statistical model was proposed. However, the scheme was only able to localize distorted pixels altered in the five most significant bits. In our work, we propose a novel fragile watermarking scheme in the z-transform domain. The z-transform is a convenient yet invaluable tool for representing, analyzing, and designing discrete-time signals and systems. However, to our knowledge, this is the first time that this transform has been applied to digital watermarking. The locations of zeroes of the z-transform are very susceptible to any pixel value change. It has the advantage of easy implementation and pixel-wise sensitivity to external tampering. Moreover, it provides better data-hiding security protection than the normal LSBs check-sum fragile watermarking techniques.

In recent years, as digital media are gaining wider popularity, their security related issues are becoming greater concern. Digital watermarking is a technique which allows an individual to add copyright notices or other verification messages to digital media. Image authentication is one of the applications of digital watermarking, which is used for authenticating the digital images. The objective is not to protect the contents from being copied or stolen, but is to provide a method to authenticate the image and assure the integrity of the image. The way to realize this feature is to embed a layer of the authentication signature into the digital image using a digital watermark. In the case of the image being tampered, it can easily be detected as the pixel values of the embedded data would change and do not match with the original pixel values. There are many spatial and frequency domain techniques available for authentication watermarking.

Literatures on Previous Analysis

Previous methods have failed in providing robust behavior under many commonly considered attacks mainly, because they attempted to face the image, audio or video signal in a global sense, without

exploiting their local characteristics. In the case of image watermarking, employing spatial characteristics is essential for ensuring immunity to geometric transformations. When a watermark is embedded on the entire image, scaling, rotation or cropping will result in the destruction of the watermark because no reference points exist that would lead in finding the amount of scaling, rotation or cropping. The use of an image transform, with the exception of the Fourier transform, will suffer the same problems. The Fourier transform is theoretically rotation, translation and scale invariant, but the robustness to filtering or compression depends on the range of frequencies that are used for watermarking.

In our work, we propose a novel fragile watermarking scheme in the z-transform domain. The z-transform is a convenient yet invaluable tool for representing, analyzing, and designing discrete-time signals and systems. However, to our knowledge, this is the first time that this transform has been applied to digital watermarking. The locations of zeroes of the z-transform are very susceptible to any pixel value change. It has the advantage of easy implementation and pixel-wise sensitivity to external tampering. Moreover, it provides better data-hiding security protection than the normal LSBs check-sum fragile watermarking techniques.

Fragile Watermarking

It checks and detects even a small change in the host image. In other words it is a mark that is readily altered or destroyed when the host image is modified through a linear or nonlinear transformation. Fragile marks are not suited for enforcing copyright ownership of digital images, an attacker would attempt to destroy the embedded mark and fragile marks are, by definition, easily destroyed. The sensitivity of fragile marks to modification leads to their use in image authentication. That is, it may be of interest for parties to verify that an image has not been edited, damaged, or altered since it was marked. Fragile or semi-fragile watermarking schemes based on conventional DWT have been reported during the last few years. Tamper detection at multi-resolution had been achieved. But it violates the nature of the human visual system. It brings perceptible distortion to the watermarked images. Inoue et al. embedded fragile watermark by threshold and quantize wavelet coefficients at the coarser scales and gave a measurement for tamper proofing. Yu et al. modeled the DWT coefficient's changes caused by tamper as Gaussian distribution. Malicious tamper has large variance while incidental tamper has small variance. They embedded mark based on modulating the mean of some coefficients instead of individual coefficients.

Most conventional DWT based fragile or semi-fragile watermarking schemes reported in the literature have three shortcomings: (1) Insecurity. The schemes used only one wavelet base to perform the DWT. Once the algorithm was stolen by an attacker, the hidden information bits may be exposed or changed easily. (2) Low robustness to JPEG. (3) High computational complexity. Compared to DCT (discrete cosine transform), conventional DWT has less computational cost. But in the case of images having large size, it is still a problem when DWT applied to a whole image.

Background on Z-Transform

In signal processing, the Z-transform converts a discrete time domain signal (a sequence of real numbers), into a complex frequency domain representation. The Z-transform is to discrete time domain signals what the Laplace transform is to continuous time domain signals.

Definition: If we discrete a time series with a constant sampling interval T, we can write the time series in the following manner: $[x_k] = x_0, x_1, x_2, \ldots, x_k, \ldots$

Where each x_k represents the value (number) of the variable x (t) at time t = k T. We can represent this data in the following form:

$$x_0 + x_1 z^{-1} + x_2 z^{-2} + \ldots + x_k z^{-k} \ldots$$

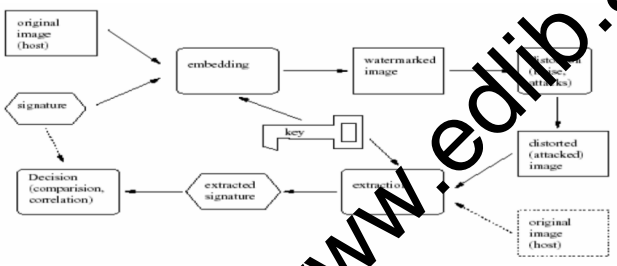
This form is a (symbolic) power series in the variable z^{-1}. We can also write it in the following more compact form:

$$Z[x_k] = \sum_{k=0}^{\infty} x_k z^{-k}.$$

In mathematics and signal processing, the **Z-transform** converts a discrete time-domain signal, which is a sequence of real or complex numbers, into a complex frequency-domain representation. It can be considered as a discrete equivalent of the Laplace transform. This similarity is explored in the theory of time scale calculus. The z-transform was introduced, under this name, by Ragazzini and Zadeh in 1952. The modified or advanced Z-transform was later developed by E. I. Jury, and presented in his book *Sampled-Data Control Systems* (John Wiley & Sons 1958). The idea contained within the Z-transform was previously known as the "generating function method".

Existing Method of Watermarking

Watermarking is previously done by using the wavelet transform, DCT, etc.



The image from the data base is taken using a user friendly menu selection. The image is then read using imread function available in Matlab image processing tool box. Then the content to be water marked is also read and stored in a variable. The block ztrans sub routine is called to perform z transforms operation. After the water marked image is returned from the block ztrans function, both the original and water marked image is shown in the screen using imshow function. In addition to the above we show the watermark which we added to the image. The PSNR is calculated using the formula as shown given below.

MSE = $\frac{1}{MN} \sum_{y=1}^{M} \sum_{x=1}^{N} [I(x,y) - I'(x,y)]^2$

PSNR = 20 * log10 (255 / sqrt (MSE))

Problem Identified

Most current image-watermarking research focuses on invisible watermarks, those which are imperceptible under normal viewing conditions. The different techniques that are used for invisible image watermarks can be categorized into two classes: spatial-domain watermarks and transform-domain watermarks. The embedding of the image-watermark data into the least-significant bits of image pixels is a typical approach employed by spatial-domain watermarking methods. For transform domain techniques, an image transform, such as the discrete cosine transform (DCT) or discrete wavelet transform (DWT), is employed, the watermark is added to the transform coefficients, and the corresponding inverse transform is taken.

As opposed to spatial-domain techniques which have relatively low bit capacity, transform-domain techniques can embed a large amount of watermark data without incurring noticeable visual artifacts, and they tend to be more robust than spatial-domain methods to attacks on the watermark. The problem with both spatial and frequency domain watermarking techniques is that they modify some pixels of the host

image directly or indirectly, which decreases the image quality. In addition, both of the techniques perform poorly when noise is added to the image. Apart from this most of the watermark techniques are not resistant to attacks.

Embedding strength in conventional method of water marking is low. Quantity of watermark data is low in conventional methods.

Proposed System

In this project we design and development for the fragile watermarking for digital image authentication by using the zeros of the z-transform. Digital image authentication is increasingly becoming more important with the tremendous development of the Internet. The ability of fragile watermarking to detect changes in the watermarked image to provide authenticity and integrity of the image makes it go a long way toward solving the image authentication problem. In contrast to a semifragile watermark, which only seeks to detect a predefined set of illegitimate distortions to the host image, a fragile watermark is designed to detect any change to the host image.

Hence, a variety of fragile watermarking methods has been proposed by embedding identifying information in the least-significant bits (LSBs) of the image. Unfortunately, these methods are somewhat unsecured as the use of LSBs could be easily detected and manipulated. However, the scheme was only able to localize distorted pixels altered in the five most significant bits. In our work, we propose a novel fragile watermarking scheme in the z-transform domain. The z-transform is a convenient yet invaluable tool for representing, analyzing, and designing discrete-time signals and systems. However, to our knowledge, this is the first time that this transform has been applied to digital watermarking. The locations of zeroes of the z-transform are very susceptible to any pixel value change. It has the advantage of easy implementation and pixel-wise sensitivity to external tampering. Moreover, it provides better data-hiding security protection than the normal LSBs check-sum fragile watermarking techniques.

Watermark Embedding and Detecting

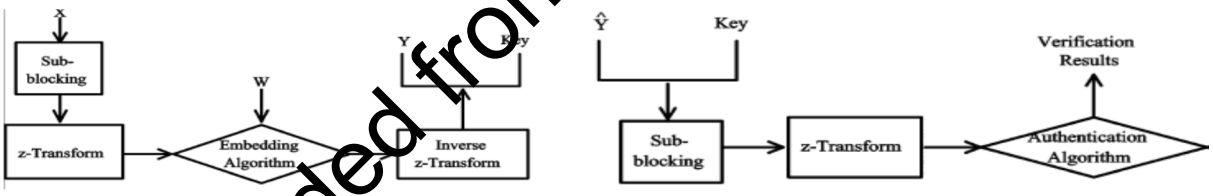


Image Authentication Algorithm for Watermarking Process

Watermarking process

1. The original image X is divided into non overlapping blocks of size NxN, where N is an even positive integer.
2. By viewing it row by row, each block can be expressed as a sequence of vectors.
3. We then perform the z-transform and obtain the zeroes.
4. We embed the watermark w by slightly perturbing the locations of the zeroes, where w is a binary sequence of N. The watermark bits are randomly generated and the initial seed number is contained in a secret key file. A watermark signal of N bits long is embedded into every block, that is, one bit is embedded into every vector. To avoid the complex number computation, we embed the authentication watermark by slightly modifying the modulus of negative real zeroes.
5. After the watermark embedding process, we transform the zeroes back to the sequence using the inverse z-transform. We then obtain another vector X'
6. The output of this work is nothing but the Water marked image Y and the key generated k.

Algorithm for Authentication Process

Authentication process

1. In the authentication process, we need the watermarked image and the secret key to identify the watermark.
2. Let the watermarked image after passing through variant communication channels be Y'. The watermark sequence w is generated using the initial state number contained in the key.
3. The authentication process also starts by dividing the image into small blocks of size N x N. In every block, by applying the z-transform to every row, we obtain the zeroes.
4. We find the values of p from the hash functions and the watermarked image block after z transform

Strengths and Limitations

In this project we did the watermarking and authentication process by taking z-transform to the given image. Generally watermarking is done by using Fourier transform and the wavelet transform. The advantages of using the z-transform in watermarking are no need to have the host image. We do the fragility check without the host image. Everything was done with the key and the watermarked image.

Results & Analysis

In this project we introduce the new idea for watermarking generally watermarking is done by using the wavelet transform but in this project we prefer z-transform for fragile watermarking for digital image authentication. The original image X is divided into non overlapping blocks of size N _ N, where N is an even positive integer. By viewing it row by row, each block can be expressed as a sequence of vectors $\{x_m\}$, m = 0; 1; . . . ; N-1, where $x_m = \{x_m[n]\}$, n = 0; 1; . . . ; N-1. We then perform the z-transform and obtain the zeroes, which are denoted as $\{z_{m;i}\}$ i = 1; . . . ; N-1, and m = 0; . . . ; N-1.

We embed the watermark w by slightly perturbing the locations of the zeroes, where w is a binary sequence of N. The watermark bits are randomly generated and the initial seed number is contained in a secret key file. A watermark signal of N bits long is embedded into every block, that is, one bit is embedded into every vector. To avoid the complex number computation, we embed the authentication watermark by slightly modifying the modulus of negative real zeroes, which are denoted by z_{nr}. As proven in Section II, since N is even, which is the case under most circumstances for natural images; there must be at least one real negative zero in the zero set of a pixel vector. Besides the negative real zero, there are (N=2)-1 pairs of complex zeroes for every vector (the number of complex zeroes would be less if multiple negative real zeroes exist). The small positive offset € determines the tradeoff between the fragility of the watermarking scheme and the quality of the watermarked image.

After the watermark embedding process, we transform the zeroes back to the sequence using the inverse z-transform. We then obtain another vector x'_m, which is slightly different from the one before watermarking. By applying the aforementioned process to all of the relevant blocks, we obtain the watermarked image Y.

In the authentication process, we need the watermarked image and the secret key to identify the watermark. Let the watermarked image after passing through variant communication channels be Ý. The watermark sequence w is generated using the initial state number contained in the key. The authentication process also starts by dividing the image into small blocks of size N*N.

Simulation Results

In this project we introduce the new idea for watermarking generally watermarking is done by using the wavelet transform but in this project we prefer z-transform for fragile watermarking for digital image

authentication. The original image X is divided into non overlapping blocks of size N _ N, where N is an even positive integer. By viewing it row by row, each block can be expressed as a sequence of vectors $\{x_m\}$, m = 0; 1; . . . N-1, where $x_m = \{x_m[n]\}$, n = 0; 1; . . . ; N-1. We then perform the z-transform and obtain the zeroes, which are denoted as $\{z_{m;i}\}$ i = 1; . . . ; N-1, and m = 0; . . . ; N-1.

We embed the watermark w by slightly perturbing the locations of the zeroes, where w is a binary sequence of N. The watermark bits are randomly generated and the initial seed number is contained in a secret key file. A watermark signal of N bits long is embedded into every block, that is, one bit is embedded into every vector. To avoid the complex number computation, we embed the authentication watermark by slightly modifying the modulus of negative real zeroes, which are denoted by z_{nr}. As proven, since N is even, which is the case under most circumstances for natural images; there must be at least one real negative zero in the zero set of a pixel vector. Besides the negative real zero, there are (N=2)-1 pairs of complex zeroes for every vector (the number of complex zeroes would be less if multiple negative real zeroes exist). The small positive offset € determines the tradeoff between the fragility of the watermarking scheme and the quality of the watermarked image.

After the watermark embedding process, we transform the zeroes back to the sequence using the inverse z-transform. We then obtain another vector x'_m, which is slightly different from the one before watermarking. By applying the aforementioned process to all of the relevant blocks, we obtain the watermarked image Y.

In the authentication process, we need the watermarked image and the secret key to identify the watermark. Let the watermarked image after passing through various communication channels be Ý. The watermark sequence w is generated using the initial state number contained in the key. The authentication process also starts by dividing the image into small blocks of size N*N.

Fig: authenticated image

Fig: Tampered image

Fig: authenticated image

Fig: Tampered image

Conclusion

No need to have the host image. We do the fragility check without the host image. Everything is done with the key and the watermarked image. The project can be extended further with some other techniques like wavelet and DCT combined with z-transform for digital image authentication process. The computation time can be reduced by using high end processors. The same work can be extended for visible watermarking also.

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VHDL Implementation of USB Transceiver Macro cell Interface with 2.0 Specifications

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Abstract: The Universal Serial Bus(USB) Transceiver Macro cell Interface (UTMI) is a two wire, bi-directional serial bus interface. The USB2.0 specifications define three types of UTMI implementations depends on data transmission rates, those are Low Speed (1.5MHz) only (LS), Full Speed (12MHz) only (FS) and High Speed (480MHz)/Full speed (12MHz) (HS). UTMI consists of Transmitting and Receiving sections, in which the Transmitter of the UTMI sends data to different USB devices through D+ and D- lines whereas the Receiver gets data on the same lines. This presentation reveals the FPGA implementation of UTMI with HS/FS transmission rate providing with USB 2.0 specifications. Further UTMI has been designed by using VHDL code and simulated, synthesized and programmed to the targeted Spartan2family of FPGA in the Xilinx environment

1. Introduction

The Universal Serial Bus (USB) Transceiver Macrocell Interface (UTMI) is a two wire, bi- directional serial bus interface between USB devices through D+ and D- lines. This is one of the important functional blocks of USB controller, which can transmit and receive data to or from USB devices. There are three functional blocks present in USB controller; those are Serial Interface Engine (SIE), UTMI and Device Specific Logic (DSL). Figure 1 shows the block diagram of UTMI. The parallel data from SIE is taken into the transmit hold register and this data is sent to transmit shift register from where the data is converted serially. This serial data is bit stuffed to perform data transitions for clock recovery and NRZI (1) encoding. Then the encoded data is sent out to the serial bus. When the data is received on the serial bus, it is decoded, bit unstuffed and is sent to receive shift register. After the shift register is full, the data is sent to receive hold register.

2. Design Aspects

The present UTMI has been designed according to the following specifications provided by the USB 2.0 protocol. SYNC and End of Packet (EOP) generation by the transmitter. SYNC and EOP detection by the receiver. Receive error reporting. Enabling or disabling the bit stuffer and NRZI encoder depends on the operational mode Suspension of the transceiver by the SIE.Further the UTMI is divided into two important modules which are the Transmitter module and the Receiver module. In this section the design Considerations of these modules have been explained separately and integrated to get top level Transceiver (UTMI) module

2.1 The Transmitter Module

The block diagram of the UTMI transmitter is shown in Figure2. The transmitter module has been implemented by considering the following specifications. The SYNC pattern "01111110" has to be transmitted immediately after the transmitter is initiated by the SIE. After six consecutive '1's occur in the data stream a zero to be inserted. The data should be encoded using Non Return to Zero Invert on 1 (NRZI -1) encoding technique. The EOP pattern two single ended zeroes(D+ and D- lines are carrying zero for two clock cycles) and a bit one have to be transmitted after each packet or after SIE suspends the transmitter This data will be presented on the parallel interfacewhere it is sampled by the SIE. The intent of the UTMI is to accelerate USB 2.0 peripheral development.

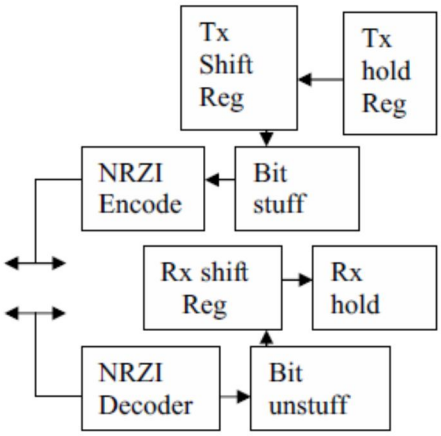

Figure 1: Block diagram of UTMI

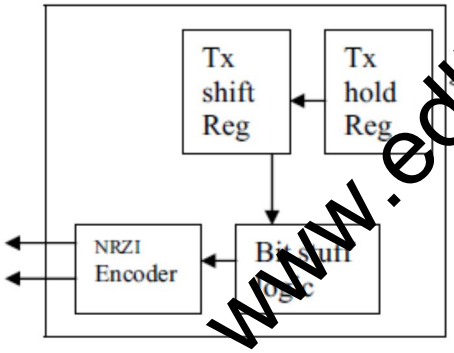

Figure 2: Block diagram of UTMI Transmitter

2.2 The Receiver Module

The block diagram of the UTMI receiver is shown in Figure 3. The receiver module has been implemented by considering the following specifications. When SYNC pattern is detected that should be intimated to the SIE. If a zero is not detected after six consecutive '1's an error should be reported to the SIE. When EOP pattern is detected that should be intimated to the SIE.

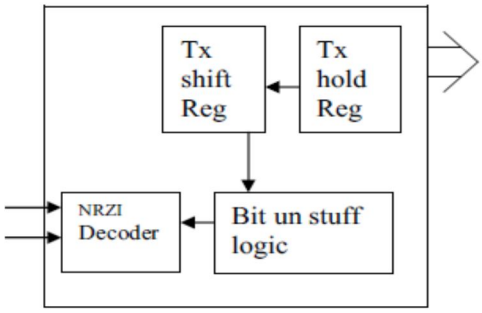

Figure 3: Block diagram of UTMI Receiver.

The receiver logic facilitates SYNC detection, NRZI decoding, bit un stuffing, serial to parallel conversion of data, receive error reporting and EOP detection.

2.3 The Transceiver Module

The transmitter and the receiver modules are combined together to design the transceiver (UTMI) module. This transceiver met all the USB2.0 specifications considered above. The transceiver logic facilitates the output of the transmitter to feed to the input of the receiver for functional verification. The Transceiver module has been designed with the considerations of individual modules of the transmitter and the receiver Specifications. Further the required Transceiver module logic has been verified with the functional simulation followed by necessary Synthesis and perform Programming to the targeted FPGA Device.

3. Simulaton Results

The individual modules of the UTMI are designed using VHDL as stated above and they are simulated within the Xilinx based Model Sim 6.0 environment

3.1 The Transmitter Module

The Figure 4 shows the Simulation results of UTMI transmitter. When TX valid signal goes high, encoded SYNC pattern “01010100”is transmitted and the signal txready is asserted. The data “10110100” present on the dataIn bus is NRZI encoded and transmitted on to the txdp, txdm lines. The signal txready goes low when the data is sampled by the TX hold register.

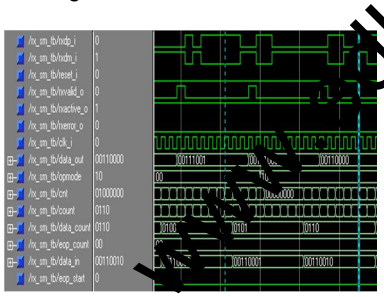

Figure 4 The Transmitter Module

3.2 The Receiver Module

The Figure 5 shows the Simulation results of UTMI receiver. When SYNC is detected rxactive is asserted. The data present on rxdp, rxdm lines is decoded, serial to parallel converted and sent to the SIE through data out bus by asserting rxvalid signal.

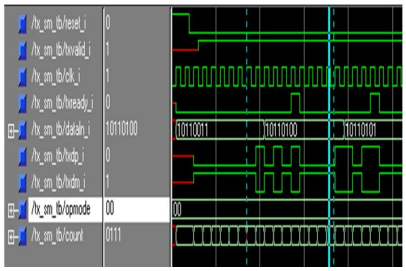

Figure 5 The Receiver Module

3.3 The Transceiver Module

The Figure 6 shows the Simulation results of the Transceiver module which transmits and receives data. When txvalid goes high, SYNC is transmitted. The data “00000000” present on the data_bustx is NRZI encoded and transmitted on to the dp, dm lines.

When SYNC is detected by the receiver rxactive is asserted by the UTMI. The data present on the dp, dm lines is NRZI decoded and sent to the SIE through rxdata_bus by asserting rxvalid signal. Rxdata_bus contains “00000000” since the transmitted data is fed back to the receiver.

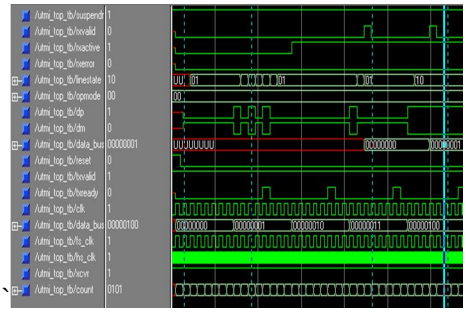

Figure 6: Transceiver (UTMI) Module.

4. FPGA Implementation

The top order module, UTMI is synthesized within the Xilinx 8.1 ISE software tool and it is programmed to the targeted SPARTAN 2 family of FPGA Device. The various levels of implementation such as Synthesis report, RTL View, Place and Route Report and Device Programming has been explained and visualized in the following sub sections

4.2 RTL View

This section gives the visualization of Resister Transistor Logic (RTL) views in the form of schematic and Netlist diagrams which are shown in Figure 7 and Figure 8 respectively. Figure 7 which gives RTL schematic diagram reveals the pin diagram of Top order module with the required specified notes whereas Figure 8 reveals the Gate level logic diagram of Top order module with the required input and output ports(Netlist view).

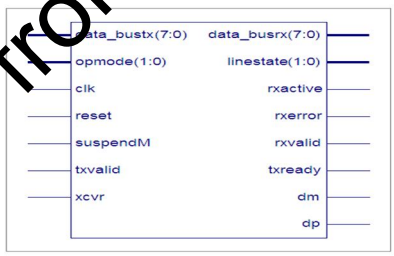

Figure 7: RTL Schematic diagram

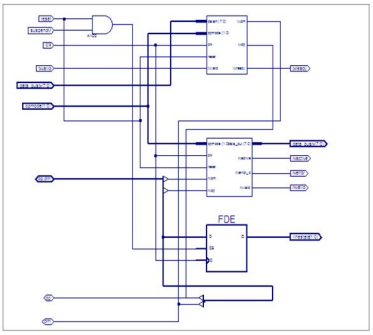

Figure 8: RTL netlist view

4.3 Place and Route Report

This section concentrates on target FPGA device utilization summary which reveals the information required for proper layout at the level of manufacturing in the form of Place and Route report. Further it gives the timing synchronization of CPU with the REAL time environment.

4.4 Device Programming

After successful process of synthesis the Target device xc2s15 of Spartan2 is connected to the system through printer port. The pin assignment is specified in the User Constraint File (UCF). The functional verification is carried out by using a pattern generator.

5. Conclusion

The individual modules of UTMI have been designed using VHDL and verified functionally with the Model Sim 6.0.The UTMI Transmitter is capable of converting parallel data into serial bits, performing bit stuffing and NRZI encoding.The UTMI Receiver is capable of performing NRZI decoding bitunstuffing and converting serial bits into parallel data.

The functional simulation has been successfully carried out. The design has been synthesized using FPGA technology from Xilinx. This design is targeted to the device family spartan2, device xc2s15, and package cs144 and speed grade 6. The device belongs to the Vertex-E group of FPGAs from Xilinx. The UTMI is designed to support HS/FS, FS Only and LS Only UTM implementations. The three options allow a single SIE implementation to be used with any speed USB transceiver. A vendor can choose the transceiver performance that best meets their needs.

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Optimized Mobile Search Engine Using Click-Through Data

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Abstract—Data mining is a system employing for more computer learning technique to automatically analyse and extracting knowledge from data stored in the database. The goal of data mining is to extract hidden predictive information from database. This paper make use of data mining concept for collecting user's multiple preference from click through data. we propose a personalized mobile search engine (PMSE) that captures the users' preferences in the form of concepts by mining their click through data. Due to the importance of location information in mobile search, PMSE classifies these concepts into content concepts and location concepts. In addition, users' locations (positioned by GPS) are used to represent the location concepts in PMSE. The user preferences are organized in an ontology-based, multi-facet user profile, which are used to adapt a personalized ranking function for rank adaptation of future search results. To characterize the diversity of the concepts associated with a query and their relevance to the user's need. based on the client-server model, we also present a detailed architecture and design for implementation of PMSE. In our design, the client collects and stores locally the click through data to protect privacy, whereas heavy tasks such as concept extraction, training, and reranking are performed at the PMSE server. Moreover, we prototype PMSE on the Google Android platform.

1. Introduction

A major problem in mobile search is that the interactions between the users and search engines are limited by the small form factors of the mobile devices. As a result, mobile users tend to submit shorter, hence, more ambiguous queries compared to their web search counter parts. In order to return highly related results to the users, mobile search engines must be able to profile the users' interests and personalize the search results according to the users' profiles. We present in this paper a personalized mobile search engine(PMSE) which represents different types of concepts in different ontologies.

We separate concepts into location concepts and content concepts. For example, a user who is planning to visit Japan may issue the query "hotel," and click on the search results about hotels in Japan. From the click-through of the query "hotel," PMSE can learn the user's content preference (e.g., "room rate" and "facilities") and location preferences ("Japan"). Accordingly, PMSE will favour results that are concerned with hotel information in Japan for future queries on "hotel." The introduction of location preferences offers PMSE an additional dimension for capturing a user's interest and an opportunity to enhance search quality for users.

GPS locations play an important role in mobile web search. For example, if the user, who is searching for hotel information, is currently located in "Shinjuku, Tokyo," his/her position can be used to personalize the search results to favour information about nearby hotels. Here, we can see that the GPS locations (i.e., "Shinjuku, Tokyo") help reinforcing the user's location preferences (i.e., "Japan") derived from a user's search activities to provide the most relevant results. A realistic design for PMSE by adopting the meta search approach which relies on one of the commercial search engines, such as Google, Yahoo, or Bing, to perform an actual search. The client is responsible for receiving the user's requests, submitting the requests to the PMSE server, displaying the returned results, and collecting his/her click through in order to derive his/her personal preferences. The PMSE server, on the other hand, is responsible for handling heavy tasks such as forwarding the requests to a commercial search engine, as well as training. And reranking of search results before they are returned to the client. The user profiles for specific users are stored on the PMSE

clients, thus preserving privacy to the users. PMSE has been prototyped with PMSE clients on the Google Android platform and the PMSE server on a PC server to validate the proposed ideas.

We also recognize that the same content or location concept may have different degrees of importance to different users and different queries. To formally characterize the diversity of the concepts associated with a query and their relevance to the user's need, we introduce the notion of content and location entropies to measure the amount of content and location information associated with a query. Similarly, to measure how much the user is interested in the content and/or location information in the results, we propose click content and location entropies. Based on these entropies, we develop a method to estimate the personalization effectiveness for a particular query of a given user, which is then used to strike a balanced combination between the content and location preferences. The results are re -ranked according to the user's content and location preferences before returning to the client.
The main contributions of this paper are as follows:

- This paper studies the unique characteristics of content and location concepts, and provides a coherent strategy using a client-server architecture to integrate them into a uniform solution for the mobile environment.
- It studies the unique characteristics of content and location concepts, and provides a coherent strategy using a client-server architecture to integrate them into a uniform solution for the mobile environment.

2. Related Work

Click through data have been used in determining the users' preferences on their search results. Many existing personalized web search systems are based on click through data to determine users' preferences. Joachims [10] proposed to mine document preferences from click through data. Later, Ng et al. [15] proposed to combine a spying technique together with a novel voting procedure to determine user preferences. More recently, Leung et al. [12] introduced an effective approach to predict users' conceptual preferences from click through data for personalized query suggestions. Search queries can be classified as content (i.e., non-geo) or location (i.e., geo) queries. Examples of location queries are "Hong Kong hotels," "museums in London," and "Virginia historical sites." In [9], Gan et al. developed a classifier to classify geo and non-geo queries. It was found that a significant number of queries were location queries focusing on location information. In order to handle the queries that focus on location information, a number of location-based search systems designed for location queries have been proposed.

Later on, Chen et al. [7] studied the problem of efficient query processing in location-based search systems. A query assigned with a query footprint that specifies the geographical area of interest to the user. Several algorithms are employed to rank the search results as a combination of a textual and a geographic score. More recently, Li et al. proposed a probabilistic topic-based framework for location- sensitive domain information retrieval. Instead of modeling locations in latitude-longitude pairs, the model assumes that users can be interested in a set of location sensitive topics. It recognizes the geographical influence distributions of topics, and models it using probabilistic Gaussian Process classifiers.

The differences between existing works and ours are:

- We propose and implement a new and realistic design for PMSE. To train the user profiles quickly and efficiently, our design forwards user requests to the PMSE server to handle the training and reranking processes.
- Existing works on personalization do not address the issues of privacy preservation. PMSE addresses this issue by controlling the amount of information in the client's user profile being exposed to the PMSE server using two privacy parameters, which can control privacy smoothly, while maintaining good ranking quality.

3. System Design

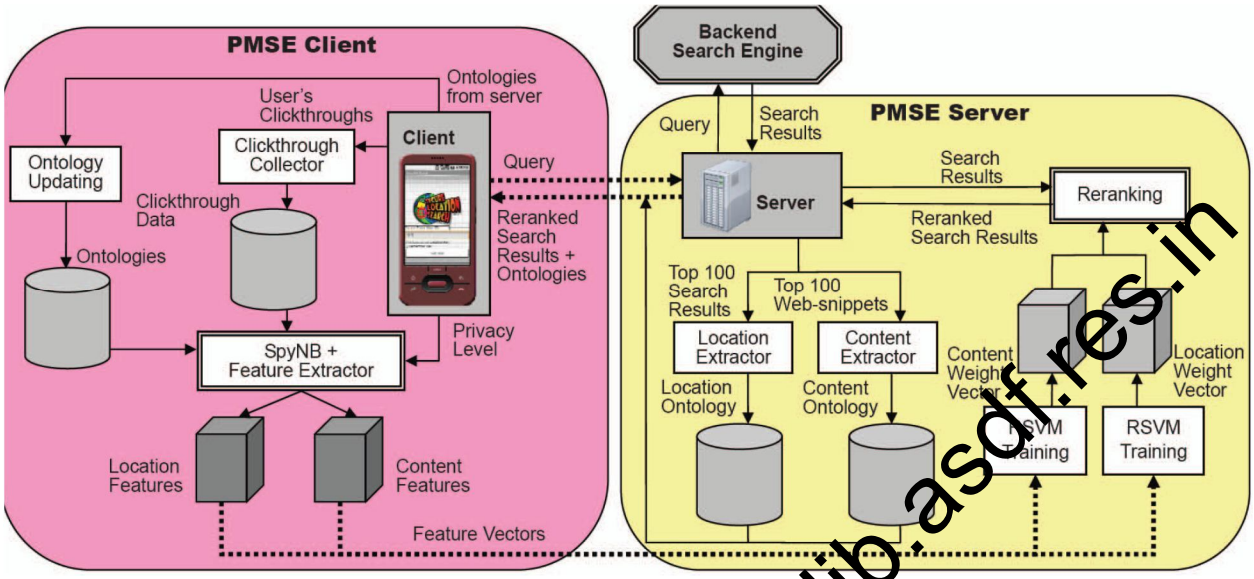


Fig. 1. The general process flow of PMSE

Fig. 1 shows PMSE's client-server architecture, which meets three important requirements. First, computation-intensive tasks, such as RSVM training for learning a linear weight vector (consisting both content and location features) to rank the search results. Second, data transmission between client and server should be minimized to ensure fast and efficient processing of the search. Third, click through data, representing precise user preferences on the search results, should be stored on the PMSE clients in order to preserve user privacy. In the PMSE's client-server architecture, PMSE clients are responsible for storing the user click through and the ontologies derived from the PMSE server. Simple tasks, such as updating click thoughts and ontologies, creating feature vectors, and displaying reranked search results are handled by the PMSE clients with limited computational power. On the other hand, heavy tasks, such as RSVM training and reranking of search results are handled by the PMSE server.

PMSE consists of two major activities:

1. Reranking the search results at PMSE server

When a user submits a query on the PMSE client, the query together with the feature vectors containing the user's content and location preferences (i.e., filtered ontologies according to the user's privacy setting) are forwarded to the PMSE server, which in turn obtains the search results from the back-end search engine (i.e., Google). The content and location concepts are extracted from the search results and organized into ontologies to capture the relationships between the concepts. The server is used to perform ontology extraction for its speed. The feature vectors from the client are then used in RSVM training to obtain a content weight vector and a location weight vector, representing the user interests based on the user's content and location preferences for the reranking. Again, the training process is performed on the server for its speed. The search results are then reranked according to the weight vectors obtained from the RSVM training. Finally, the reranked results and the extracted ontologies for the personalization.

2. Ontology update and clickthrough collection at PMSE client

Ontology formally represents knowledge as a set of concepts within a domain, and the relationships among those concepts. It can be used to reason about the entities within that domain and may be used to describe

the domain. Here, we are using the ontology concept to group the data as per the related domain. So that, if the user search the data, the data will displayed in domain they are requesting. Many geographical relationships among locations have already been captured as facts.The ontologies returned from the PMSE server contain the concept space that models the relationships between the concepts extracted from the search results. They are stored in the ontology database on the client. When the user clicks on a search result, the clickthrough data together with the associated content and location concepts are stored in the clickthrough database on the client. When the user clicks on a search result, the clickthrough data together with the associated content and location concepts are stored in the clickthrough database on the client. The clickthroughs are stored on the PMSE clients, so the PMSE server does not know the exact set of documents that the user has clicked on. This design allows user privacy to be preserved in certain degree. Two privacy parameters, min distance and expRatio, are proposed to control the amount of personal preferences exposed to the PMSE server. If the user is concerned with his/her own privacy, the privacy level can be set to high so that only limited personal information will be included in the feature vectors and passed along to the PMSE server for the personalization.

On the other hand, if a user wants more accurate results according to his/her preferences, the privacy level can be set to low so that the PMSE server can use the full feature vectors to maximize the personalization effect. To address privacy issues, clickthroughs are stored on the PMSE client, and the user could adjust the privacy parameters to control the amount of personal information to be included in the feature vectors, which are forwarded to the PMSE server for RSVM training to adapt personalized ranking functions for content and location preferences.

Content Ontology

Our content concept extraction method first extracts all the keywords and phrases (excluding the stop words) from the web-snippet sarising from q. If a keyword/phrase exists frequently in the web-snippets arising from the query q, we would treat it as an important concept related to the query, as it coexists in close proximity with the query in the top documents. The following support formula, which is inspired by the well-known problem of finding frequent item sets in data mining, is employed to measure the importance of a particular keyword/phrase p with respect to the query q.

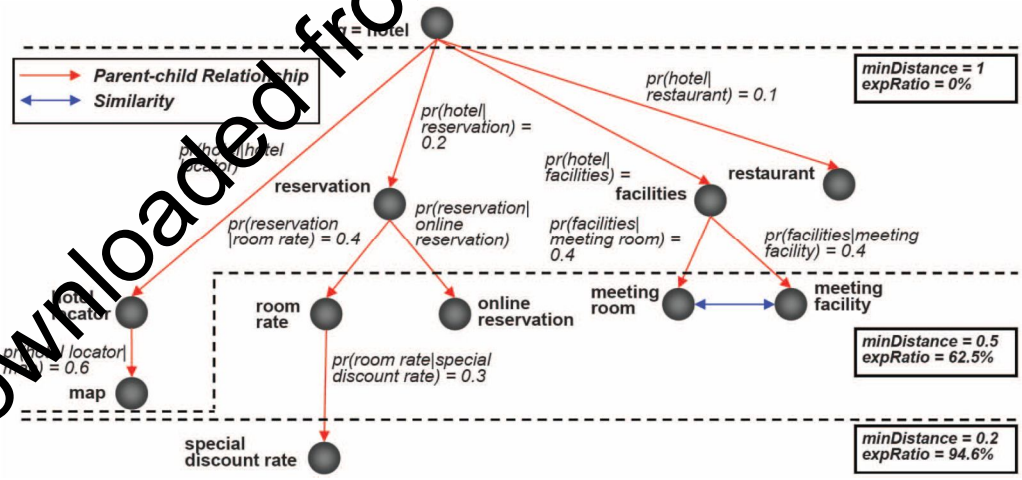


Fig. 2. Ontology for q ="hotel" with p=0.2,0.5,1.0

Fig. 2 shows an example content ontology created for the query "hotel," where content concepts linked with a one sided arrow (→) are parent-child concepts, and concepts linked with a double-sided arrow (←>) are similar concepts. Fig. 2 shows the possible concept space determined for the query "hotel," while the click through data determine the user preferences on the concept space.

Location Ontology

Our approach for extracting location concepts is different from that for extracting content concepts. We observe two important issues in location ontology formulation. First, a document usually embodies only a few location concepts, and thus only very few of them co-occur with the query terms in web-snippets. To alleviate this problem, we extract location concepts from the full documents. Second, the similarity and parent-child relationship cannot be accurately derived statistically because the limited number of location concepts embodied in documents. Furthermore, many geographical relationships among locations have already been captured as facts.

Table 1 Statistics of the Location Ontology

No. of Countries	8	Total no. of nodes	17899
No. of Regions	200	Country region nodes	200
No. of Provinces	5700	Region-Province nodes	1959
No. of Towns	10233	Province-City nodes	15897

We organize all the cities as children under their provinces, all the provinces as children under their regions, and all the regions as children under their countries. The statistics of our location ontology are provided in Table 1.The predefined location ontology is used to associate location information with the search results. All of the keywords and key-phrases from the documents returned for query q are extracted. If a keyword or key-phrase in a retrieved document d matches a location name in our predefined location ontology, it will be treated as a location concept of d. For example, assume that document d contains the keyword "Los Angeles." "Los Angeles" would then be matched against the location ontology. Since "Los Angeles" is a location in our location ontology, it is treated as a location concept related to d. Furthermore, we would explore the predefined location hierarchy, which would identify "Los Angeles" as a city under the state "California." Thus, the location "/United States/California/Los Angeles/" is associated with document d. If a concept matches several nodes in the location ontology, all matched locations will be associated with the document.

4. Experimental Evaluation

In this section, we evaluate the effectiveness of PMSE. We describe the experimental setup in the following section then, we evaluate the ranking quality of PMSE with different user profiles. We study the effect of noise clicks on the personalization quality.

Experiment Methodology

The experiment aims to answer the following question: Given that a user is only interested in some specific aspects of a query, can PMSE generate a ranking function personalized to the user's interest from the user's clickthroughs?

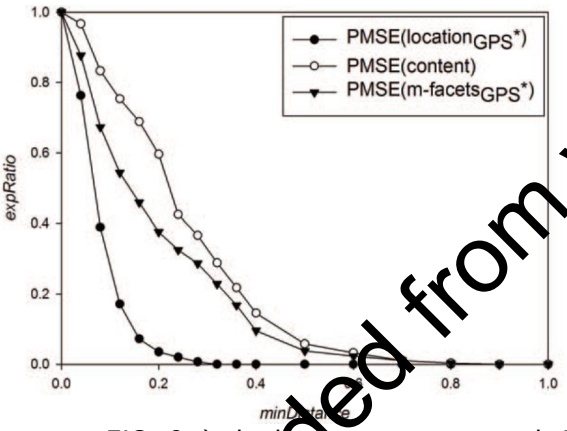
To answer this question, we need to evaluate the search results before and after personalization. The difficulty of the evaluation is that only the user who conducted the search can tell which of the results are relevant to his/her search intent. This is in contrast to the evaluation of traditional information retrieval systems [20], where expert judges are employed to judge the relevance of a set of documents (e.g., TREC) based on a detailed description of the information need. The relevance judgment is then considered the standard to judge the quality of the search results. This evaluation method clearly cannot be applied to personalized search, because what an expert judge considered as relevant to a query needs not be relevant from another user's point of view because the same query issued by two different users may have different goals behind it. Instead of using a small number of users each searching a large number of queries we use a large number of users each searching a small number of queries to prevent the users from overly adapted to the system.

For example, when the topical category is “photography” and the query is “canon,” the user will look for information about “canon” digital cameras but not “canon” laser printers or “canon” as a location name. Yet, within the “photography” category, the user can decide what to look for, e.g., specific products, photo gallery, etc.

5 Analysis & Results

Privacy versus Ranking Quality

We evaluate PMSE’s privacy parameters, min Distance and expRatio, against the ranking quality. We plot expRatio(the amount of private information exposed) against min Distance for a number of PMSE methods in Fig. 9a. The expRatio of PMSE(content), which employs content ontology only, decreases uniformly from 1 to nearly zero when min Distance increases from 0 to 0.7.minDistance measures the distance of a concept away from the root (i.e., too specific).Since the heights of the trees in the content ontology are mostly less than 0.7, most of the concepts are pruned when min Distance>0:7 in PMSE (content). On the other hand, the expRatio of PMSE (location GPS_), which employs location ontology only, decreases uniformly from 1 to nearly zero when min Distance increases from 0 to 0.3. The heights of the trees in the location ontology are mostly less than 0.3. We observe that a node in the location ontology can associate many children (e.g., a country has many provinces or states, a province/state has many cities). Once a node is pruned in the location ontology, all the children will also be pruned, thus expratio decreases much faster than that in PMSE (content). Finally, the expRatio of PMSE (m-facets GPS_), which employs both content and location ontologies, decreases faster than PMSE (content), but slower than PMSE (location GPS_).



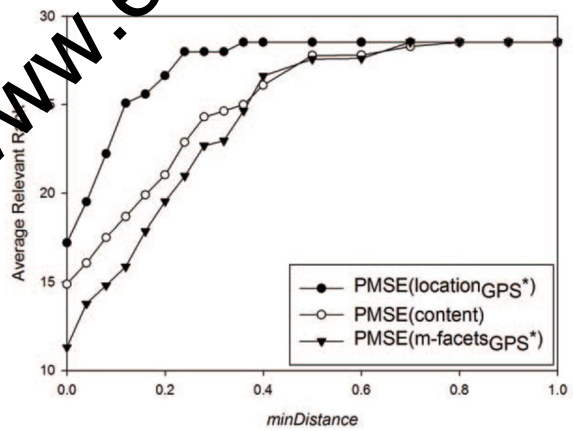


FIG 9 a)min distance versus exp ratio FIG 9 b)min distance vs average relevant rank

We plot the ARR of the search results against minDistance in Fig. 9b. As discussed before, the amount of private information exposed (expRatio) in PMSE (content) drops uniformly when minDistance increases from 0 to 0.7. Thus, the ARR of PMSE (content) increases uniformly when minDistance increases from 0 to 0.7. Similarly, the ARR of PMSE (location GPS_) increases uniformly when minDistance increases from 0 to 0.3, and the ARR of PMSE (m-facets GPS_)increases uniformly when minDistance increases from 0 to 0.6.

Conclusion

We proposed PMSE to extract and learn a user’s content and location preferences based on the user’s clickthrough.To adapt to the user mobility, we incorporated the user’s GPS locations in the personalization process.We also proposed two privacy parameters, minDistance and expRatio, to address privacy issues in PMSE by allowing users to control the amount of personal information exposed to the PMSE server. The privacy parameters facilitate smooth control of privacy exposure while maintaining good ranking quality. For future work, we will investigate methods to exploit regular travel patterns and query patterns from the GPS and clickthrough data to further enhance the personalization effectiveness of PMSE.

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System Design using FPGA

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Abstract— This paper provides the importance of System Design using FPGA for Engineering Education to utilize it as a commercial device to deliver a product, proposed by comparing with various technologies and tools with concern to Area, Speed and Power consumption of commercially available high-capacity FPGAs. According to the requirement of field applications the FPGAs are suitable to reach the Time to Market (TTM) of a product by avoiding the role of process industries up to some extent.

The recent developing trends in VLSI Technology are Full custom design,ASICs,FPGAs,CPLDs, Masking and Non Masking of PLDs, Top to DN, DN to Top approaches of the semicustomdesigns like ASICs,FPGAs Field-Programmable Gate Arrays (FPGAs). The Architecture and implementation methods would be discussed here in detaill

Keywords—Fullcustoms,FPGAs,Latches,Power,Area,Speed, K-Maps,CPLDs

I. Introduction

Types of IC Technologies and Implementation methods are mainly derived into the following methods shown in Figure-

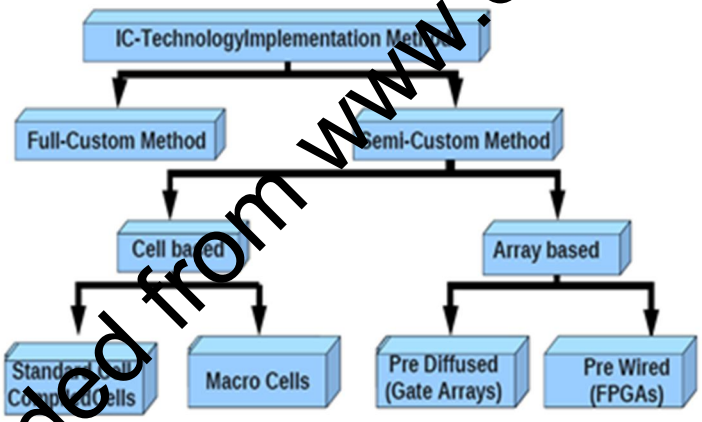


Figure-1 Types of IC-Technologies

Full Custom Design: The Full custom design flow of the VLSI Technology is more concerned with micro based technology which consists of Sub-micron level

A. Behavioral Level /Architectural level exploration and simulation by using HDL Languages like VHDL/ Verilog/ Verilog-a/ABEL for Conceive Design Implementation and Operation CDIO mechanisms

B. Transistors schematic design to implement the Boolean function 'F' consists of A, B, C… by using the formula F-UP/PMOS, F-DN/NMOS network can be obtained from the formula given below for PMOS, NMOS respectively

F-UP/PMOS = F (A', B', C',.....) - - - - - -- -Equation-1 F-DN/NMOS = (Boolean function F)'- - - - - - - - - Equation-2

In this formula Demorgan's principles enormously used to get schematic design and simulations (by adjusting the transistor sizing between PMOS/Power-UP network or NMOS/Power-DN network,

calculating the I_d values and all) has to meet the Behavioral level's simulations by doing the iterations and then continued for the layout design described in the part 'C'

C. In the Layout design we need to follow the Lambda based or Submicron rules (Micro based design) to implement the Layout designs by using the standard layers (here four layer technology of AMS-Austrian Micro Systems based process rules are using) by special Manhattan's principle, Euler-Path techniques were used to develop the layout to get the Optimistic values of getting Chip Area, Power, High speed, low cost for bulk production is here Layout (vs) Schematic are compared if they are equal(number of devices, number of interconnects) then proceeds for the insertion of this layout into the PAD frame(Chip Assembly) for Electro Static Discharge ESD protection I/O buffers for i/p,o/p connections, Analog protected input output frames (APRIOP) for the circuit protection and then converted to the GDS-II file format(Tape Out) for Fabrication industry by inserting the CAP NET on the total layout design in the pad frame.

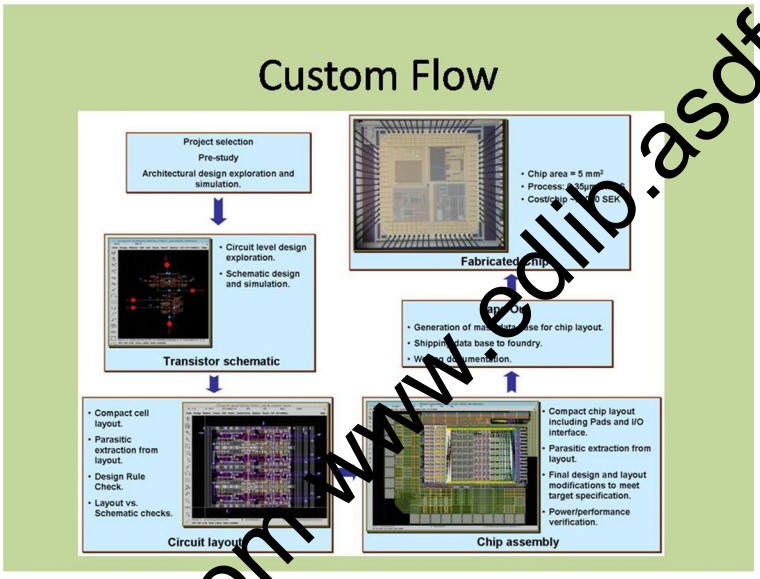


Figure-2 Flow of Full Custom Design

This process method would give more efficient results because it's a pure handcrafting techniques are used(Intel 4004 Microprocessor is the worlds Single ChipMicroProcessor was developed by fullcustom designs in 1971 and now also implementing for super computers or Hyper Supercomputers only especially for Timing Modules like PLL,DLL,A/D,D/A converter at which the clock recovery mechanisms are more important) concern to Area, Low Power, High Speed but the more skilled designer is needed, Time to reach the market would be very much slow may be (months to year) though it is suitable for bulk/mass production with low cost, and also It is too tough for developing countries which doesn't have the process industries, to get the fabricated chip would consume more time which may not reach the market to launch the developed product, If any error comes while designing the product/ at the time of processing may leads to the loss by time, cost, scope of rectification to the design and fault finding in each level of design stage leads to more time.

Cadence ICFB tools (consists of Verilog-a,Virtuoso Schematic Composer for transistors level schematic capture, Analog environment with Spectre simulators, Virtuoso Layout for layout by using LSW window, Diva for DRC (design rule checking)

DRC:- Check the layout for design (sub-micron)rule violations
Extract:- Create a extracted view of the layout. This view is used for simulations.
Markers:- *Explain*: click on the marker to find out the design rule violated. Remove all the markers after a DRC run,

Semicustom Designs: Application Specific Integrated Circuits Design flow (ASIC) In this design process some latest techniques can also be incorporated for Layout designs by using Physically Knowledgeable Synthesis (PKS) for layouts, NC-Launch and Soc-Encounter too.

Common Design flow for Semicustom Designs of ASIC and FPGA are in continuation with the following figure

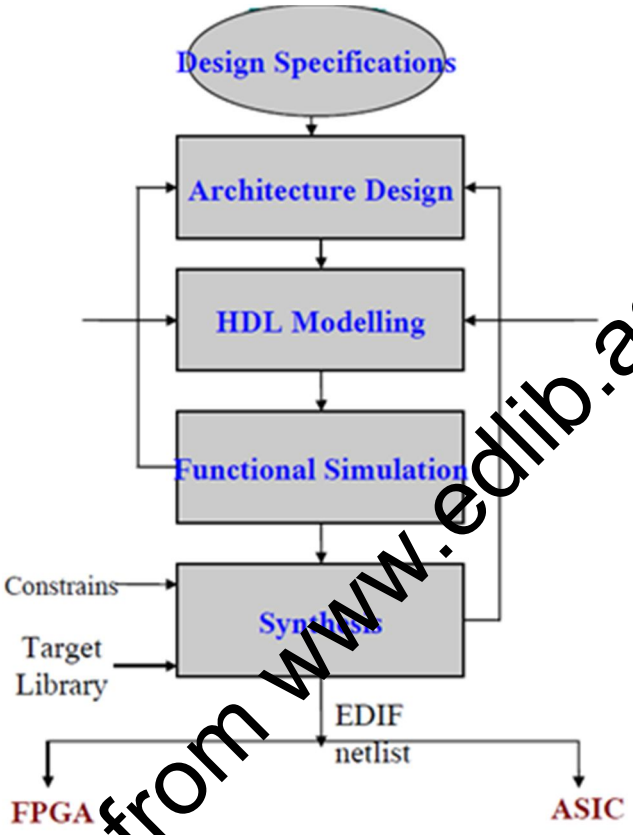


Figure 3: Common Flow for ASICs and FPGAs

II. The Requirements and Necessities Lead the Technology towards Poor Men's ASICs

Programmable Logic Designs: Programmable Logic Designs (PLDs) which are mostly in three important construction models

- Simple Programmable Logic Devices(SPLD's) PROM, PLAs, PALs shown in Figures
- Complex Programmable Logic Devices(CPLD's) Figure
- Field Programmable Gate Arrays (FPGA's) in figure Figure

SPLDs

An ad hoc approch to laying out a logic regular strctured design was adopted called as gate array structure.Predictablity over the logic is possible then improve area, performance by reducing two level layout i.e The Logic Shifts the Layout into SOP/POS Fashion of Prediffused/Mask Programmable Arrays,

Bacthes of wafers containing arrays of primitive cells (or) Transistors are manufacture by the vendors & stored, with all fabrication steps are standadised & executed without regraded to the Final Application

A. Layer of gates implement AND operations (prod)
B. Layer of gates implement OR operations (sum) are Sparingly used today's semicustom logicdesign

PROM Structure: PROM structure **consists** of Fixed AND Array, Programmable OR ARRAY

Figure 4-Programmable Read Only Memory (PROM)

PAL structure: Programmable Array Logic structure consists of Programmable AND Array, Fixed OR array

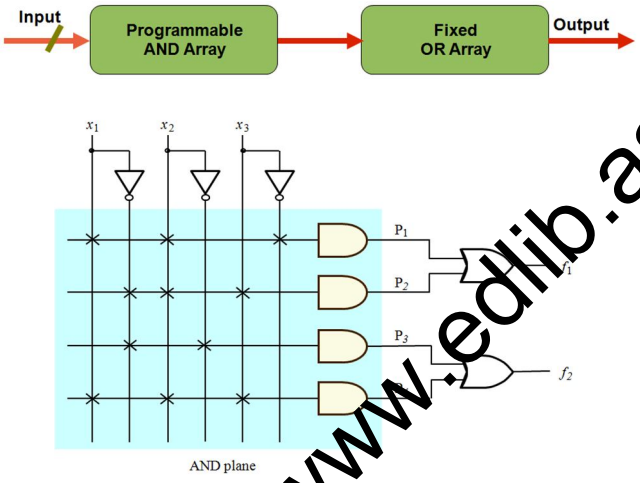


Figure 5-Programmable Array Logic (PAL)

PLA Structure

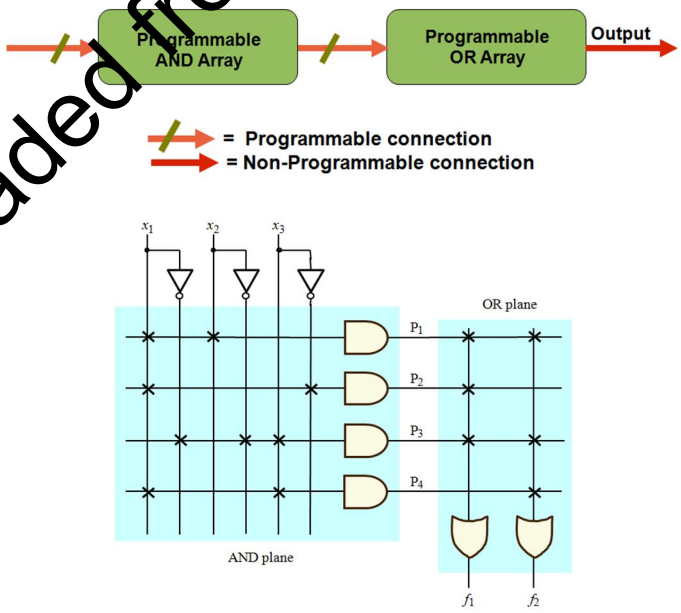


Figure- 6 Programmable Logic Array (PLA)

Demerits with SPLDs– Pre routed Channels are power hungry If Prediffused cell for 4-I/P then using it for 2-I/P wastes I/Ps, The multiple alternative cells creates geometry / Oxide isolation The "dogbone" terminations on the layout increases the Gate to poly(high resistance) In theses models which ever is more programmable nature will always tries to give the optimum logic and gives the good performence along with lowest Don't care states For Example PROM will have more number of Don't Care States than the PLA due to the (AND&OR) Arrays both are programmable.

The "dogbone" terminations,Longer fingure sizes on the layout increases the Gate/polyresistance (No option for free hand craft techniques for folding fingure of gate wire length)

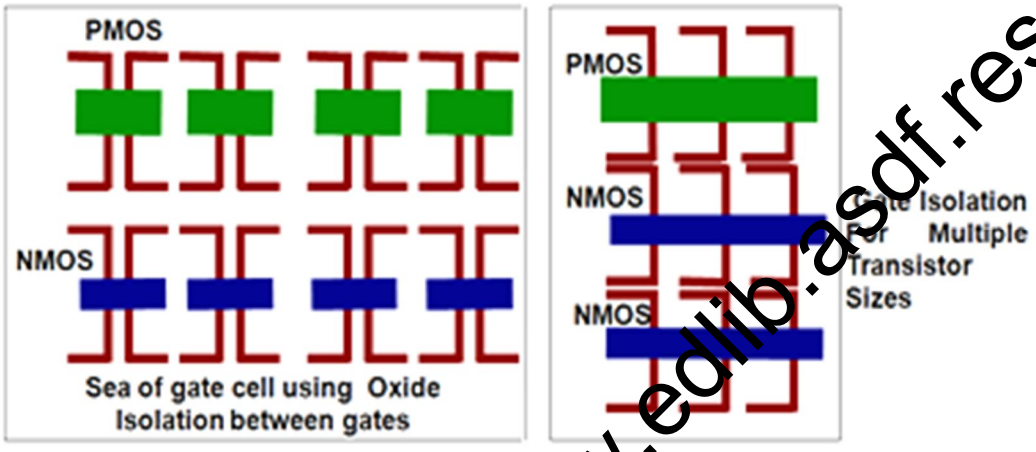


Figure- 7 Dogbone structure

Here Masking(Non-Programmable Array) and Non-Masking (Programmable Array)concepts needs to be under stand in an efficient manner to utilize these skills in System Designs at field levelimplementation, Pre Masked part gives optimistic results(Power,Area,Speed) point of view that's why they never allowed to change /programm those modules/arrays.

CPLD's: CPLDs consists of like SPLDs blocks connected with Programmable interconnectmatrix with Input/Output pins on S/CPLD

This PLDs structures and principles lead the concepts to preprocessed die that can be programmed at the field levels which acts as a performen's ASICs i.e.FPGA (without the help of Fab centre)

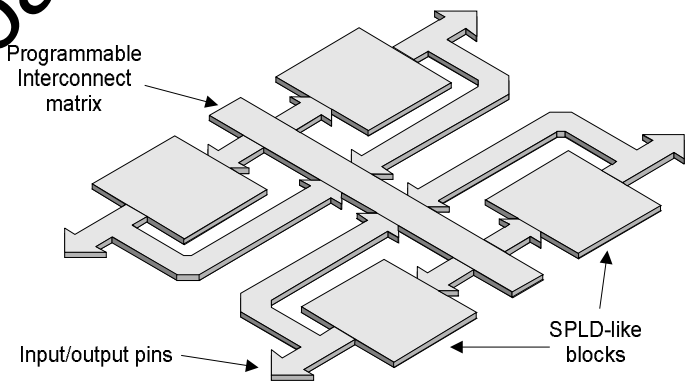


Figure: 8 A generic structure of CPLDs

III. FPGA's

Field programmable gate arrays design flow consists of the folowing steps which reduces the design cost by low cost software,not much complex and low cost for the designers, fast TTM, executed at field level.

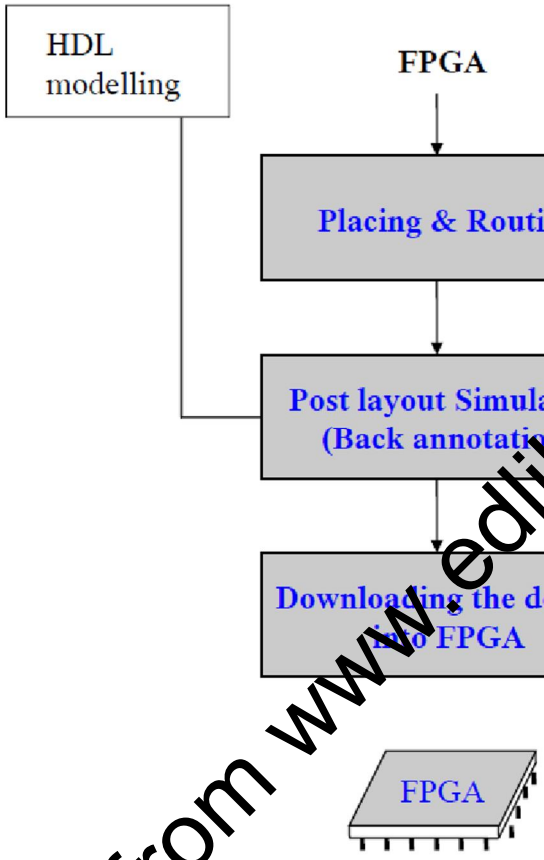


Figure- 9 FPGAs Design & Implementation Flow

Here I would like to express some internal contents and steps to execute the design steps for FPGAs implementations by writing the Verilog-code and get the simulations and must be synthesizable style of the design module. With the help of technology mapping and place and route the Configurable Logic Blocks (CLBs) into optimistic manner to get the low power, area by avoiding the longest interconnects.

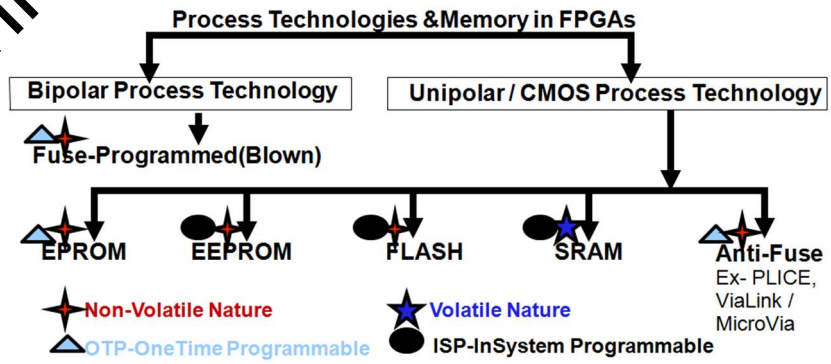


Figure: 10 Classification of FPGAs based on memories

	Fuse	EPROM(N)	EEPROM	FLASH	SRAM	Anti-Fuse
Programming Nature	OTP	OTP	ISP	ISP	ISP	OTP
Typical Data retention time	unlimited	10-20years	> 10-20years	>10-20years	only at stable power-on	unlimited
TypicalErase/ ProgramCycles	1 time (OTP)	OTP/10,000 Times	>1000 to -10,000times	>50 to 10,000 times	unlimited	1 time (OTP)
TypicalErase/ ProgramTimes	not erasable / some minutes for whole chip (depends on chip complexity) original programmi--ng technology for programma ble logic	some minutes UV-light / about 0.1 msec. per cell	some milliseconds per cell / about 0.1 msec. per cell	about 1 sec. for whole chip / about 0.1 msec. per cell	about some milliseconds / milliseconds to minutes for whole chip (depends on ROM-interface)	not erasable / some minutes for whole chip (depends on chip complexity) Antifuse cells are electrically programmed in a device programmer used for High Realiability Appllications

Figure: 11Reliability of the FPGAs

Type of the FPGAs	Vendor's Name	Web Links	Approximate Market Share in %
Volatile SRAM-based FPGAs	Xilinx.Inc.,	www.xilinx.com	58%
	Altera Corporation	www.altrea.com	31%
	Lattice Semiconductor Corporation	www.atmel.com	Remaining all together 11%
Non-Volatile Antifuse & Flash basedFPGAs	Actel Corporation	www.actel.com	
	Quick Logic Corporation	www.quicklogic.com	

Figure: 12 Vendors for FPGAs

FPGA Structures

Finegrained Architectures

Xilinx High reconfigurable nature, gives less performence Area, Delay time,Power Ex-Look Up Tables LUT's in Xilinxhe has become the major vendor in the market

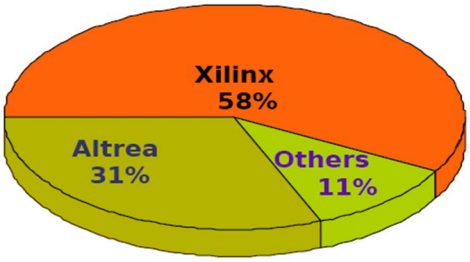


Figure: 13 Market Survey for FPGAs

Coarsegrained Architectures

Dynamic Precision Scaling(DPS) blocks in Altrea Example DPS in ALTREA, Less reconfigurable nature due to it's Fixed position(masked) gives high performence Area,Delay time,Power Because the path which is allocated is fixed and can't reconfigured in any case[4] Nothing but Masking and kept the rights into vendor's usage at the time of layout designs/Asic is called as masking

The FPGA Architecture is shown in figure below consists of CLBs,I/OBlocks,BlockRAMS

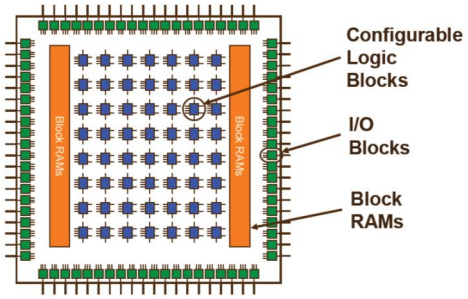


Figure: 14 FPGAs Structure and Architecture

Think about the Logic Modules which can be incorporate one near by the other rather than the random placing over all the FPGA area. Here no physical layout designs to manipulate for best design.

The design continued with the following steps; simulation, synthesis, optimistic design by logic (HDL code), place and route; user constraint file consists of the details about logical ports of the design module, physical ports of the FPGA board are used to communicate between system and FPGA board and to load the designed module in the form of bit-stream could be reconfigured by the designer at the field level by themselves

Manufacturing cycle for ASIC is very costly, lengthy and engages lots of manpower, Mistakes not detected at design time have large impact on development time and cost

Figure:15 Past and Present trends in VLSI

FPGAs are perfect for rapid prototyping of digital circuits Easy upgrades like in case of software, unique applications, and reconfigurable computing comparisons with ASIC and FPGA incorporated below

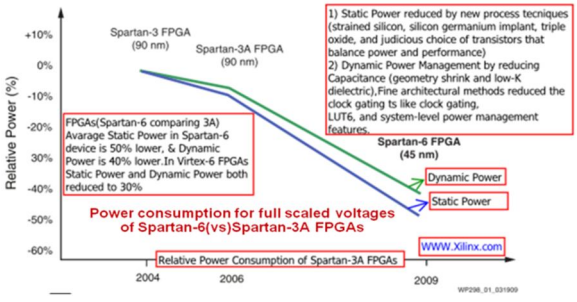


Figure: 16 Power comparisons for Xilinx Spartan 3 to 6 FPGAs

Majority of FPGA vendors in the market for SRAM-based FPGAs: Xilinx, Inc., Altera[5] Corp., Atmel, Lattice Semiconductor refer the figure for market shares

Efficiency	Performance Delay Time, Low Power & Area	NRE-Cost	Unit-Cost	TTM & Rapid Prototyping
↑	**ASIC**	**ASIC**	FPGA	FPGA
	FPGA	FPGA	**ASIC**	**ASIC**

Figure: 17 comparisons between ASICs and FPGAs

Flash & antifuse FPGAs: Actel, Quick Logic CorpPrimary products: FPGAs and the associated CAD Software are listed below because the highest market share occupied by the vendor Xilinx.Inc. Main headquarters in San Jose, CA Fables* Semiconductor Company with earliest of CPLD, ISE Alliance and Foundation Series Design Software have been used

Figure: 18 Technology Performences

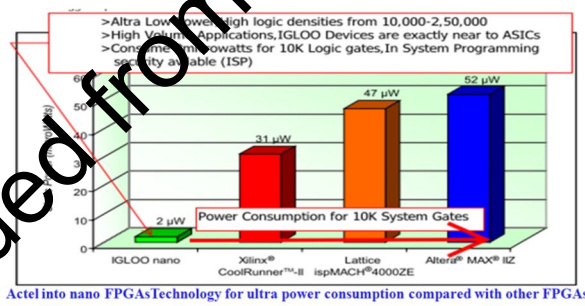


Figure: 19 The new Road Map for IGLOO-Nano FPGAs

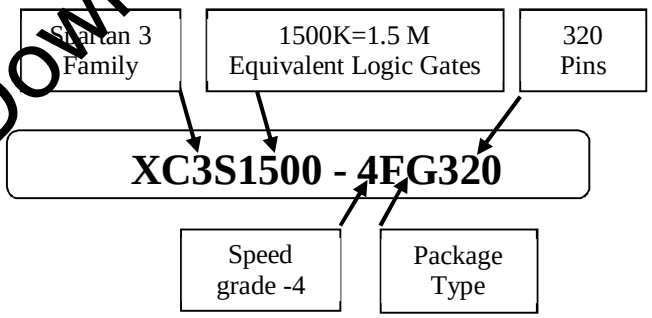


Figure: 20 Spartan3A with Nomenclature

Xilinx consists of Vertex family boards for High performance; Spartan family is a Low Cost Family that we have used Spartan3A/3E, Spartan 6/7 too. Architectural details were described below for Spartan3A with Nomenclature

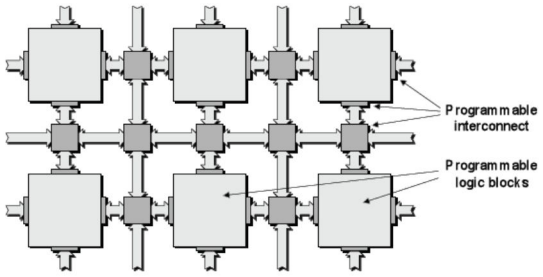


Figure: 21 Internal Structure of the Spartan3A

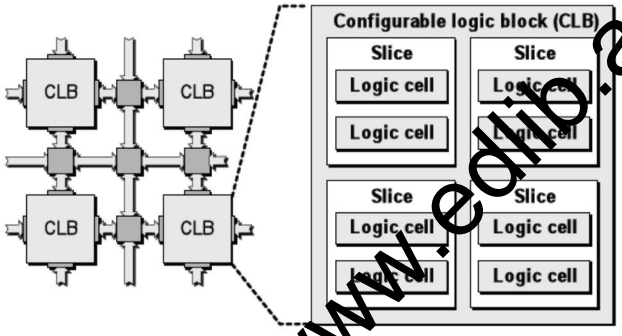


Figure: 22 Structure of each Configurable L-Block

Each slice contains two sets of the Following

Four-input LUT, Any 4-input logic function or 16-bit x 1 sync RAM (SLICEM only) or 16-bit shift registers (SLICEM only) Carry & Control, Fast arithmetic logic, Multiplier logic, Multiplexer logic, Storage element, Latch or flip-flop, Set and reset, True or inverted inputs, Sync. or async. Control after the design synthesis Map report with the FPGA hardware, software details and design date , number of errors, warnings, logic utilization like number of sliced flip-flops, number of 4-Input LUTs, number of used LUTs and number LUTs used for route through, Post layout, Timing, P&R report, resource utilization with design statistics

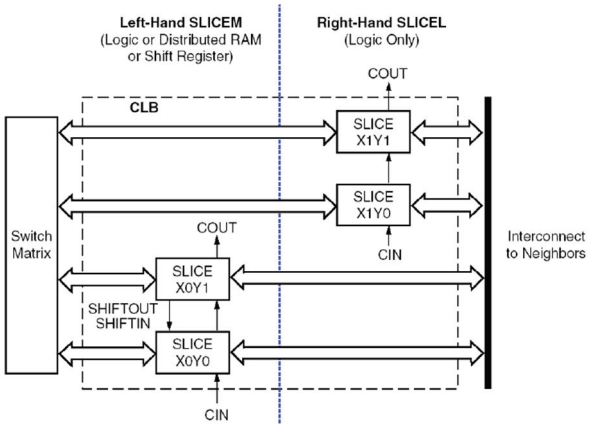


Figure: 23 Internal Structure of Configurable L-Block

LUT's: Look Up Tables are primary elements for Logic implementations, Each LUT can implement any function of 4 Inputs Example shown below

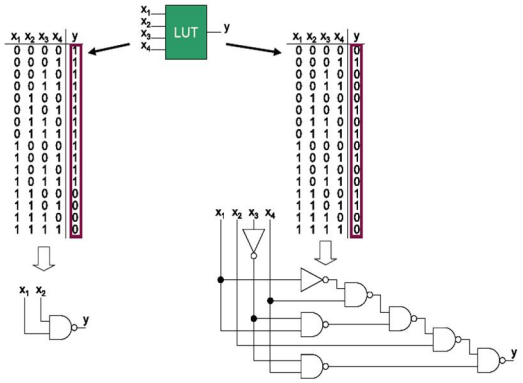


Figure: 24 Internal Structure of Configurable L-Block

LUT'S follow the **Rent's rule** pertains to the organization of computing logic, specifically the relationship between the number of external signal connections to a logic block (i.e., the number of "pins") with the number of logic gates in the logic block, and has been applied to circuits ranging from small digital circuits to mainframe computers. 5-Input Functions implemented using two LUTs One CLB Slice can implement any function of 5 inputs

- Logic function is partitioned between two LUTs
- F5 multiplexer selects LUT

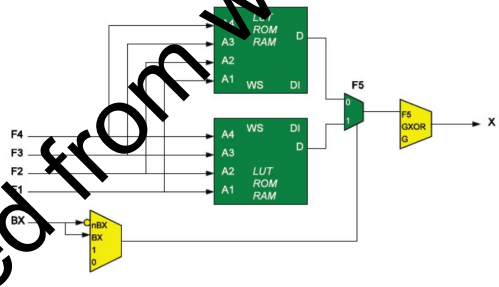


Figure: 25 Internal Structure of each Configurable L-Block

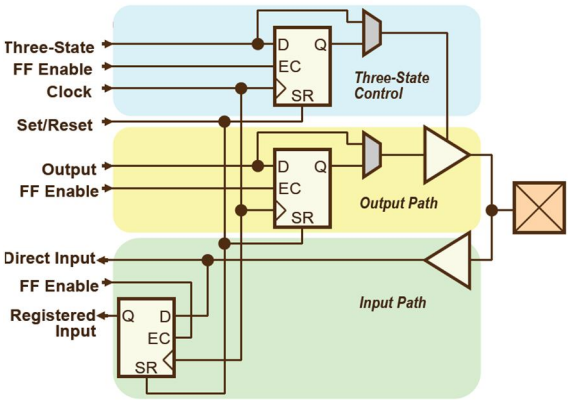


Figure: 26 Internal Structure of I/O –Block of Spartan 3

Here need to take care while writing the HDL's for any design
While writing the HDL code

1) The case statement should be end with the default value of case otherwise it will generate and uses one extra Latch which consumes more power for Example 2 i/p binary count/ selects

Case 00,
Case01,
Case10,
Case11,

Again we need to mention the case00; in last stage otherwise it definitely generate the Latch we can observe in the synthesis.

Observe the following code

Model of a Flip Flop with
asynchronous reset
always @(posedge clock)
q <= d;
always @(reset)
if (reset)
assign q = 1'b0;
else
deassign q; /*here if the deassign q is not mentioned the Latch would be generated along with the Flip Flop in the synthesis.

2)For the 2variable K-Map, approach i.e 00,01,11,10 Gray code counting method, like wise in Mux based select/ counter mechanisms also use the same method, if we use the binary count 00,01,10,11 which consumes 6 switching states where as in gray method it takes only 4 switching states which would directly impact on the Dynamic power consumption the Dynamic power = ½ $CV^2 f_{0-->1}$ binary counter getting 2 times more switching power than the gray code mechanism here power consumption effects are due to the $f_{0-->1}$ depends on clock frequency is also applicable for CMOS switching activities too for primitive gates.

3) For mission critical application try to be stick on to the coding method as if, else, if, else method rather than looking for case/wait statements, and also for the FSMs use the MOORE model is better than the usage of MELAY Machine if reliability/ mission critical application to avoid the catastrophe though it's speeder than the MOORE but power consumption is major constraint use the MELAY machine for field level implementations.

4) Implementation of the design View the placed and routed design in FPGA Editor Set up multiple place and route runs on your design

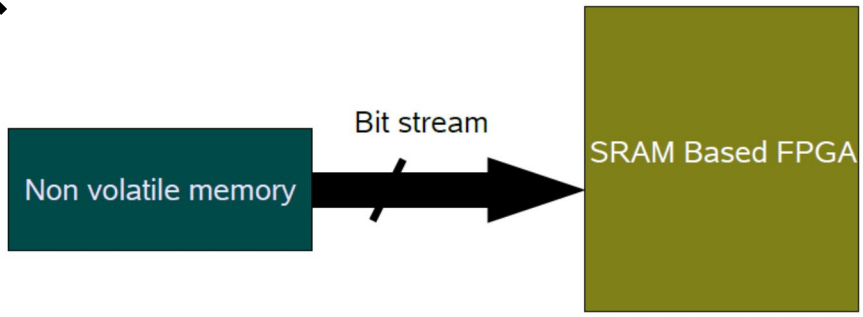


Figure: 27 Download onto FPGA

Steps to download onto FPGA

1. Create a programming file (.bit) to program your FPGA
2. Generate a PROM, ACE, or JTAG file for debugging or to download to the device, Use iMPACT to program the device with a programming cable

Generate Programming File

Bitsream (.bit) for FPGA
PROM image file (.mcs) for non volatile memory

Configure Device

Use a JTAG download cable, Load bitstream directly on to FPGA, Load PROM image file to non -volatile memory Using a PROM Serial and Parallel interface, Xilinx or 3rd party solutions

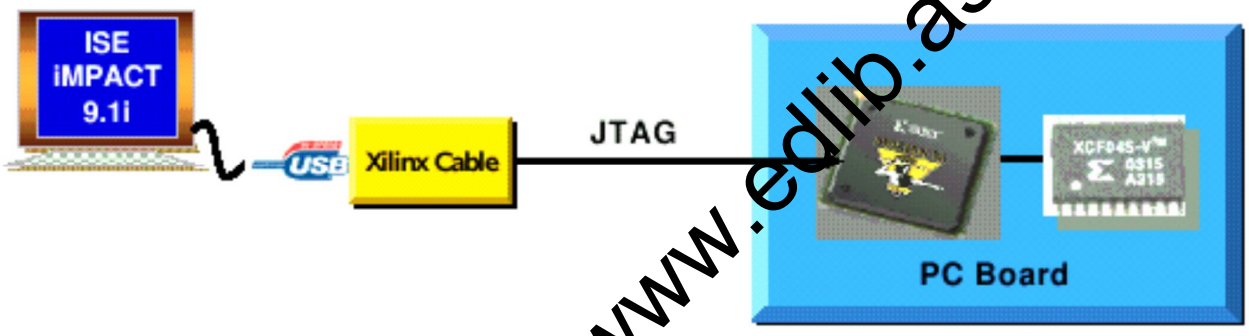


Figure: 28 JTAG Cable specifications

Reconfigurability of FPGA devices can be re-configured to change logic function while resident in the system. Design updates or modifications are easy, and can be made to products already in the field. An FPGA can even be reconfigured dynamically to perform different functions at different times
Number of Bits to Program a Spartan-3 Generation FPGA and Smallest Platform Flash PROM

Family	FPGA	Number of configurable Bits	Smallest Possible Platform FLASH PROM
Spartan-3A	XC3S400A	1,886,560	XCF02S
Spartan-3AN	XC3S700A	2,732,640	XCF02S

Figure: 29 Internal Structure of Configurable L-Block

JTAG Interface: Spartan-3 Generation FPGAs and the Platform Flash PROMs both have a four-wire IEEE 1149.1/1532 JTAG port. Both the FPGA and the PROM share the JTAG TCK clock input and the TMS mode select input. The devices may connect in either order on the JTAG chain With the TDO output of one device feeding the TDI input of the following device in the chain. The TDO output of the last device in the JTAG chain drives the JTAG connector

Set the FPGA board with default values as shown below on the board

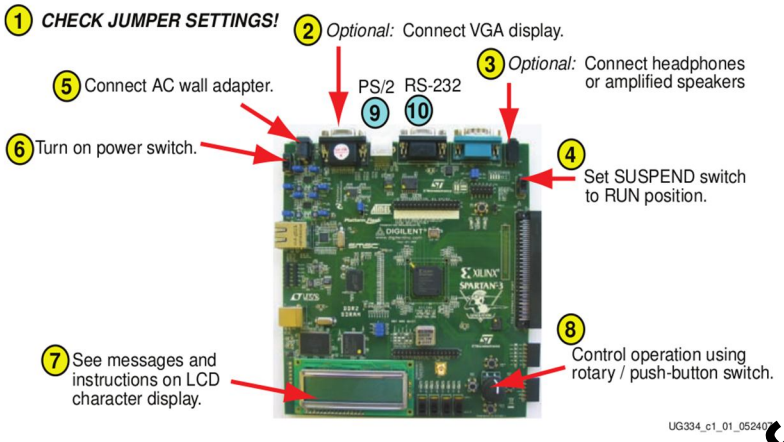


Figure: 30 Physical View of the Xilinx FPGAs

Conclusions

1. Here the Xilinx FPGAs more suitable to implement at the fields for engineering applications because it's flexibility and Market share.
2. Keeping some notes about the FPGA Design can also be say top-down & down-top approach by taking the design module writing HDL, Simulate by giving test vectors and checking the simulation results according to specifications can be called as top- to –down approach here the design implemented by Logics, K-Maps, Truth tables etc.
3. Synthesis for the above same design using UCF, P and R and generating the .bit file and loading on to the FPGA to get it implement on the board called as down to top approach. Iterative methods can be done for better results (Area,Speed,Power) by verifying the Logics, K-Maps, Truth tables can be obtained in this synthesis delivered by the tool would be same as designed in step-2 (top-down), but the Logic implementation would be changed and optimized by using the Shannon's principle , to implement all logics in Mux based implementations by implementing the

4) Shannon's principle

Boolean function **f(w1,w2,...wn)** can be written in the format
f(w1,w2,...wn) = w1'.f (0,w2,..wn) + w1.f(1,w2,.....wn)

1) Example:Three-input XOR implemented with 2-to-1 Mux

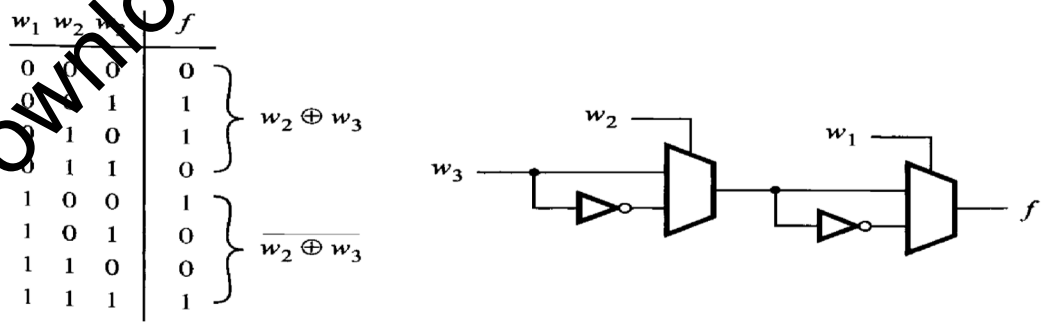


Figure: 34 Three-input XOR

2)Optimized circuit for Three-input XOR gate implemented with a 4-to-1Mux

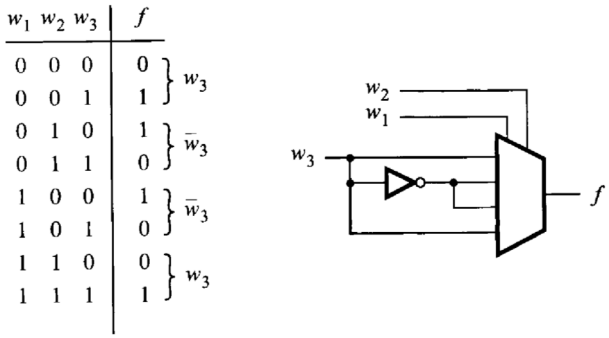


Figure: 32 Internal Structure of Configurable L-Block

using the FPGAs in good manner to get synthesized and occupied very less to concern of the layout design and maps to the RTL, Technology file can be checked after the synthesis.

5) For easy understanding purpose took the NAND Gate as an example

```
DL for Nand Gate
module NANDgate(A, B,F);
input [0:0] A;
input [0:0] B;
output [0:0] F;
reg F;
//The Process Starts
always@(A or B)
begin
F<= ~(A & B);
end
endmodule
```

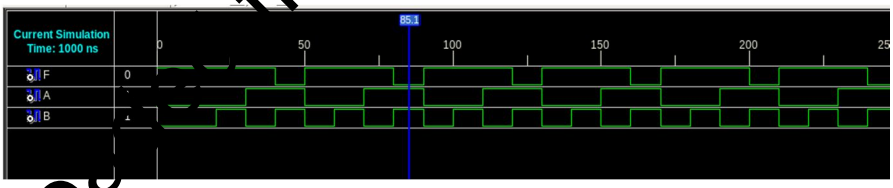


Figure: 33 Simulation results for NAND gate

the result should be like this but never comes as usual changes to the eqivalent circuit

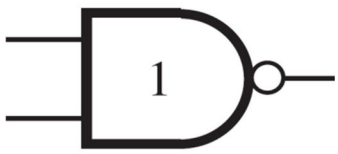


Figure: 34 NAND GATE

After synthesis we got the Values for truth table and Karnaugh -Map

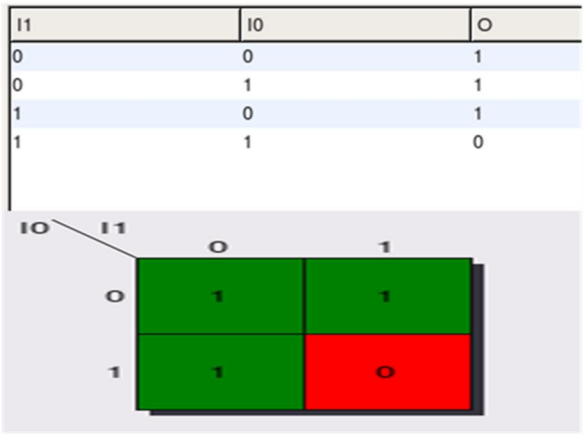


Figure : 35 Synthesis details to get the K-Map,T-Table

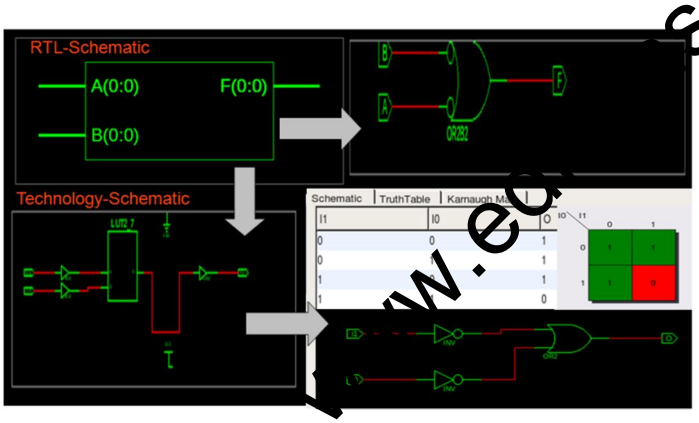
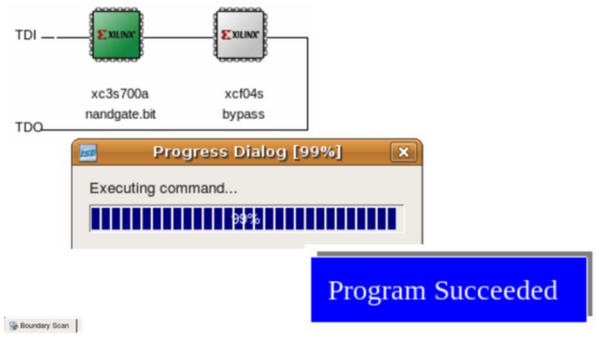


Figure : 36 Synthesis details to get the K-Map,T-Table

Equivalent circuits generated by synthesis for the above design. And get the results for RTL-Schematic, Technology schematic; K-Map for all parameters becomes correct.

6).After seeing all Macro level functions of the FPGAs are suitable for field level implementations at all levels without the fab-centre. Design can be configured n-number of times, FPGAs has become the Poor Man's ASICs



Research on Big Data for Mobile Computing

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Abstract- This paper presents an overview of the Mobile Data Challenge (MDC), a large-scale research initiative aimed at generating innovations around smart phone-based research, as well as community-based evaluation of related mobile data analysis methodologies. First we review the Lausanne Data Collection Campaign (LDCC) {an initiative to collect unique, longitudinal smart phone data set for the basis of the MDC. Then, we introduce the Open and Dedicated Tracks of the MDC; describe the specific data sets used in each of them; and discuss some of the key aspects in order to generate privacy-respecting, challenging, and scientifically relevant mobile data resources for wider use of the research community. The concluding remarks will summarize the paper.

I. Introduction

Mobile phone technology has transformed the way we live, as phone adoption has increased rapidly across the globe [17]. This has widespread social implications. The phones themselves have become instruments for fast communication and collective participation. Further, different user groups, like teenagers, have started to use them in creative ways. At the same time, the number of sensors embedded in phones and the applications built around them have exploded. In the past few years, smart phones remarkably started to carry sensors like GPS, accelerometer, gyroscope, microphone, camera and Bluetooth. Related application and service offering covers e.g. information search, entertainment or healthcare.

The ubiquity of mobile phones and the increasing wealth of the data generated from sensors and applications are giving rise to a new research domain across computing and social science. Researchers are beginning to examine issues in behavioral and social science from the Big Data perspective {by using large-scale mobile data as input to characterize and understand real-life phenomena, including individual traits, as well as human mobility, communication, and interaction patterns [11, 12, 9].

This new research, whose findings are clearly important to society at large, has been often conducted within corporations that historically have had access to these data types, including telecom operators [13] or Internet companies [6],or through granted data access to academics in highly restricted forms [12]. Some initiatives, like [1], have collected publicly available but in some extent limited data sets together. Clearly, government and corporate regulations for privacy and data protection play a fundamental and necessary role in protecting all sensitive aspects of mobile data. From the research perspective, this also implies that mobile data resources are scarce and often not ecologically valid to test scientific hypotheses related to real-life behavior.

The Mobile Data Challenge (MDC) by Nokia is motivated by our belief in the value of mobile computing research for the common good - i.e., of research that can result in a deeper scientific understanding of human and social phenomena, advanced mobile experiences and technological innovations. Guided by this principle, in January 2009 Nokia Research Center Lausanne and its Swiss academic partners Idiap and EPFL started an initiative to create large-scale mobile data research resources. This included the design and implementation of the Lausanne Data Collection Campaign (LDCC), an effort to collect a longitudinal smart phone data set from nearly 200 volunteers in the Lake Geneva region over one year of time. It also involved the definition of a number of research tasks with clearly specified experimental protocols. From the very beginning the intention was to share these research resources with the research community which required integration of holistic and proactive approach on privacy according to the of privacy-by-design principles [2].

The MDC is the visible outcome of nearly three years of work in this direction. The Challenge provided researchers with an opportunity to analyze a relatively unexplored data set including rich mobility, communication, and interaction information. The MDC comprised of two research alternatives through an Open Research Track and a Dedicated Research Track. In the Open Track, researchers were given opportunity to approach the data set from an exploratory perspective, by proposing their own tasks according to their interests and background. The Dedicated Track gave researchers the possibility to take on up to three tasks to solve, related with prediction of mobility patterns, recognition of place categories, and estimation of demographic attributes. Each of these tasks had properly defined experimental protocols and standard evaluation measures to assess and rank all contributions.

This paper presents an overview of the Mobile Data Challenge intended both for participants of the MDC and a wider audience. Section 2 summarizes the LDCC data, the basis for the MDC. Section 3 describes the MDC tracks and tasks in detail. Section 4 provides details on the specific data sets used for the MDC. Section 5 summarizes the schedule we have followed to organize the Challenge. Finally, Section 6 offers some final remarks.

2. The Lausanne Data Collection Campaign (LDCC)

LDCC aimed at designing and implementing a large-scale campaign to collect smartphone data in everyday life conditions, grounding the study on a European culture. The overall goal was to collect quasi-continuous measurements covering all sensory and other available information on a smartphone. This way we were able to capture phone users' daily activities unobtrusively, in a setting that implemented the privacy-by design principles [2]. The collected data included a significant amount of behavioral information, including both personal and relational aspects. This enables investigation of a large number of research questions related to personal and social context - including mobility, phone usage, communication, and interaction. Only content, like image _les or content of the messages, was excluded because content capturing was considered too intrusive for the longitudinal study based on volunteering participation with selfless drivers. Instead log-_les with metadata were collected both for imaging and messaging applications. This section provides a summary on the LDCC implementation and captured data types. An initial paper introducing LDCC, its data types and statistics early 2010 appeared in [14]. Part of the material in this section has been adapted from it.

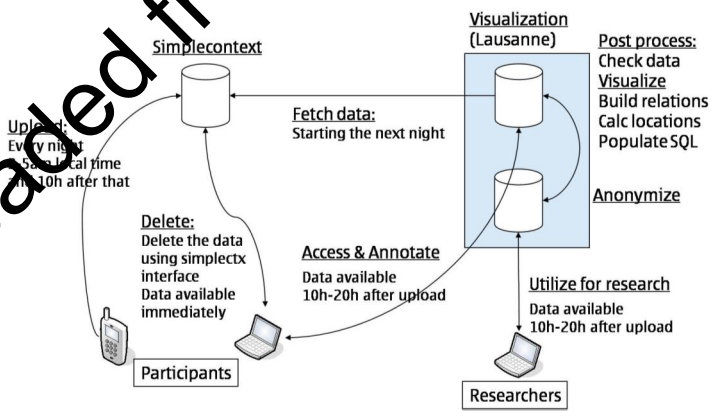


Figure 1: LDCC data flow, progressing from mobile data from volunteers to anonymized data for research [14]).

2.1 LDCC design

Nokia Research Center, Idiap, and EPFL partnered towards LDCC since January 2009. After the implementation and evaluation of the sensing architecture, and the recruitment of the initial pool of

volunteers, the data collection started in October 2009. Over time, smartphones with data collection software were allocated to close to 200 volunteers in the Lake Geneva region. A viral approach was used to pro mote the campaign and recruit volunteers. This resulted in a great proportion of the members of the campaign population having social connections to other participants, as well as to the demographical representativeness. A key aspect of the success of LDCC was the enthusiastic participation of volunteers who agreed to participate and share their data mainly driven by selfless interest. The campaign concluded in March 2011.

Data was collected using Nokia N95 phones and a client-server architecture that made the data collection invisible to the participants. A seamless implementation of the data recording process was a key to make a longitudinal study feasible in practice { many participants remained in the study for over a year. Another important target for the client software design was to reach an appropriate trade-off between quality of the collected data and phone energy consumption. The collected data was first stored in the device and then uploaded automatically to a Simple Context server via WLAN. The server received the data, and built a database that could be accessed by the campaign participants. The Nokia Simple Context backend had been developed already earlier by the Nokia Research Center in Palo Alto. Additionally data visualization tool was developed which offered a “life diary" type of view for the campaign participants on their data. Simultaneously, an anonymized database was being populated, from which researchers were able to access the data for their purposes. Fig. 1 presents a block diagram of the collection architecture.

2.2 Data characteristics

The LDCC initiative produced a unique data set in terms of scale, temporal dimension, and variety of data types. The campaign population reached 185 participants (38% female, 62% male), and was concentrated on young individuals (the age range of 22-33 year-old accounts for roughly two thirds of the population.) A bird-eye's view on the LDCC in terms of data types appears in Table 1. As can be seen, data types related to location (GPS, WLAN), motion (accelerometer), proximity (Bluetooth), communication (phone call and SMS logs), multimedia (camera, media player), and application usage (user-downloaded applications in addition to system ones) and audio environment (optional) were recorded. The numbers themselves reflect a combination of experimental design choices (e.g., every user had the same phone and data plan) and specific aspects of the volunteer population (e.g., many participants use public transportation).

Data type	Quantity
Calls (in/out/missed)	240,227
SMS (in/out/failed/pending)	175,832
Photos	37,151
Videos Application events	2,940
Calendar entries	8,096,870
Phone book entries	13,792
Location points	45,928
Unique cell towers	26,152,673
Accelerometer samples	99,166
Bluetooth observations	1,273,333
Unique Bluetooth devices	38,259,550
WLAN observations	498,593
Unique WLAN access points	31,013,270
Audio samples	560,441

Table 1: LDCC main data types and amounts for each type.

Due to space limitations, it is not possible to visualize multiple data types here. A compelling example, however, is presented in Fig. 2, which plots the raw location data of the LDCC on the map of Switzerland for the volunteer population after 1 week, and then after 1, 3, 6, 12, and 18 months of campaign. When seen in detail, the geographical coverage of the LDCC allows a reasonable tracing of the main routes on the map of Suisse Romande -French-speaking, western part of Switzerland - and gradually also of other regions of the country.

In addition to contributing phone data, participants of the LDCC also agreed to fill a small number of surveys during the data recording process. We would like to highlight two types of survey data which were important for the later development of the MDC - (1) a set of manual semantic labels for frequently and infrequently visited places for each user and (2) basic demographic attributes. The relevant places were first detected automatically with a method discussed in [15]. After that the campaign participants specified place categories from a fixed list of tags (home, work, leisure places, etc.). In sense of demographics, participants self-reported their attributes like gender, age group, marital status and job type etc.

2.3 Privacy

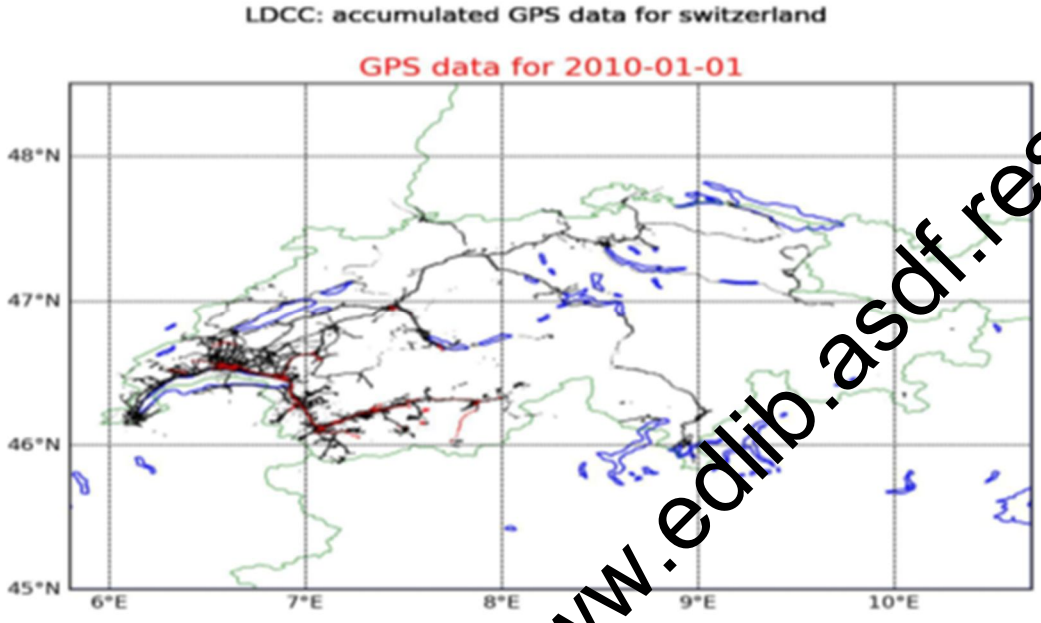
Privacy played an essential role in the design and implementation of the LDCC, given the nature and scale of the data shared by the participants of the initiative. In order to satisfy the ethical and legal requirements to collect data while protecting the privacy of the participants, the LDCC research team implemented an approach based on multiple strict measures. The approach can be summarized as follows (more details can be found in [14]):

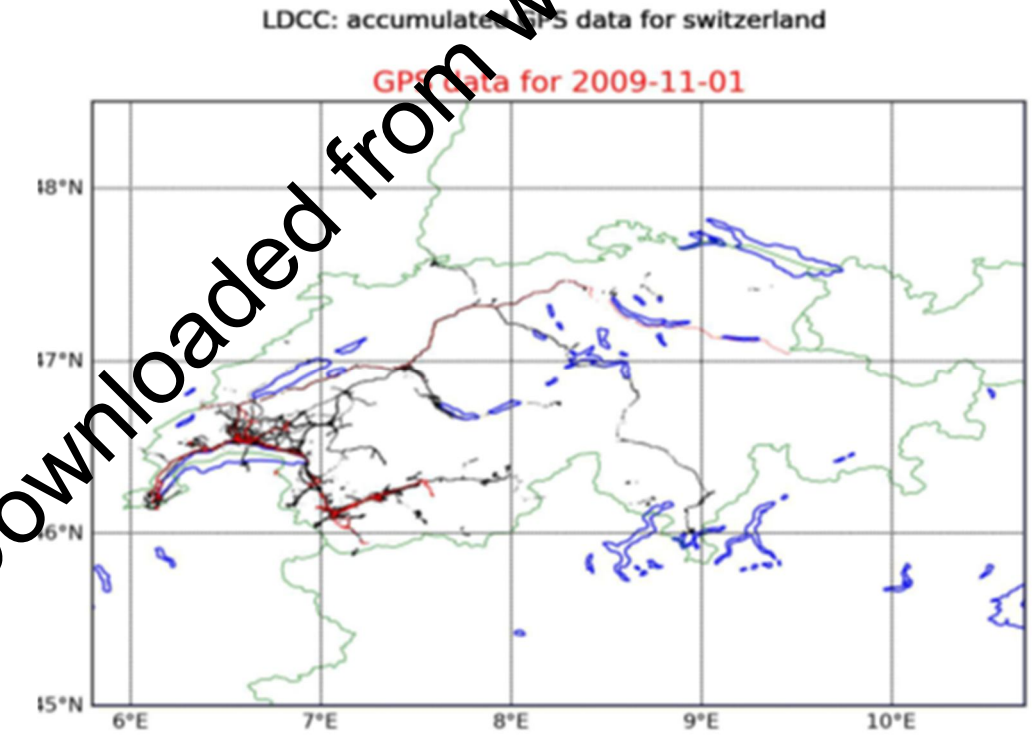
1. Communication with volunteers about privacy. Following Nokia's general privacy policy, we obtained written consent from each individual participating the LDCC. We explicitly stated that data would be collected for research purposes. All participants were informed about their data rights, including the right to access their own collected data and to decide what to do with it (e.g. to delete data entries if they opted to do so). The participants had also opportunity to opt-out at any moment.
2. Data security. The data was recorded and stored using best industry practices in this domain.
3. Data anonymization. By design, the LDCC did not store any content information (e.g. no photo _les or message content were recorded). The major portion of the collected data consisted of event logs, and when sensitive data beyond logs was collected, it was anonymized using state-of-the-art techniques and/or aggregated for research purposes [5]. Examples include the use of pseudonyms instead of identifiable data and the reduction of location accuracy around potentially sensitive locations. The researchers do have access only to the anonymized data.
4. Commitment of researchers to respect privacy. Privacy protection of such a rich data only by automatic anonymization techniques is not possible so that research value and richness of the data can be simultaneously maintained. In addition to technical means also agreement based counter-measures are necessary. Trusted researchers have been able to work with the LDCC data after agreeing in written form to respect the anonymity and privacy of the volunteering LDCC participants. This practically limited the access to the LDCC data to a small number of authorized partners and their affiliated researchers. After our initial experience with the LDCC, the next step was to outreach the mobile computing community at large, which motivated the creation of the Mobile Data Challenge, discussed in detail in the next sections.

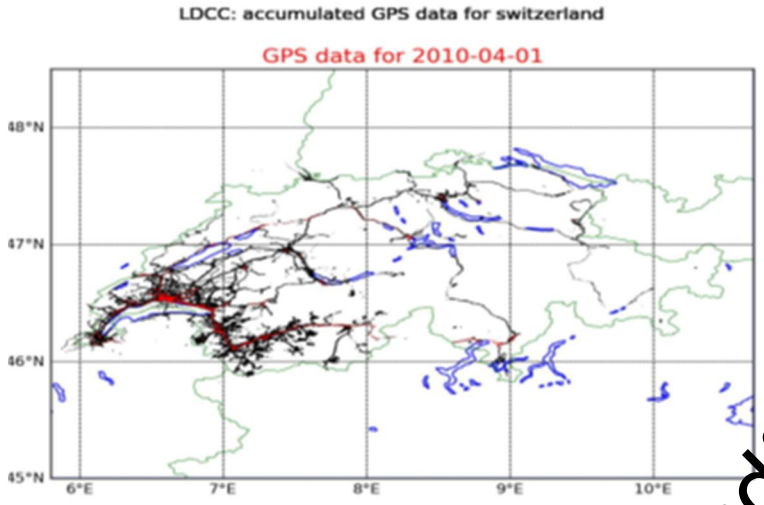
3. MDC Tracks

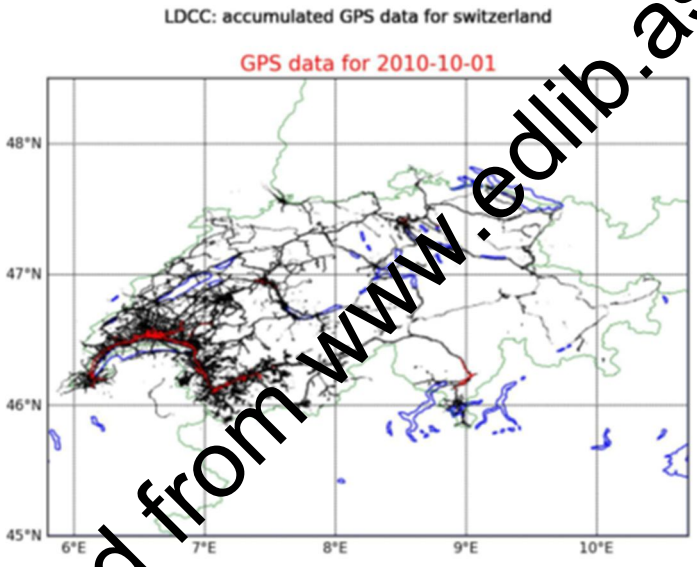
MDC's original intention was to be inclusive at a global scale. Other previously successful evaluation initiatives in computing, like those organized by NIST in several areas [16, 18] or the Netix challenge [8, 7] focused on either one or at most a small number of tasks with objective evaluation protocols. This was also a guiding principle for MDC. On the other hand, the nature of mobile data is highly exploratory, so there was a clear benefit in encouraging and welcoming also open ideas. Learning from these past experiences, we

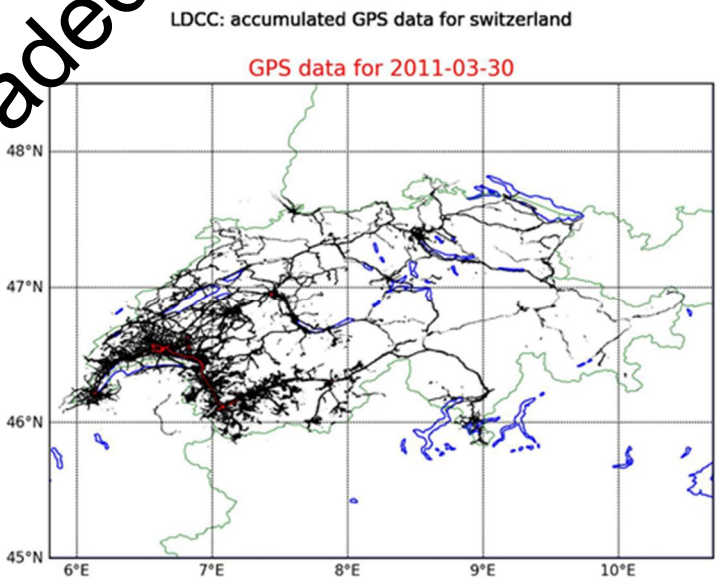
decided that MDC would feature both open and pre-defined options to participate. The Open Track was defined to receive self-defined ideas from the community. On the other hand, the concrete options were given in the Dedicated Track, which defined three classification/prediction tasks. These tasks covered several key aspects of mobility and mobile users. The Open Track. This track enabled participants to propose their own Challenge task based on their own research interests and background.











4. MDC Data

This section presents an overview of the MDC datasets and the corresponding preparation procedures. We first describe the division of the original LDCC data that was needed in order to address the different MDC tasks. We then summarize the data types that were made available. We finalize by discussing the procedures related to privacy and data security.

4.1 Division of the Dataset

The datasets provided to the participants of the MDC consist of slices of the full LDCC dataset. Slicing the data was needed in order to create separate training and test sets for the tasks in the Dedicated Track, but was also useful to assign the richest and cleanest parts of the LDCC dataset to the right type of challenge. Four data slices were created for the MDC:

Set A: Common training set for the three dedicated tasks.
Set B: Test set for demographic attribute and semantic place label prediction tasks.
Set C: Test set for location prediction task.

Open set. Set for all open track entries.

The overall structure of the datasets is given in Figure 3. The rationale behind this structure was the following. First, the participants of the LDCC were separated in three groups, according to the quality of their data according to different aspects. The 80 users with the highest-quality location traces were assigned to sets A and C. Set A contains the full data for these users except the 50 last days of traces, whereas set C contains the 50 last days for which location data is available for testing. In order to maximize the use of our available data, we reused Set A as a training set for the two other dedicated tasks. A set of 34 further users was selected as a test set for these tasks and appeared in Set B. In this way, models trained on the users of Set A can be applied to the users of their most visited locations.

4.2 Data Types

For both Open and Dedicated Tracks, most data types were released in a raw format except a few data types that needed to be anonymized. There are two main differences between the Open Track data and the Dedicated Track data. First, the physical location (based on GPS coordinates) was avail- able in the Open Track but not in the Dedicated Track. Instead, we released a preprocessed version of the location data in the form of sequences of visited places for the Dedicated Track. This allowed studying performance of algorithms in location privacy-sensitive manner. The second main dfference was in the availability of relational data between users. This included both direct contacts (e.g., when a user calls another user) and indirect contacts (e.g., if two users observe the same WLAN access point at the same time then they are in proximity). We decided to keep this data in the Open Track but removed it in the Dedicated Track since it could have potentially revealed the ground truth to be predicted.

In the anonymization algorithm, a common encryption password was used for the users selected to the Open Track data sets. On the other hand, we used a different password for each user in the Dedicated Track.

Common data types. Each data type corresponds to a table in which each row represents a record such as a phone call or an observation of a WLAN access point. User IDs and timestamps are the basic information for each record.

Data types for Open Track only. Geo-location information was only available in the Open Track. In addition to GPS data, we also used WLAN data for inferring user location. The location of WLAN access points was computed by matching WLAN traces with GPS traces during the data collection campaign.

5. MDC Schedule

The plans to organize MDC started in summer 2011. We targeted to organize the final MDC workshop within one year. We decided to keep the challenge open for all the researchers with purely academic affiliation. The prospective participants of the Open Track had to submit a short proposal with their concrete plan, and the participants of the Dedicated Track had to agree to participate at least one task. While the MDC was by nature open, a series of important steps were established for participant registration. Importantly, this included signature of the Terms and Conditions agreement.

6. Conclusions

This paper described a systematic flow of research, targeting to create and provide unique longitudinal smartphone data set for wider use by the research community. In this paper we gave motivation for this initiative and summarized the key aspects of the Lausanne Data Collection Campaign (LDCC) in which the rich smartphone data was collected from around 200 individuals over more than a year. We also described in further details the Mobile Data Challenge (MDC) by Nokia which was a data analytics contest making this data widely available to the research community.

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Cancellation of ISI and High Spectral Efficiency Using Adaptive OFDMA

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Abstract: The demand for high data rate services has been increasing very rapidly and there is no slowdown in sight. Almost every existing physical medium capable of supporting broadband data transmission to our homes, offices and schools has been or will be used in the future. This includes both wired (Digital Subscriber Lines, Cable Modems, Power Lines) and wireless media. Often, these services require very reliable data transmission over very harsh environments. Most of these transmission systems experience many degradations, such as large attenuation, noise, multipath, interference (ISI), low spectral efficiency time variation, non-linearity's, and must meet many constraints, such as finite transmit power and most importantly finite cost. In such channels, extreme fading of the signal amplitude occurs and Inter Symbol Interference (ISI) due to the frequency selectivity of the channel appears at the receiver side. This leads to a high probability of errors and the system's overall performance becomes very poor. Adaptive orthogonal frequency division multiple access (OFDMA) has recently been recognized as a promising technique for providing high spectral efficiency by updating SCA subcarrier allocation using slow adaptive OFDMA system. This paper proposes a slow adaptive OFDMA scheme, in which the subcarrier allocation is updated on a much slower timescale than that of the fluctuation of instantaneous channel conditions However, such "fast" adaptation requires high computational complexity and excessive signaling overhead. This hinders the deployment of adaptive OFDMA systems worldwide. We formulate safe tractable constraintsfor the problem based on recent advances in chance constrained programming. Here we apply the chance constrained programming methodology to wireless system designs. We then develop a polynomial-time algorithm for computing an optimal solution to the reformulated problem. Our results show that the proposed slow adaptation scheme drastically reduces ISI and and improves spectral efficiency when compared with the conventional fast adaptive OFDMA. Our work can be viewed as an initial attempt to apply the chance con-strained programming methodology to wireless system designs

Indexterms: Adaptive orthogonal frequency division multiple access (OFDMA), chance constrained programming, dynamic re-source allocation, stochastic programming.

I. Introduction

In the existing literature, adaptive OFDMA exploits time, frequency, and multiuser diversity by quickly adapting subcarrier allocation (SCA) to the instantaneous channel state information (CSI) of all users. Such "fast" adaptation suffers from high computational complexity, since an optimization problem required for adaptation has to be solved by the base station (BS) every time the channel changes. Considering the fact that wireless channel fading can vary quickly (e.g., at the order of milliseconds in wireless cellular system), the implementation of fast adaptive OFDMA becomes infeasible for practical systems, even when the number of users is small. Recent work on reducing complexity of fast adaptive OFDMA includes [5], [6], etc. Moreover, fast adaptive OFDMA requires frequent signaling between a the BS and the monbile users in order to inform the users of their labels latest allocation decisions. The overhead thus incurred is likely to negate the performance gain obtained by the fast adaptation schemes. To date, high computational cost and high control signaling overhead are the major hurdles that pre-vent adaptive OFDMA from being deployed in practical systems.

We consider a slow adaptive OFDMA scheme, which is motivated by [7], to address the aforementioned problem. In contrast to the common belief that radio resource allocation should be readapted once the instantaneous channel conditions change, the proposed scheme updates the SCA on a much slower

timescale than that of channel fluctuation

In this paper, we propose a slow adaptive OFDMA scheme that aims at maximizing the long-term system throughput while satisfying with high probability the short-term data rate require-ments. The key contributions of this paper are as follows

This paper considers a single-cell multiuser OFDM system with k users and N subcarriers. We assume that the instantaneous channel coefficients of user k and subcarriers n and described by complex Gaussian random variables $h_{k,n}^{(t)} \sim \mathcal{CN}(0,\sigma_k^2)$, independent in both n and k. the parameter σ_k can be used to model the long-term average channel gain as $\sigma_k = (d_k/d_0)^{-\gamma} \cdot s_k$, , where d_k is the distance between the BS and subscribe k, is the reference distance ,y is the amplitude path-loss exponent and s_k characterizes the shadowing effect. Hence, the channel gain $g_{k,n}^{(t)} = |h_{k,n}^{(t)}|^2$ is an exponential random variable with probability density function (PDF) given by

$$f_{g_{k,n}}(\xi) = \frac{1}{\sigma_k} \exp\left(-\frac{\xi}{\sigma_k}\right).$$

The transmission rate of user k on subcarrier n at time t is given by

$$r_{k,n}^{(t)} = W \log_2\left(1 + \frac{p_t g_{k,n}^{(t)}}{\Gamma N_0}\right)$$

here p_t is the transmission power of a subcarrier, $g($ is the channel gain at time t, W is the bandwidth of a subcarrier, N_0 is the power spectral density of Gaussian noise, and Γ is the capacity gap that is related to the target bit error rate (BER) and coding-modulation schemes.

In traditional fast adaptive OFDMA systems, SCA decisions are made based on instantaneous channel conditions in order to maximize the system throughput. As depicted in Fig. 1(a), SCA is performed at the beginning of each time slot, where the duration of the *slot* is no larger than the coherence time of the channel. Denoting by $x_{k,n}^{(t)}$ the fraction of airtime assigned to user k on subcarrier n, fast adaptive OFDMA solves at each time slot t the following linear programming problem.

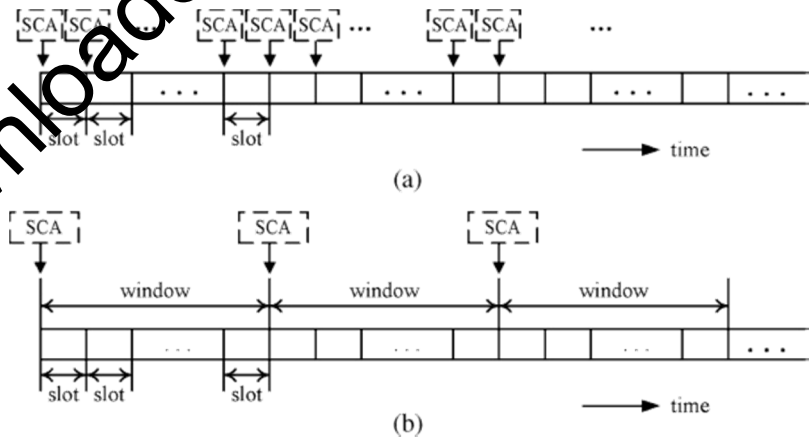

Fig. 1. Adaptation timescales of fast and slow adaptive OFDMA system
. (a) Fast adaptive OFDMA. (b) Slow adaptive OFDMA.

$$\mathcal{P}_{\text{fast}}: \quad \max_{x_{k,n}^{(t)}} \sum_{k=1}^{K}\sum_{n=1}^{N} x_{k,n}^{(t)} r_{k,n}^{(t)}$$
$$\text{s.t.} \quad \sum_{n=1}^{N} x_{k,n}^{(t)} r_{k,n}^{(t)} \geq q_k, \quad \forall k$$
$$\sum_{k=1}^{K} x_{k,n}^{(t)} \leq 1, \quad \forall n$$
$$x_{k,n}^{(t)} \geq 0, \quad \forall k, n$$

where the objective function in (2) represents the total system throughput at time t, and (3) represents the data rate constraint of user k at time t with q_k denoting the minimum required data rate. We assume that q_k is known by the BS and can be different for each user k. Since $g_{k,n}^{(t)}$ (and hence $r_{k,n}^{(t)}$) varies on the order of coherence time, one has to solve the Problem $\mathcal{P}_{\text{fast}}$ at the beginning of every time slot t to obtain SCA decisions. Thus, the above fast adaptive OFDMA scheme is extremely costly in practice.

In contrast to fast adaptation schemes, we propose a slow adaptation scheme in which SCA is updated only every *adap-tation window* of length T. More precisely, SCA decision is made at the beginning of each adaptation window as depicted in Fig. 1(b), and the allocation remains unchanged till the next window. We consider the duration T of a window to be large compared with that of fast fading fluctuation so that the channel fading process over the window is ergodic; but small compared with the large-scale channel variation so that path-loss and shad-owing are considered to be fixed in each window. Unlike fast adaptive systems that require the exact CSI to perform SCA, slow adaptive OFDMA systems rely only on the distributional information of channel fading and make an SCA decision for each window.

Let $x_{k,n} \in [0,1]$ denote the SCA for a given adaptation window.[3] Then, the time-average throughput of user k during the window becomes

$$\bar{b}_k = \sum_{n=1}^{N} x_{k,n} \bar{r}_{k,n}$$

Where

$$\bar{r}_{k,n} = \frac{1}{T}\int_{t_0}^{t_0+T} r_{k,n}^{(t)}\, dt$$

is the time-average data rate of user k on subcarrier n during the adaptation window. The time-average system throughput is given by

$$\bar{b} = \sum_{k=1}^{K}\sum_{n=1}^{N} x_{k,n} \bar{r}_{k,n}.$$

Now, suppose that each user has a short-term data rate require-ment q_k defined on each time slot. If $\sum x_{k,n} r(\cdot) < q_k$, then we say that a rate outage occurs for user k at time slot t, and the probability of rate outage for user k during the window $[t_0, t_0+T]$ is defined as

$$P_k^{\text{out}} \triangleq \Pr\left\{\sum_{n=1}^{N} x_{k,n} r_{k,n}^{(t)} < q_k\right\}, \quad \forall t \in [t_0, t_0 + T]$$

Where t_0 is the beginning time of the window.

Inelastic applications, such as voice and multimedia, that are concerned with short-term QoS can often tolerate an occasional dip in the instantaneous data rate. In fact, most applications can run smoothly as long as the short-term data rate requirement is satisfied with sufficiently high probability. With the above con-siderations, we formulate the slow adaptive OFDMA problem as follows:

$$\begin{aligned}
\mathcal{P}_{\text{slow}} : \max_{x_{k,n}} \; & \sum_{k=1}^{K}\sum_{n=1}^{N} x_{k,n}\mathbb{E}\left\{r_{k,n}^{(t)}\right\} \\
\text{s.t.} \; & \Pr\left\{\sum_{n=1}^{N} x_{k,n} r_{k,n}^{(t)} \geq q_k\right\} \geq 1 - \epsilon_k, \; \forall k \\
& \sum_{k=1}^{K} x_{k,n} \leq 1, \quad \forall n \\
& x_{k,n} \geq 0, \quad \forall k, n
\end{aligned}$$

Where the expectation[4] in (4) is taken over the random channel process $g_= \{ g() \}$ for $t \in \lceil t_0 \, t_0 + T \rceil$, and $\epsilon_k \in \lceil 01 \rceil$ in (5) is the maximum outage probability user k can tolerate. In the above formulation, we seek the optimal SCA that max-imizes the expected system throughput while satisfying each user's short-term QoS requirement, i.e., the instantaneous data rate of user k is higher than q_k with the probability at least $1 - \epsilon_k$. . the above formulation is a chance constraine (5) has been imposed.

II Safe Tractable Constraints

Despite its utility and relevance to real applications, chance constraint (5) imposed in $\mathbf{p}_{\text{slow.}}$ makes the ptimization highly intractable. The main reason is that the convexity of the feasible set defined by (5) is difficultto verify. Indeed, given a generic chance constraint $\Pr\{F(\mathbf{x}, \mathbf{r}) > 0\} \leq \epsilon$ where r is a random vector,x, is a vector of decision variable F is a real valued function , its feasible set is often nonconvex except for very few special cases. Moreover, even with the function in (5) $F(\mathbf{x}, \mathbf{r}) = q_k - \sum_{n=1}^{N} x_{k,n} r_{k,n}^{(t)}$ is bilinear in x and r. whose distribution is known, it is still unclear how to compute the probability in (5) efficiently.

To circumvent the above hurdles, we propose the following formulation $\mathbf{p}_{\text{slow.}}$ by replacing the chance constraints (5) with system of constraints $\mathcal{H}$ such that (i)x is feasible for (5) whenever it is feasible for , $\mathcal{H}$ are convexand efficiently unfeasible. The new formulation is given as follows:

$$\begin{aligned}
\tilde{\mathcal{P}}_{\text{slow}} : \max_{x_{k,n}} \; & \sum_{k=1}^{K}\sum_{n=1}^{N} x_{k,n}\mathbb{E}\left\{r_{k,n}^{(t)}\right\} \\
\text{s.t.} \; & \inf_{\varrho > 0} \left\{ q_k + \varrho \sum_{n=1}^{N} \Lambda_k(-\varrho^{-1} x_{k,n}) \right. \\
& \qquad \left. - \varrho \log \epsilon_k \right\} \leq 0, \quad \forall k \\
& \sum_{k=1}^{K} x_{k,n} \leq 1, \quad \forall n \\
& x_{k,n} \geq 0, \quad \forall k, n
\end{aligned}$$

Where $\Lambda_k(.)$ is the cumulant generating function of $r_{k,n}^{(t)}$, and

$$\Lambda_k(-\varrho^{-1}\hat{x}_{k,n}) = \log\left[\int_0^\infty \left(1+\frac{p_t\xi}{\Gamma N_0}\right)^{\frac{-W\hat{x}_{k,n}}{\varrho \ln 2}} \cdot\frac{1}{\sigma_k}\exp\left(-\frac{\xi}{\sigma_k}\right)d\xi\right].$$

In the following, we first prove that any solution x that is feasible for the STC (7) in $\mathbf{p}_{\text{slow}}$ is also feasible for the chance constraints. then we prove that $\mathbf{p}_{\text{slow is convex}}$

III Algorithm

1 Structure of the Proposed Algorithm

Require: The feasible solution set of Problem $\mathcal{P}_{\text{slow}}$ is a compact set $\mathcal{X}$ defined by (7)–(9).

1: Construct a polytope $X_0 \supset \mathcal{X}$ by (8) and (9). Set $i \leftarrow 0$.

2: Choose a query point (Section IV-A-1) at the ith iteration as $\mathbf{x}^i$ by computing the analytic center of X_i. Initially, set $\mathbf{x}^0 = \mathbf{e}/K \in X_0$ where $\mathbf{e}$ is an N-vector of ones.

3: Query the separation oracle (Section IV-A-2) with $\mathbf{x}^i$.

4: If $\mathbf{x}^i \in \mathcal{X}$ then generate a hyperplane (optimality cut) through $\mathbf{x}^i$ to remove the part of X_i that has lower objective values.

6: else

7: generate a hyperplane (feasibility cut) through $\mathbf{x}^i$ to remove the part of X_i that contains infeasible solutions.

8: end if

9: Set $i \leftarrow i+1$, and update X_{i+1} by the separation hyperplane.

10: if termination criterion (Section IV-B) is satisfied then

11: stop.

12: else

13: return to step 2.

14: end if

IV Simulation Results

In this section, we demonstrate the performance of our pro-posed slow adaptive OFDMA scheme through numerical sim-ulations. We simulate an OFDMA system with four users and 64 subcarriers. Each user k has a requirement on its short-term

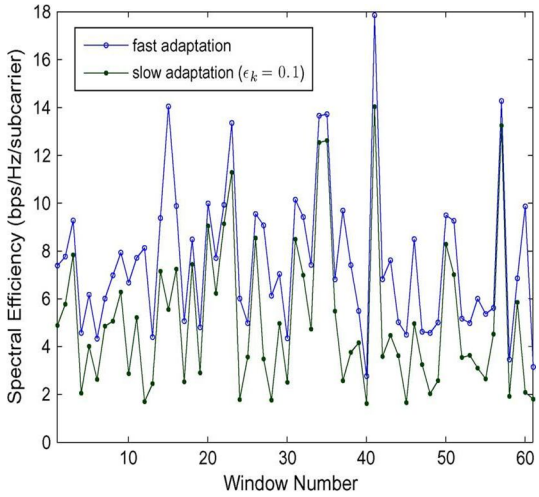

Fig. 1. Comparison of system spectral efficiency between

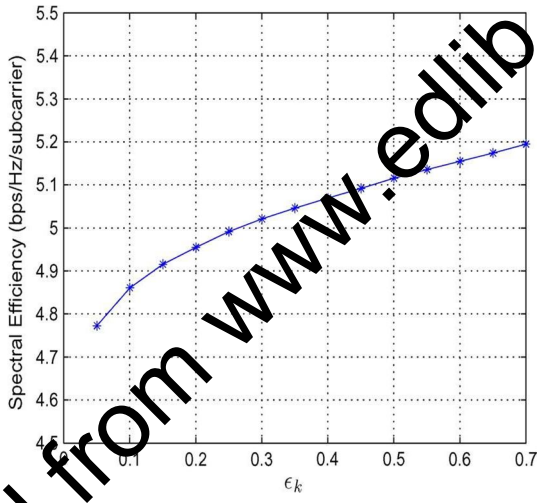

Fig. 2. Spectral efficiency versus tolerance parameter fast adaptive OFDMA and slow adaptive OFDMA Calculated from the average overall system throughput on one window, where the long-term average channel gain of the four users are 065.11 dB, 056.28 dB, 068.14 dB, and 081.96 dB, respectively.

V. Conclusion

This paper proposed a slow adaptive OFDMA scheme that can achieve a throughput close to that of fast adaptive OFDMA schemes, while significantly reducing the ISI, computational com-plexity and control signaling overhead and increases the spectral efficiency. Our scheme can satisfy user data rate requirement with high probability. This is achieved by formulating our problem as a stochastic optimization problem. Based on this formulation, we design a polyno-mial-time algorithm for subcarrier allocation in slow adaptive OFDMA

In the future, it would be interesting to investigate the chance constrained subcarrier allocation problem when frequency cor-relation exists, or when the channel distribution information is not perfectly known at the BS. Moreover, it is worthy to study the tightness of the Bernstein approximation. Another in-teresting direction is to consider discrete data rate and exclusive subcarrier allocation. In fact, the proposed algorithm based on cutting plane methods can be extended to incorporate integer constraints on the variables

Finally, our work is an initial attempt to apply the chance constrained programming methodology to wireless system de-signs. As probabilistic constraints arise quite naturally in many wireless communication systems due to the randomness in channel conditions, user locations, etc., we expect that chance constrained programming will find further applications in the design of high performance wireless systems

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Genetic Algorithm Approach to Solve Economic Load Dispatch Problem on Three Thermal Plants and A Combined Cycle Co-Generation Plant

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Abstract — This paper presents an approach based on Genetic Algorithm to solve the economic load dispatch problem with losses for three thermal plant system and combined cycle co-generation plant. Genetic algorithms are adaptive search methods that simulate some of the natural processes: selection, inheritance, random mutation and population dynamics. This approach is used to test for an example of three thermal plant system and one combined cycle co-generation plant in two ways of dispatching load between three thermal plants and among two thermal plus one combined cycle co-generation plant and the results are compared. In this paper, the results are obtained through the genetic algorithms developed in c Language.

Index Terms — About four key words or phrases in order of importance, separated by commas.

I. Introduction

Economic load dispatch (ELD) is a sub-problem of the optimal power flow (OPF) having the objective of fuel-cost minimization. The classical solutions for ELD problems have used equal incremental criterion for the loss-less system and the use of penalty factors for considering the system losses. However, all these methods are based on the assumption of continuity and differentiability of cost functions. Hence, the cost functions have been approximated in the differentiable form, mostly in the quadratic form. Further, these methods also suffer on two main counts. One is their inability to provide global optimal solution and getting stuck at local optima. The second problem is handling the integer or discrete variables.

Genetic algorithms (GAs) have been proved to be effective and quite robust in solving the optimization problems. GAs can provide near global solutions and also can handle effectively the discrete control variables. Discontinuity and non-differentiability of cost characteristics can be effectively handled by GAs.

Combined cycle co-generation plants (CCCP) have the following advantages over the thermal plants, namely,

1. Higher overall thermal efficiency.
2. Minimum air pollution by nox, dust etc.
3. Independent operation of gas turbine for peak loads.
4. Quick start-up and less capital cost per kw and
5. Less water requirement per unit of electrical output.

This paper proposes the application of GAs to solve the economic load dispatch for two types, that is,

1. The thermal plant systems and the results are compared with conventional method, and
2. Two thermal plant systems and third plant as a combined cycle co-generation plant and the results are included.

II. Theoretical Analysis on Genetic Algorithm and Economic Load Dispatch

A. Genetic Algorithm

1) Introduction

Genetic algorithms are search algorithms based on the mechanics of natural selection and natural genetics. They combine survival of the fittest among string structures with a structured yet randomized information exchange to form a search algorithm with some of the innovative flair of human search [1]. In every generation,

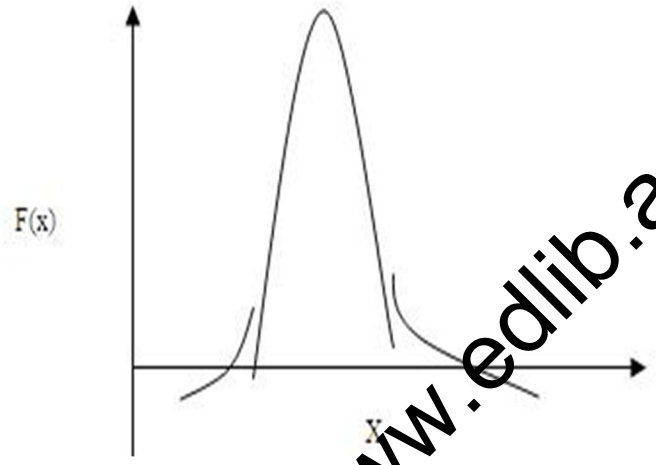


Figure 1 The Single Peak function which is easy for Calculus – Based Methods

A new set of artificial creatures (strings) is created using bits and pieces of the fittest of the old; an occasional new part is tried for good measure.

2) A Simple Genetic Algorithm

The mechanics of simple genetic algorithm are surprisingly simple, involving nothing more complex than copying strings and swapping partial strings. Simplicity of operation and power of effect are two of the main attractions of the genetic algorithm approach.

A simple genetic algorithm that yields good results in many practical problems is composed of three operators:

a. Reproduction
b. Crossover
c. Mutation

A) Reproduction

Reproduction is a process in which individual strings are copied according to their objective function values, f (biologists call this function the fittest function). This operator is artificial version of natural selection, a Darwinian survival of fittest among string creatures. In natural populations fitness is determined by a creature's ability to survive predators, pestilence and the other obstacles to adulthood and subsequent reproduction. In our artificial setting the objective function is the final arbiter of the string creature's life or death.

No.	String	Fitness	% of Total
1	01101	169	14.4
2	11000	576	49.2
3	01000	64	5.5
4	10011	361	30.9
Total		1170	100.0

Table 1

The reproduction operator may be implemented in an algorithmic form in a number of ways. The easiest is to create a biased roulette wheel where each current string in the population has a roulette wheel slot sized in proportion to its fitness. Suppose the sample population of four strings in the black box problem has objective or fitness function values f as shown in Table1

Summing the fitness over all four strings, one obtains a total of 1170. The percentage of population total fitness is also shown in the table. To reproduce, one simply spin the weighted roulette wheel thus defined four times. For the example problem, string number 1 has a fitness value of 169, which represents 14.4 percent of the total fitness. As a result, string 1 is given 14.4 percent of the biased roulette wheel, and each spin turns up string 1 with probability 0.144.

B) Crossover

After reproduction, simple crossover may proceed into two steps. First, members of the newly of reproduced strings in the matting pool are matted at random. Second, each pair of strings undergoes crossing over as follows: an integer position k along the string is selected uniformly at random between 1 and the string length less 1 (1 to l-1). Swapping all characters between positions k+1 and l inclusively creates two new strings. For example consider strings A1 and A2 from the initial population:

A1=0110/1
A2=1101/0

Suppose in choosing a random number between 1 and 4, we obtain a k=4 (as indicated by a separator symbol '/'). The resulting crossover yields two new strings where the prime (') means the strings are part of the new generation:

A1'=01100
A2'=11011

Consider a population of n strings over some appropriate alphabet, coded so that each is a complete idea or prescription for performing a particular task. Sub strings within each string (idea) contain various notions of what is important or relevant to the task. Genetic algorithms ruthlessly exploit this wealth of information by

(1) Reproducing high-quality notions according to their performance and
(2) Crossing these notions with many other high-performance notions from other strings.

Thus, the action of crossover with previous reproductions speculates on new ideas constructed from the high-performance building blocks (notions) of past trials.

C) Mutation

Mutation plays a decidedly secondary role in the operation of genetic algorithms. Mutation is needed because, even though reproduction and crossover effectively search and recombine extant notions, occasionally they may become overzealous and lose some potentially useful genetic material (1's or 0's at particular locations).

One may notice that the fitness or objective function values are the same as the black box values (compare Tables 1 and 2). There is no coincidence, and the black box optimization problem was well represented by the particular function f(x), and coding one is now using. A generation of the genetic algorithm begins with reproduction. One select the mating pool of the next generation by spinning the weighted roulette wheel four times.

String No.	Initial population (Randomly Generated)					x Value unsigned integer	$f(x_i)$ x^2	Pselect $f_i / \sum f$	Expected count $f_i / \bar{f}$	Actual Count From roulette wheel
1	0	1	1	0	1	13	169	0.14	0.58	1
2	1	1	0	0	0	24	576	0.49	1.97	2
3	0	1	0	0	0	8	64	0.06	0.22	0
4	1	0	0	1	1	19	361	0.31	1.23	1
Sum							1170	1.00	4.00	4.0
Average							293	0.25	1.00	1.0
Max							576	0.49	1.97	2.0

Table2

Actual simulation of this process using coin tosses has resulted in string 1 and string 4 receiving one copy in the mating pool, string 2 receiving two copies, and string 3 receiving no copies, as shown[9] in the center of Table 2.

B. Economic Load Dispatch

1) Introduction

An early method of attempting to minimize the cost of delivered power called for supplying power from only the most efficient plant at light loads. As load is increased, the most efficient plant would supply power until the point of maximum efficiency of that plant was reached. Even with transmission losses neglected this methods fail to minimize the cost.

Thus, because of the following trends in the growth of power systems it has become progressively important to give increasing attention to economic operation of power systems.

1. In many cases, economic factors and the availability of primary essential such as coal, water etc., dictate that new generating plants be located at greater distances from the load centre.
2. The installation of larger blocks of power has resulted in the necessity of transmitting power out of a given area until the load in that area is equal to new block of installed capacity
3. Power systems are interconnecting for purposes of economy interchange and reduction of reserve capacity.
4. In a number of areas of the country the cost of fuel is rapidly increasing.

The main factor controlling the most desirable load allocation between various generating units is the total running cost. The operating cost of a thermal plant is mainly the cost of the fuel. Fuel supplies for thermal plants can be coal/natural gas, oil or nuclear fuel. The other costs such as cost of labour, supplies,

maintenance etc., being difficult to be determined and approximate, are assumed to vary as affixed percentage of the fuel cost.

2) Economic Dispatch Neglecting Losses

When transmission distances are very small and load density is very high, transmission losses may be neglected and the optimal dispatch of generation is achieved with all plants operating at equal incremental production cost. .The common for including the effect of transmission losses is to express the total transmission losses as quadratic function of the generator power outputs . The simplest quadratic form is

$$P_l = \sum_{i=1}^{n} \sum_{j=1}^{n} P_i B_{ij} P_j \qquad \text{.....(1)}$$

Here the coefficients Bij are called loss coefficients or B-coefficients. B-coefficients are assumed constant and reasonable accuracy can be expected provided the actual operating conditions are close to the base values where the B-constants are computed.

For a system with 'n' generating units let

$$F_t = f_1 + f_2 + \ldots\ldots\ldots + f_n$$

Where Ft is the cost function giving all the fuel for the entire system and is the sum of the fuel cost of the individual units f1, f2 , ... f n.

The total megawatt power input to the network from all units is the sum

$P_{G1} + P_{G2} + P_{G3} \ldots\ldots P_{Gn}$.

Where PG1 ,PG2 ,.....PG n are the individual outputs of the units injected into the network. The total Ft of the system is a function of all the power plant outputs. The constraining equation on the minimum value of Ft is given by the power balance equation

$$P_1 + P_d - \sum_{i=1}^{n} P_{Gi} = o \qquad \text{.....(2)}$$

Where Pd is the total power received by the loads and P1 is the transmission loss of the system. The objective is to obtain a minimum Ft for affixed system load Pd subjected to the above power balance constraint.

The procedure for solving such minimization problems is called the method of Lagrange's multipliers.

The new cost function F is formed by combining the fuel cost and the equality constraint in the following manner:

$$F = F_t + \lambda \left(P_1 + P_d - \sum_{i=1}^{n} P_{Gi} \right) \text{.....(3)}$$

The augmented cost function F is also called the Lagrangian and the parameter, which is called the Lagrange multiplier is the effective incremental fuel cost of the system when transmission line losses are taken into account.

The original problem of minimizing Ft subjected to the constraint given by Eq 3.2.4.2 is transformed into an unconstrained problem given by F, where it is required to minimize F with respect to and the generator outputs.

$$F/PGi = Ft/PGi + \lambda \left(Pl+Pd - \sum_{i=0}^{n} PGi \right) / PGi = o \quad .....(4)$$

Since, Pd is fixed and the fuel cost of any one unit varies only if the power output of that unit is varied. So the above equation yields:

$$F/PGi = Ft/PGi + \lambda \, (Pl/PGi-1) = 0 \quad .....(5)$$

for each of the generating unit outputs PG1,PG2,.....PGn.

Because Ft depends on only PGi, the partial derivatives of Ft can be replaced by the full derivative and the Eq 3.2.4.5 gives

$$\lambda = \frac{1}{1-(Pl/PGi)} (dFt/dPGi) \quad .....(6)$$

for every value of i.

This equation can also be written in the form

$$\lambda = L\,i \, (dFt / dPGi) \quad .....(.7)$$

where Li is called penalty factor of plant i, and is given by

$$Li = \frac{1}{1-(Pl/PGi)} \quad .....(.8)$$

The result for Eq (7) means that the minimum fuel cost is obtained when the incremental fuel cost of each unit multiplied by its penalty factor is the same for all the generating units in the system. The products Li (dFt/dPGi) are each equal to called the system, which are approximately the cost in Rs/h to increase the total delivered load by one MW.

Eq (7) governs the coordination of transmission loss into the problem of economic loading of units in plants, which are geographically dispersed throughout the system.

3) Combined Cycle Co-Generation Plant

Combined cycle co generation plants have the following advantages over the thermal plants, namely,

1. higher overall thermal efficiency
2. minimum air pollution by nox, dust etc.
3. independent operation of gas turbine for peak loads.
4. quick start-up and less capital cost per KW and
5. less water requirement per unit of electrical output.

The fuel consumption and the cost characteristics of such plants, in general, are not differentiable. The application of the genetic algorithms is the only viable solution for power system with combined cycle cogeneration plants and it is not possible to solve such a ELD problem by conventional technique. Till date only limited work has been reported in the area of CCCP economic load dispatch.

4) Two Thermal Plants and One CCCP System

In the three thermal plant systems, the third thermal plant is to be replaced by combined cycle cogeneration plant CCCP(two 75MW gas turbines and one 50 MW steam turbines). The fuel cost characteristics of this plant is shown in figure below[6] :

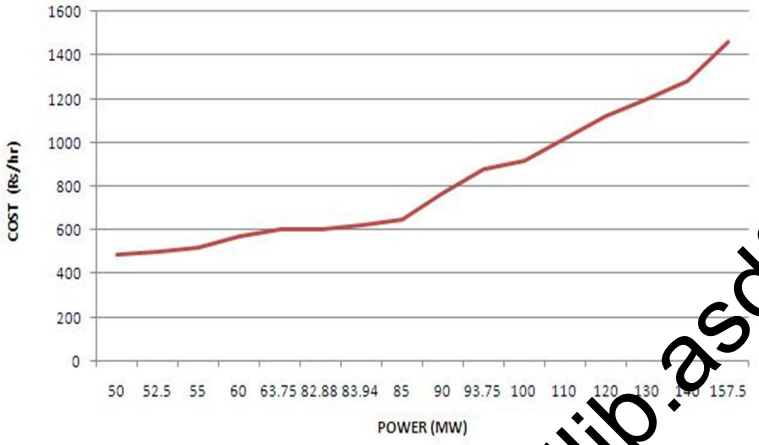


Figure .2: Fuel characteristics of co-generation plant

Power(MW)	Cost(Rs/h)
50	490
52.5	505
55	520
60	570
63.75	605
82.88	605
83.94	625
85	650
90	770
93.75	880
100	920
110	1020
120	1120
130	1200
140	1280
157.5	1460
166	1460
176.63	1460
178.32	1490
180	1520
185	1600
190	1720
200	1850

Table.3

Using the given set of points, a polynomial of specific order can be fitted using polynomial regression technique. We assume that the quadratic is to be fitted here for the cost curve. Assume that n pairs of coordinates (xi,yi) are given which are to be approximated by a quadratic. Let the quadratic be represented as

$$Y = AX2+BX+C$$

When X=Xi The left hand side of the above equation is represented by Yci

$$Yci=AXi2+BXi+C$$

The sum of squares of the deviations is given by

$$S=\Sigma\ (Yi - Yci)_2 = \Sigma(\ Yi - A\ Xi2 - BXi - C\ )2$$

Differentiating S w.r.t A,B,C respectively and setting each of the co-efficient equal to zero, we get

$$nC+B\Sigma Xi+A\Sigma Xi_2 = \Sigma\ Yi$$
$$C\Sigma Xi+B\Sigma Xi_2+A\Sigma Xi_3 = \Sigma Xi\ Yi$$
$$C\Sigma Xi_2+B\Sigma Xi_3+A\Sigma Xi_4 = \Sigma Xi_2 Yi$$

These are three linear equations in three unknowns. These are called normal equations for quadratic regression. These may be solved by Gauss – Jordan procedure.
Finally we obtain the curve as

$$F = A\ PGi2 + B\ PGi + C$$

For the problem, the solution was obtained through the genetic algorithms developed in c language. It is observed that this method is accurate and may replace effectively the conventional practices presently performed in different central load dispatch centers.

III. Classical Economic Load Dispatch Problem

The object of ELD problem is to minimize the total fuel cost at thermal plants

$$OBJ=\sum_{i=1}^{n} Fi(Pi)$$

Subject to the constraint of equality in real power balance

$$\sum_{i=1} Pi-Pl-Pd=0$$

The inequalities of real power limits on the generator outputs are

$$Pimin < Pi < Pimax$$

Where Fi(Pi) is the individual generation production in terms of its real power generation Pi, Pi is the output generation for unit i, n the number of generators in the system, Pd the total current system load demand, and Pl the total system transmission losses.

The thermal plant can be expressed as input-output models (cost function), where the input is the fuel cost and the output the power output of each unit. In practice, the cost function could be represented by a quadratic function.

$$Fi(Pi)=Ai.Pi^2+Bi.Pi+Ci$$

The incremental cost curve data are obtained by taking the derivative of the unit input-output equation resulting in the following equation for each generator:

$$dFi(Pi)/dPi=2.Ai.Pi+Bi$$

transmission losses are a function of the unit generations and are based on the system topology. Solving the ELD equation for a specified system requires an iterative approach since all unit generation allocation are embedded in the equation for each unit .

$$Pl=PiBijPj$$

Where Bij are coefficients, constant for certain conditions.
Application of GA to economic load dispatch problem.

Value=bit0*20+bit1*21+.....+biti*2i+.....+bitchrom-length*2chrom-length

If the optimized parameter belongs to (Pimax,Pimin),decoding value of the parameter is computed by equation(4.1.1).

$$Pi = Pimin + \frac{value*(Pimax- Pimin)}{2chrom\text{-}length -1}$$

Objective Function and Fitness Function Formulation

In the ELD problem, the goal is to minimize the objective function

$$Ft = \sum_{i=1}^{n} Fi\ (Pi)$$

with the constraint of equality

$$\sum_{i=1}^{n} Pi-PL-Pd=0$$

is changed to constrained optimization problem and thus forming fitness function

$$Fct=Ft+PF\ (\sum Pi-PL-Pd)$$

where pf is penalty factor .the penalty function is placed into the objective function in such away that it penalizes any violation of the constraint and forces that unconstrained optima toward the feasible region . in the ELD problem the goal is to minimize the objective function Fct, while the objective when using GAs is to maximize a fitness function Ftt in the given form[10].

$$Ftt=EXP(-(K1*Fct)k2)$$

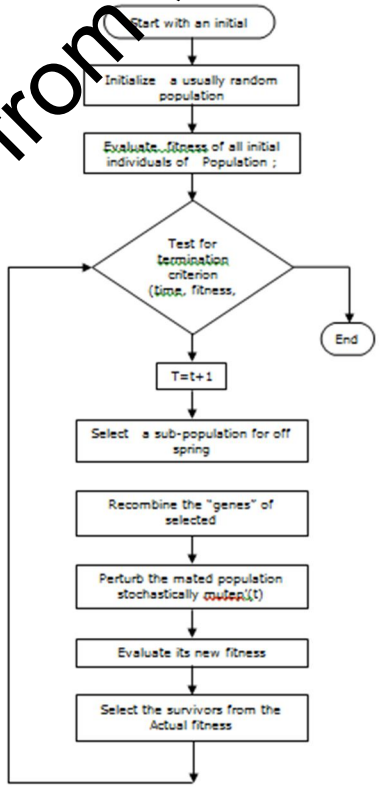
K1 and K2 are constants and the value is problem dependent .considering the evolutionary process of the GAs ,the solution is improved through the generation and also to decrease the penalty function over successive iterations can be adapted with the penalty function varying directly with the number of generations.

IV. Software and Results

The cost functions of the three thermal plants considered in this paper are obtained from Sheble and Britting [11]and they are as follows.

F1=(0.00156)P1^2+(7.92)P1+561 Rs/h
F2=(0.00194)P2^2+(7.85)P2+310 Rs/h
F3=(0.00482)P3^2+(7.97)P3+78 Rs/h
The loss co-efficients of the considered system are
0.000075 0.000005 0.000008
0.000005 0.000015 0.000010
0.000008 0.000010 0.000045
The Operating ranges for three plants are :
100MW < P1 < 600MW
100MW < P2 < 400MW
50MW < P3 < 200MW

Population size :10
Chromosome length :36
Maximum number of generations : 1000
Crossover probability :0.50
Mutation probability : 0.01



Total load P_D MW	Classical Kirchmayer Method				Cost Rs./h	GA				Cost Rs./h
	P_{G1}	P_{G2}	P_{G3}	P_L		P_{G1}	P_{G2}	P_{G3}	P_L	
812.57	325.116	371.012	130.000	13.558	7986.093	314.381	383.003	128.334	13.146	7986.068
585.33	233.258	268.106	90.933	6.962	5890.063	243.450	257.655	91.475	7.250	5890.094
869.00	345.120	400.660	138.610	15.420	8522.450	355.524	395.091	134.196	15.812	8522.875

Table.4

Here the range of limits for the load can be taken as 250MW – 1200 MW.

Genetic Algorithm claims to provide near optimal or optimal solution for computationally intensive problems. Therefore the effectiveness of the genetic algorithm solutions should always be evaluated by experimental results. For economic load dispatch problem, the results obtained through genetic algorithms developed in C language was tested for three thermal plant systems and extended to one plant as combined cycle co-generation plant in three thermal plant systems. The execution time takes two seconds in Pentium 120 MHz processor.

The performance of GA approach is compared with the classical Kirchmayer method as given in table 5.1. For the load of 585.33 MW, ΣPi-PD-PL = 592.297 – 585.33 – 6.962 = 0.005 MW in Classical Kirchmayer method, and it is 592.850 – 585.330 – 7.25 = 0 in GA approach. For the load of 869 MW ΣPi-PD-PL = 884.390 – 869.000 – 15.420 = -0.030 in conventional method and it is 884.811 – 869.000 – 15.812 = -0.001 MW in GA approach. The constraint of equality ΣPi-PD-PL = 0 does not hold good for classical Kirchmayer method. But this constraint is almost equal to or nearer to zero in GA approach. It at all it is having some value, it is multiplied by the penalty factor (PF) which is placed into the objective function in such a way that it penalizes any violation of the constraints and forces that unconstrained optima towards the feasible region. The solution of GA is improved through the generations, and also by decreasing the penalty function.

In conventional method, the values of PG1,PG2,PG3 are not optimal values as the constraint of equality does not hold good and also the cost functions of the plants are non-linear and they are approximated as either linear or quadratic.

It is observed that for any load, GA approach provides optimal values as the constraint of equality is almost zero or nearer to zero to minimize the objective function and there is no need of approximating the cost functions. Hence it is more accurate method and may replace effectively the conventional methods.

The cost functions of two thermal plants of taken as same as in the case of three thermal plants and the cost function of combined cycle co-generation plant (CCCP) can be taken as F3=(0.003210) P3^2+(7.927738) P3+56.667804 Rs/h. The loss co-efficients, operating ranges and the other data used in GA are same as in the first case.

Total load P_D MW	GA Method on three thermal plants					Cost Rs./h
	No.of generations	P_{G1}	P_{G2}	P_{G3}	P_L	
750	26	370.556	266.333	131.167	14.480	7415.401
650	203	317.018	230.211	115.106	10.725	6521.871
869	0	435.484	301.29	150.645	19.791	8532.77
1000	386	508.764	345.258	172.269	26.782	9842.026
812.57	256	404.262	282.557	141.279	17.133	7986.512

Total load P_D MW	GA Method on two thermal plants and one CCCP					Cost Rs./h
	No.of generations	P_{G1}	P_{G2}	P_{G3}	P_L	
750	676	371.418	262.85	131.425	14.545	7404.04
650	364	316.971	230.183	115.091	10.722	6471.786
869	37	436.787	302.072	151.036	19.906	8511.479
1000	284	508.343	345.006	172.503	26.739	9752.957
812.57	326	404.629	282.777	141.389	17.163	7938.337

Tables.5.1 and 5.2

As combined cycle co-generation plant (CCCP) is having low cost, total cost of two thermal plants with one combined cycle co-generation plant is lower than the total cost of three thermal plant system for any load and it is proved by the GA approach given in the table 5.2. The method is accurate and may replays effectively the conventional practices presently performed in different central load dispatched centers. This approach is only viable solution for power system with combined cycle co-generation plants and it is not possible to solve such a ELD problem by conventional technique and it is given table 5.2

V. Conclusions

The genetic algorithm is a searching or optimizing algorithm based on the natural evolution principles. Because of its capability to solve nonlinear optimization problems, the application of GAs to power system is a promising area to explore.

There is no need of approximating the cost functions of the plants in the differentiable form or quadratic form as in the case of conventional methods as Genetic Algorithms are used for solving the functions whether they are differentiable or not, continuous or not effectively. They do not stuck into local optima, because these begin with many initial points and search for the most optimum in parallel and these have been proved to be effective and quite robust in solving the optimization problems and can handle discrete control variable effectively and provide global solutions.

VI. Scope for Enhancement

Movement in the simple genetic algorithm is accomplished using three primary operators: reproduction, crossover and mutation. A genetic algorithm works with a population of chromosomes.

Refined genetic algorithms differ from simple genetic algorithms by some improvements made to ensure faster convergence. They are elitism, changing probabilities of mutation and crossover..

It is having a wide variety of current applications in science, engineering business and the social sciences. For other applications like multi-objective optimization etc. the advanced operators like Dominance, Diploid and Abeyance, Inversion and other Recording operators may be used.

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A Comprehensive Analysis of Risks, Threats and Vulnerabilities in Cloud Computing

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Abstract: Cloud computing is new paradigm that's driving the world of technology and services over the Internet. Cloud providers facilitate individuals and businesses to use software and hardware that are managed by third parties at remote locations. Cloud services include online file storage, social networking sites, webmail, and online business Applications. Moving critical applications and sensitive data to public cloud environments is of great concern for those corporations that are moving beyond their data center's network under their control. To alleviate these concerns, a cloud solution provider must ensure that customers will continue to have the same security and privacy controls over their applications and services, provide evidence to customers that their organization are secure and they can meet their service-level agreements, and that they can prove compliance to auditors

Keywords: Cloud computing, Security, SPI model, Vulnerabilities, Threats, Countermeasures, regionalization, transparency.

I. Introduction

Recent Snowden leaks aren't driving companies away from the cloud and its services; but the disclosures have made them a lot more careful and present cloud providers have more to guarantee the security of the customer data and business. In today's world Cloud computing is the most sought after and popular technology. Cloud Computing enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. One of the most significant barriers to adoption is security, followed by issues regarding compliance, privacy and legal matters. Because Cloud Computing represents a relatively new computing model, there is a great deal of uncertainty about how security at all levels (e.g., network, host, application, and data levels) can be achieved and how application security is moved to Cloud Computing.

Security concerns relate to risk areas such as external data storage, dependency on the public internet, lack of control, multi-tenancy, and integration with internal security Traditional security mechanisms such as identity, authentication, and authorization are no longer enough for clouds in their current form. Security controls in Cloud Computing are, for the most part, no different than security controls in any IT environment. However, because of the cloud service models employed, the operational models, and the technologies used to enable cloud services, Cloud Computing may present different risks to an organization than traditional IT solutions. Unfortunately, integrating security into these solutions is often perceived as making them more rigid.

A threat is defined as a potential attack that may lead to a misuse of information or resources, and vulnerability is the flaws allow an attack to be successful. This paper describes the relationship between these vulnerabilities and threats; how these vulnerabilities can be exploited in order to perform an attack, and also present some countermeasures related to these threats which try to solve or improve the identified problems.

II Literature Survey

2.1 Security in the SPI model [3] provides three types of services such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

With SaaS, the burden of security lies with the cloud provider. In part, this is because of the degree of abstraction, the SaaS model is based on a high degree of integrated functionality with minimal customer control or extensibility. By contrast, the PaaS model offers greater extensibility and greater customer control. Largely because of the relatively lower degree of abstraction, IaaS offers greater tenant or customer control over security than do PaaS or SaaS [1].

Each cloud service model comprises its own inherent security flaws; however, they also share some challenges that affect all of them. These relationships and dependencies between cloud models may also be a source of security risks. A SaaS provider may rent a development environment from a PaaS provider, which might also rent an infrastructure from an IaaS provider. Each provider is responsible for securing his own services, which may result in an inconsistent combination of security models. It also creates confusion over which service provider is responsible once an attack happens.

2.2 Software-as-a-Service (SaaS) Security Issues

SaaS provides application services on demand such as email, conferencing software, and business applications such as ERP, CRM, and SCM. SaaS users have less control over security among the three fundamental delivery models in the cloud. The adoption of SaaS applications may raise some security concerns.

2.3 Application Security

Applications are delivered via the Internet and a Web browser. However, flaws in web applications may create vulnerabilities for the SaaS applications. Attackers use the web to compromise user's computers and steal sensitive data. Security challenges in SaaS applications are same as web applications The Open Web Application Security Project (OWASP) has identified the ten most critical web applications security threats.

2.4 Multi-Tenancy

The applications in SaaS are grouped into maturity models that are determined by the following characteristics: scalability, configurability via metadata, and multi-tenancy. In the first maturity model, each customer has its own customized instance of the software. In the second model, the vendor also provides different instances of the applications for each customer, but all instances use the same application code. In the third maturity model multi-tenancy is added, so a single instance serves all customers. This approach enables more efficient use of the resources but scalability is limited. Since data from multiple tenants is likely to be stored in the same database, the risk of data leakage between these tenants is high. Good Security policies are the need of the hour to guarantee that customer's data are kept separate from other customers.

2.5 Data Security

Data security in SaaS is managed by Cloud providers. Organizational data is processed in plaintext and stored where the provider is responsible for data security, Data backup and sub contract. Most compliance standards cannot be envisioned in a world of Cloud Computing [5]. In the world of SaaS, the process of compliance is complex because data is located in the provider's datacenters, which may introduce

regulatory compliance issues such as data privacy, segregation, and security, that must be enforced by the provider.

2.6 Accessibility

Accessing applications over the internet via web browser makes access from any network device easier, including public computers and mobile devices. However, it also exposes the service to additional security risks. The Cloud Security Alliance [6] has released a document that describes the current state of mobile computing and the top threats in this area such as information stealing mobile malware, insecure networks (WiFi), vulnerabilities found in the device OS and official applications, insecure marketplaces, and proximity-based hacking.

2.7 Platform-as-a-Service (PaaS) Security Issues

PaaS facilitates deployment of cloud-based applications without the cost of buying and maintaining the underlying hardware and software layers [3]. As with SaaS and IaaS, PaaS depends on a secure and reliable network and secure web browser. PaaS application security comprises two software layers: Security of the PaaS platform itself (i.e., runtime engine), and Security of customer applications deployed on a PaaS platform [1]. PaaS providers are responsible for securing the platform software stack that includes the runtime engine that runs the customer applications. Same as SaaS, PaaS also brings data security issues and other challenges that are described as follows:

2.8 Infrastructure-as-a-Service (IaaS) Security Issues

IaaS provides a pool of resources such as servers, storage, networks, and other computing resources in the form of virtualized systems, which are accessed through the Internet. Users are entitled to run any software with full control and management on the resources allocated to them. With IaaS, cloud users have better control over the security compared to the other models as long there is no security hole in the virtual machine monitor. They control the software running in their virtual machines, and they are responsible to configure security policies correctly. However, the underlying compute, network, and storage infrastructure is controlled by cloud providers. IaaS providers must undertake a substantial effort to secure their systems in order to minimize these threats that result from creation, communication, monitoring, modification, and mobility [07].

2.9 Shared Resource

VMs located on the same server can share CPU, memory, I/O, and others. Sharing resources between VMs may decrease the security of each VM. For example, a malicious VM can infer some information about other VMs through shared memory or other shared resources without need of compromising the hypervisor. Using covert channels, two VMs can communicate bypassing all the rules defined by the security module of the VMM. Thus, a malicious Virtual Machine can monitor shared resources without being noticed by its VMM, so the attacker can infer some information about other virtual machines.

2.13 Virtual Machine Rollback

Virtual machines roll back to the previous states if an error happens. But rolling back in virtual machines may lead to security vulnerabilities that were patched or re-enable previously disabled accounts or passwords. One solution is to make a “copy” (snapshot) of the virtual machine, but this will propagate configuration errors and other vulnerabilities.

2.16 Analysis of Security Issues in Cloud Computing

This section discusses security vulnerabilities and threats of Cloud Computing. For each vulnerability and threat, we identify what cloud service model or models are affected by these security problems. The focus is mainly technology-based vulnerabilities but some of the vulnerabilities that may be common to any organization and can show negative impact are:

1)Lack of employee screening and poor hiring practices 2)Lack of customer background checks –Apocryphal accounts can let attackers perform any malicious activity without being identified 3)Lack of security education

III Vulnerabilities

Cloud Computing leverages many existing technologies such as web services, web browsers, and virtualization, which contributes to the evolution of cloud environments. Therefore, any vulnerability associated to these technologies also affects the cloud, and it can even have a significant impact. Table 2 presents an analysis of vulnerabilities in Cloud Computing. This analysis offers a brief description of the vulnerabilities, and indicates what cloud service models (SPI) can be affected by them. For this analysis, we focus mainly on technology-based vulnerabilities; however, there are other vulnerabilities that are common to any organization, but they have to be taken in consideration since they can negatively impact the security of the cloud and its underlying platform. Some of these vulnerabilities are the following: Lack of employee screening and poor hiring practices, Lack of customer background checks, Lack of security education.

Cloud Computing leverages many existing technologies such as web services, web browsers, and virtualization, which contributes to the evolution of cloud environments. Therefore, any vulnerability associated to these technologies also affects the cloud, and it can even have a significant impact.

Table 1: Vulnerabilities in cloud computing

S.No	Vulnerability	Description	layer
V1	Insecure interfaces and APIs	Cloud providers offer services that can be accessed through APIs (SOAP, REST, or HTTP with XML).The security of the cloud depends upon the security of these interfaces . Some problems are: a) Weak credential b) Insufficient authorization checks c) Insufficient input-data validation	SPI
V2	Unlimited allocation of resources	Inaccurate modeling of resource usage can lead to overbooking or over-provisioning.	SPI
V3	Data-related vulnerabilities	a) Data can be collocated with the data of unknown owners (intruders) with a weak separation b) Data may be located in different jurisdictions which have different laws c) Incomplete data deletion – data cannot be completely removed d) Data backup done by untrusted third-party providers e) Information about the location of the data usually is unavailable or not disclosed to users. f) Data is often stored, processed, and transferred in clear plain text	SPI

V4	Vulnerabilities in Virtual Machines	a) Possible covert channels in the collocation of VMs b) Unrestricted allocation and deallocation of resources with VMs [7]c) Uncontrolled Migration - VMs can be migrated from one server to another server due to fault tolerance, load balance, or hardware maintenance [7] d) Uncontrolled snapshots – VMs can be copied in order to provide flexibility [5], which may lead to data leakage) Uncontrolled rollback could lead to reset vulnerabilities - VMs can be backed up to a previous state for restoration [44], but patches applied after the previous state disappear f) VMs have IP addresses that are visible to anyone within the cloud - attackers can map where the target VM is located within the cloud (Cloud cartography)	I
V5	Vulnerabilities in V.M Images	a) Uncontrolled placement of VM images in public repositories b) VM images are not able to be patched since they are dormant artifacts	I
V6	Vulnerabilities in Hypervisors	a) Complex hypervisor code b) Flexible configuration of VMs or hypervisors to meet organization needs can be exploited	I
V7	Vulnerabilities in Virtual Networks	Sharing of virtual bridges by several virtual machines	I

We infer from the above table 2 that data storage and virtualization are the very critical and an attack to them can be more harmful. Attacks on lower layers have high impact than above layers.

IV Threats in Cloud Computing

Table 2: The following table describes various threats and their description

S.No	Threats	Description	layer
T1	Account or service hijacking	An account theft can be performed by different ways such as social engineering and weak credentials. If an attacker gains access to a user's credential, he can perform malicious activities such as access sensitive data, manipulate data, and redirect any transaction.	SPI
T2	Data scavenging	Since data cannot be completely removed from unless the device is destroyed, attackers may be able to recover this data.	SPI
T3	Data leakage	Data leakage happens when the data gets into the wrong hands when transferred, stored, audited or processed.	SPI
T4	Denial of Service	It is possible that a malicious user will take all the possible resources. Thus, the system cannot satisfy any request from other legitimate users due to resources being unavailable.	SPI
T5	Customer-data manipulation	Users attack web applications by manipulating data sent from their application component to the server's application [20,32]. For example, SQL injection, command injection, insecure direct object references, and cross-site scripting.	SPI
T6	VM escape	It is designed to exploit the hypervisor in order to take control of the underlying infrastructure.	I

T7	VM hopping	It happens when a VM is able to gain access to another VM (i.e. by exploiting some hypervisor vulnerability)	I
T8	Malicious VM creation	An attacker who creates a valid account can create a VM image containing malicious code such as a Trojan horse and store it in the provider repository [20].	I
T9	Insecure VM migration	Live migration of virtual machines exposes the contents of the VM state files to the network. An attacker can do the following actions: a) Access data illegally during migration [42] b) Transfer a VM to an untrusted host [44] c) Create and migrate several VM causing disruptions or DoS	I
T10	Sniffing/Spoofing virtual networks	A malicious VM can listen to the virtual network or even use ARP spoofing to redirect packets from/ to other.	I

V Countermeasures

5.1 Countermeasures for T01: Account or Service Hijacking

Identity and access management guidance: Cloud Security Alliance (CSA), a non-profit organization that promotes the use of best practices in order to provide security in cloud environments and identity and access reporting.

Dynamic credentials: The dynamic credential changes its value once a user changes its location or when he has exchanged a certain number of data packets.

5.2 Countermeasures for T03: Data Leakage

A. Fragmentation-redundancy-scattering (FRS) technique: This technique aims to provide intrusion tolerance and, in consequence, secure storage. This technique consists in first breaking down sensitive data into insignificant fragments, so any fragment does not have any significant information by itself. Then, fragments are scattered in a redundant fashion across different sites of the distributed system.

B. Digital signatures: [8] proposes to secure data using digital signature with RSA algorithm while data is being transferred over the Internet. They claimed that RSA is the most recognizable algorithm, and it can be used to protect data in cloud environments.

C. Homomorphic encryption: Three important operations for cloud data are transfer, store, and process. Normally encryption may be used for to and fro transfer of data .The method is based on the application of fully homomorphic encryption to the security of clouds. Fully homomorphic encryption allows performing arbitrary computation on cipher texts without being decrypted. Current homomorphic encryption schemes support limited number of homomorphic operations such as addition and multiplication but real-world cloud applications requires a huge processing power which may impact on user response time and power consumption.

D. Encryption: Encryption techniques have been used for long time to secure sensitive data. Sending or storing encrypted data in the cloud will ensure that data is secure. However, it is true assuming that the encryption algorithms are strong. There are some well-known encryption schemes such as AES (Advanced Encryption Standard). Also, SSL technology can be used to protect data while it is in transit. Moreover, [9] describes that encryption can be used to stop side channel attacks on cloud storage de-duplication, but it may lead to offline dictionary attacks reveling personal keys.

5.3 Countermeasures for T05: customer data manipulation : Web application scanners: Web application scanners is a program which scans web applications through the web front-end in order to identify security vulnerabilities such as web application firewall which routes all web traffic through the web application firewall which inspects specific threats.

5.4 Countermeasures for T06: VM Escape

A. Hyper Safe : Hyper Safe's goal is to protect type I hypervisors using two techniques: non-by by passable memory lockdown which protects write-protected memory pages from being modified, and restricted pointed indexing that converts control data into pointer indexes.

B. Trusted cloud computing platform: TCCP enables providers to offer closed box execution environments, and allows users to determine if the environment is secure before launching their VMs. The TCCP adds two fundamental elements: a trusted virtual machine monitors (TVMM), and a trusted coordinator (TC). The TC manages a set of trusted nodes that run TVMMs, and it is maintained but a trusted third party. The TC participates in the process of launching or migrating a VM, which verifies that a VM is running in a trusted platform.

5.5 Countermeasures for T08: malicious virtual machine creation: Mirage: A virtual machine image management system approach includes the following security features, access control framework, image filters, a provenance tracking, and repository maintenance services. However, the limitation of this approach is that filters may not be able to scan all malware or remove all the sensitive data from the images. Also, running these filters may raise privacy concerns because they have access to the content of the images which can contain customer's confidential data.

VI Conclusions

Cloud Computing leverages many technologies, it also inherits their security issues. Traditional web applications, data hosting, and virtualization have been looked over, but some of the solutions offered are immature or inexistent. We have presented security issues for cloud models: IaaS, PaaS, and IaaS, which vary depending on the model. As described in this paper, storage, virtualization, and networks are the biggest security concerns in Cloud Computing. Virtualization which allows multiple users to share a physical server is one of the major concerns for cloud users.

New security techniques are needed as well as redesigned traditional solutions that can work with cloud architectures. Traditional security mechanisms may not work well in cloud environments because it is a complex architecture that is composed of a combination of different technologies.

Despite some reports of slowing sales of cloud services by U.S. vendors to overseas companies, experts now expect that the Snowden leaks will have little effect on long-term sales. Analysis say IT security officials are looking at several key areas, such as data encryption, key management and data ownership, regionalization, and the need for increased government transparency, to improve cloud security. Encryption is only as secure as its key management system. US data leaks could also accelerate regionalization of cloud services. Data residency requirements is becoming the order of the day

VII Acknowledgments

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Simulation of a New Design Muffler to Reduce Noise in Exhaust System of C-12 SI Engine

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Abstract- In this work, a finite element approach is presented for modeling and analysis of expansion type muffler are used often in the modern day's automotive exhaust system. The component is analyzed by using Pro-Mechanic a FEA tool, modal analysis is carried out on the expansion muffler to avoid resonance condition, natural frequency and mode shapes are presented. The design of silencer of SI engine is a key issue to attenuate or emphasize certain spectral components of tailpipe noise. The optimization of complex shape silencer system is generally a time-consuming operation, which must be carried out by means of concurrent experimental measurements and numerical simulations. This paper, aims to reduce exhaust noise produced from the exhaust system of C-12 portable 4-stroke SI engine. Exhaust gases from the engine is high pressure, these gases the noise would be tremendous for this reason, the exhaust gases are made to flow through a muffler, it consists of series of metal plates and tubes with required design aspects. Pressure of the gases is reduced when they pass through an expansion type muffler so that the gases out through tail pipe quietly.

Keywords: Muffler, Exhaust system and C-12 SI engine.

I. Introduction

The control of both the level and quality of internal combustion engine noise is a key aspect of the design process of a new automotive powertrain system, in order to satisfy the legislation limits and provide a pleasant interior and exterior sound [1]. Due to their broadband characteristics at mid to high frequencies, dissipative mufflers have been widely used in automotive exhaust systems [2]. Although a plane wave models are available for the prediction of the sound attenuation of mufflers at low frequencies [3]. Multidimensional analytical techniques are required for higher frequencies are to be considering the propagation of higher order modes [4]. While multidimensional analytical methods are desirable due to their low computational effort, they are not capable to model complex silencer geometries or non-homogeneous properties [6]. Young and Crocker applied the finite element method to reactive concentric expansion silencers to predict their transmission loss [7]. Finite element models for bulk reacting absorbent materials were presented by Kirby to consider perforated dissipative mufflers with homogeneous properties [8-9]. The absorbent materials considered were assumed to be homogeneous. However, in realistic cases of automotive silencers, this assumption is not always fulfilled and heterogeneous acoustic properties of the fibrous materials appear, the presence of these non-homogeneous properties may arise uneven filling processes in dissipative mufflers and degradation produced by the flow of soot particles within the absorbent material, these two phenomena can cause significant variation in the filling density of the fibrous material, which as a consequence leads to heterogeneity of its equivalent complex density and speed of sound, the muffler accomplishers this with a resonating chamber, which is specifically tuned to cause destructive interference, where opposite sound waves cancel each other out [5]. Expansion-box mufflers are the simplest, and they are rarely found, which has both the inlet and outlet pipes extended into the silencer chamber and perforations are made over both the pipes. The exhaust gas entering into the inlet pipe is

allowed to expand through the perforated holes made over the inlet pipe, after expand the gases to strike over a baffle plate axially.

The gases are escapes from one side to the other through the inlet side of the silencer chamber. Finally the gases are out through the perforations made over the extension of the tail pipe. The gases emerge from the outlet are less energetic so that, it much quieter than the gas that enters the expansion box. In practice, a large expansion box is needed to give an appreciable reduction in noise so that, the expansion muffler are seldom used, unless it conjunction with another type, while designing a silencer [10]. Model analysis is carried out to find the natural frequency of the system to avoid resonance conditions in the operations. The expansion muffler concept has analyzed in Pro-Mechanica. The muffler absorbs sound waves and reduces the noise to socially and legally acceptable level. Redesigned muffler is attached with C-12 portable petrol engine as shown in Table 1.

Table I Engine Specifications Of C-12 Portable Petrol Engine

Engine Type	C-12 Petrol Engine
No. of cylinder	Single cylinder
Compression ratio	4.5 : 1
Bore (mm)	55
Stroke (mm)	50
Max power	1.2 kW, 2600 rpm
Load	1.1 – 1.2 kW
Max torque	3.3 Nm, 3600 rpm
Cooling system	Forced air cooling
Ignition timing	25° BTDC (fixed)

II. Existing and New Design Muffler

The parameters are changed with the existed and new design mufflers are below:

- Volume of the silencer should be greater than 6 times the volume of the cylinder of the engine.
- Diameter of the silencer should be greater than 2.5 times the diameter of inlet pipe.
- The diameter of tail pipe should not be more than half the diameter of the silencer chamber.
- The maximum length of silencer chamber can be up to 4 times the diameter of silencer chamber.
- A well designed silencer chamber should not reduce the power of the engine.
- The best efficiency of the silencer obtained with a loss of power 2 – 3%

A. Existing Mufflers

The parameters of an optimal design, which serves a compromise between the technical and economic factors:

Table II Specifications of existing muffler

Existing muffler	C-12 Petrol Engine
Diameter of inlet pipe	1.8 cm
Length of inlet pipe	11.5 cm
Volume of inlet pipe	29.25 cm^3
Volume of silencer chamber	235.3 cm^3
Total volume of silencer	264.55 cm^3

The design is not safe, because the amount if the total volume is very less comparing to required value that 720 cm^3 (six times the volume of the cylinder)

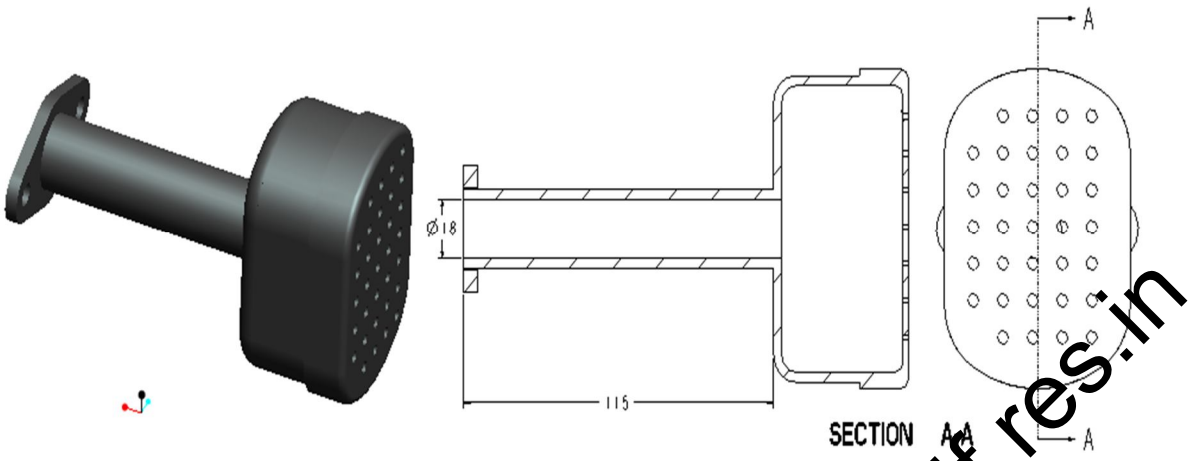


Figure 1 Existing muffler for C-12 Petrol engine

B. New Design Mufflers

The parameters of a new design expansion type muffler for exhaust system of portable single cylinder, 4-stroke spark ignition engine, as show in Table III.

Table III Specifications Of new design muffler

New design muffler	C-12 Petrol Engine
Diameter of the silencer	7.0 cm
Length of the silencer	19.0 cm
Diameter of inlet pipe & outlet pipe	2.2 cm
Volume of inlet pipe & outlet pipe	11.4 cm^3
Volume of silencer chamber	730.8 cm^3
Total volume of silencer	753.6 cm^3

The amount of total volume is greater than the required volume i.e. 720 cm3 so that, the design is safe, as shown in Figure. 2.

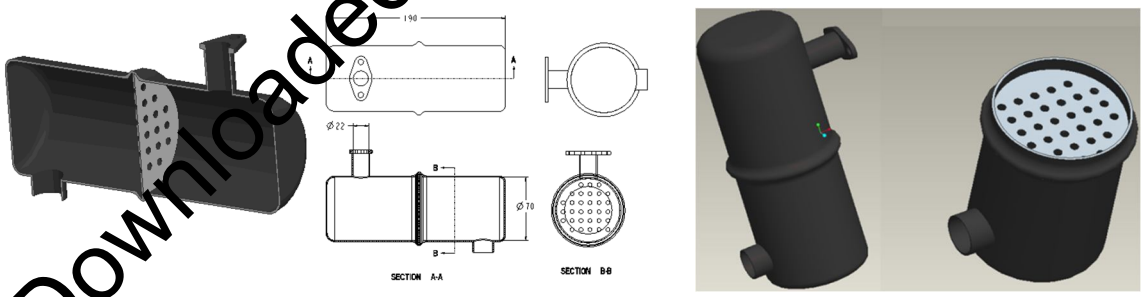


Figure 2 New design muffler

III. Experimental Setup

During testing the engine, the output is direct to the circuit, and the load varies with the help of regulator, because engine is coupled with the DC dynamometer; it converts the rotation (mechanical energy) into current (electric energy), as shown in Figure. 3

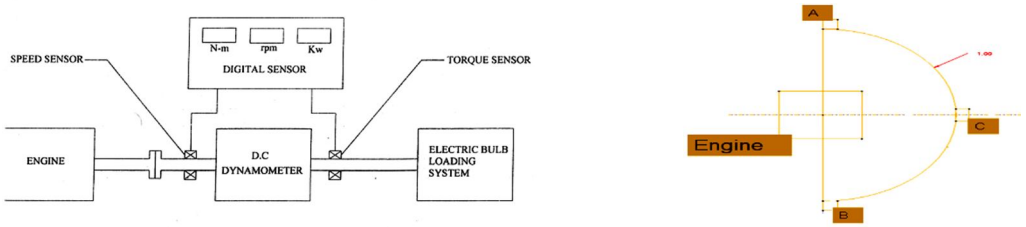


Figure 3 Digital lay out testing system

a. Testing of Silencer

The noise is measured from a fixed reference. A semicircle of 1 meter radius of the exhaust pipe outlet as the center point of the semicircle, 3 points are marked along the circumference of the circle and the points are marked as shown in Figure. 3, after testing the both existing and new designed muffler to obtain the average sound levels are shown in Table.4 and 5

TABLE IV
EXISTING MUFFLER WITH AVERAGE SOUND LEVEL 86.77

Position	Load (kW)	Speed (rpm)	Torque (Nm)	Sound Level-dB
A	-	3160	3.45	84
B	-	3160	3.34	83
C	-	3160	3.34	84
A	1.1	3100	1.27	85
B	1.1	3100	1.27	85
C	1.1	3100	1.27	85
A	1.2	3040	1.10	86
B	1.2	3040	1.10	87
C	1.2	3040	1.10	87

TABLE V
NEW DESIGN MUFFLER WITH AVERAGE SOUND LEVEL 74.44

Position	Load (kW)	Speed (rpm)	Torque (Nm)	Sound Level-dB
A	-	3160	3.34	84
B	-	3160	3.34	83
C	-	3160	3.34	84
A	1.1	3100	1.27	85
B	1.1	3100	1.27	85
C	1.1	3100	1.27	85
A	1.2	3040	1.10	86
B	1.2	3040	1.10	87
C	1.2	3040	1.10	87

The new designed silencer is tested with 3 load conditions: without load, with load and maximum load. The measurement of noise from the silencer outlet is measured using audiometer or sound level meter. The sound level meter is kept at a fixed reference from the silencer outlet, during testing the engine is made to run with the existing silencer. After 15 min first set of readings are noted at three points marked over the arc. The engine is allowed to run continuously for a prolonged period of time and it is seen whether any deceleration takes place, also the same methods are followed for other models.

b. Vibration, Resonance and Mode Shapes

A number of terms used to describe mode shape eigenvectors, normal modes, characteristic vectors or latent vectors. The five mode of vibration for an aerofoil are shown in Figure.4

Figure. 4 Digital lay out testing system

c. Frequency Analysis

Modal analysis is used to determine natural frequencies within the range of operations. Alternatively, measured mode shapes and natural frequencies of a structure can be compared with those predicted by FEA in a condition monitoring program to verify structural integrity. The response of the structure to a particular forcing excitation is required, using a technique of modal superposition. The overall response is described in terms of a sum of modal responses, with the contribution of a particular mode given by the proximity of the forcing frequency to the natural frequency and the amount of damping present in the system. The response is dominated by modes near to the excitation frequency and therefore the modal series is often truncated to reduce computation. Frequency based analysis perform eigenvalue extraction to calculate the natural frequencies and corresponding mode shapes of a 'free system' (i.e. with no time dependent loads applied).

Modal-dynamic analysis is transient in nature. It gives the response for the model as a function of time where a cyclic (sinusoidal) load is applied to the structure. Modal-dynamic analysis is also referred to as forced harmonic response analysis. Complex displacements and phase angles are evaluated and deflection & stresses may be calculated at specific times, this analysis type is formulated on the principle of modal superposition, and so a natural frequency analysis must be carried out first. The modal amplitudes are integrated through time & the response is subsequently evaluated, this analysis solution must be linear in nature (in time domain), as superposition & Eigen value extraction techniques cannot be applied to non-linear time domain application.

Figure. 5 Meshing & Boundary condition of Muffler

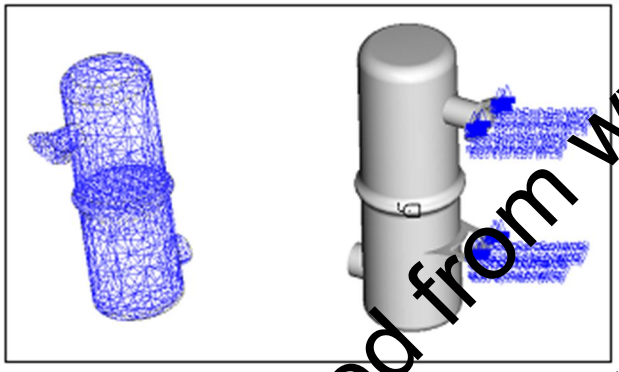


Figure. 6 Mode shape:1

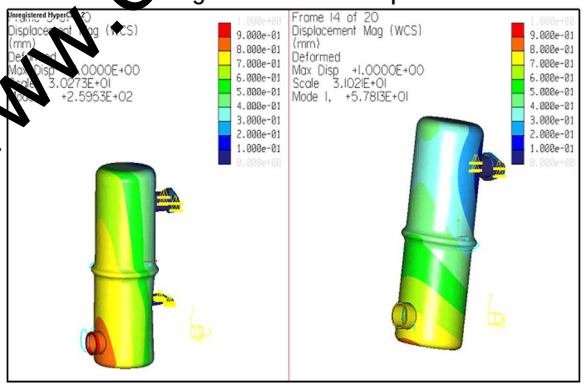


Figure. 7 Mode shape:2

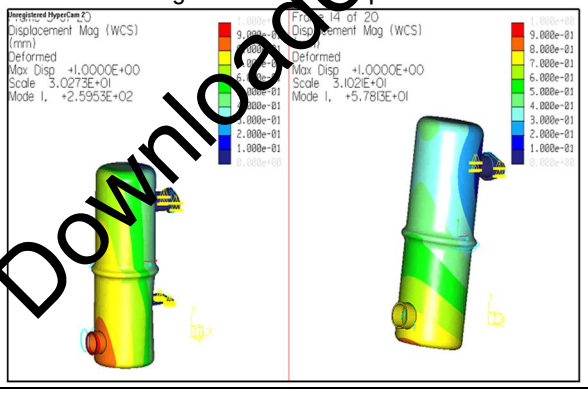


Figure. 8 Mode Shape:3

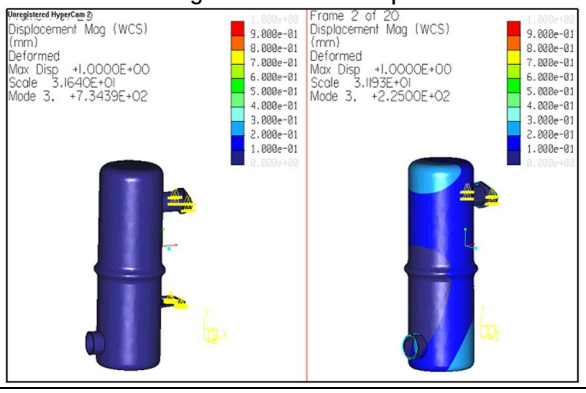
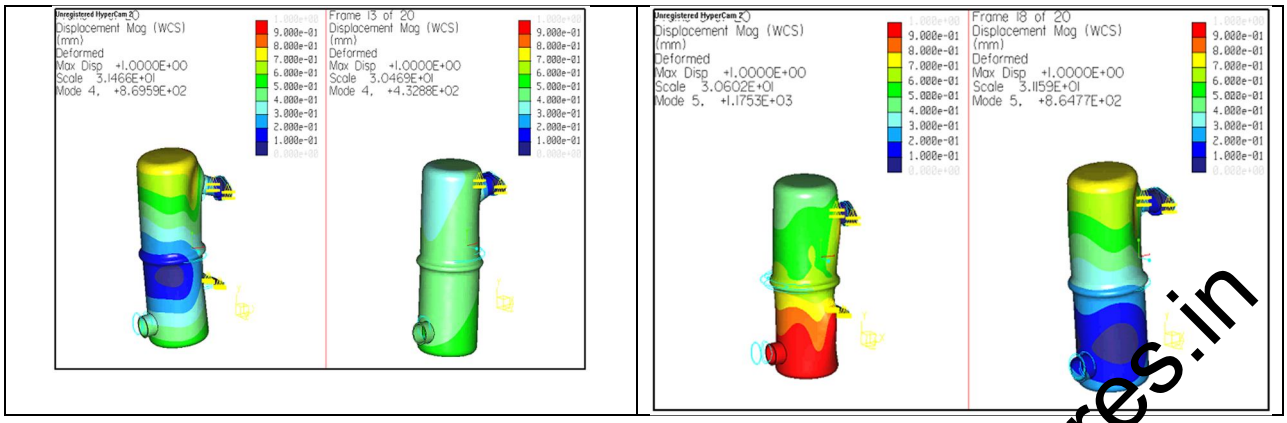


Figure. 9 Mode shape: 4

Figure. 10 Mode shape: 5



IV. Results and Discussions

A total of 30682 nodes and 30429 elements are used, all the degrees of freedom are arrested. For a large number of noise, vibration or durability related issues, modal analysis essential in discovering the root causes of the problem, stop acting on the symptoms only and gain a profound insight into the true nature of product weak spots as a first step in tackling those natural frequency of the system is above the maximum applied frequencies, so the system will work properly without any resonance nature as shown in Figure. 11. The design iterations are carried out for with bracket and results were compared with current design. Both the results are above maximum frequency level so the design is very safe in its structural behavior.

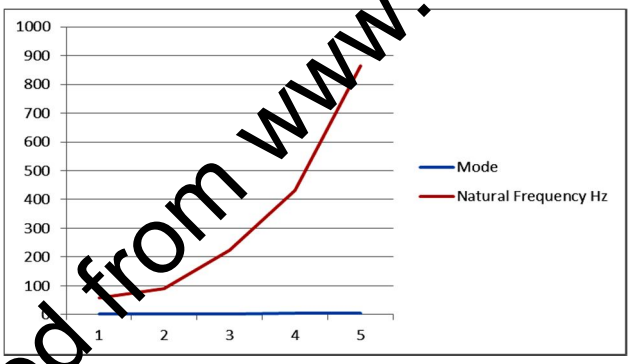


Figure. 11 Mode vs. Natural frequency of the system

V. Conclusion

1. It can be concluded from the experimental results that the sound level was reduced with the new design of muffler.
2. It is economical and in terms of reliability it has a longer life compared to the existing design
3. In this design, the baffles and reverse flow type model were eliminated for avoiding the back pressure in the exhaust.
4. The modal analysis frequency was tested with various modes-until the acceptable range, for eliminate the resonance in the chamber.
5. The various modes were tested, and it shows the natural frequency of the expansion type muffler was greater than the system frequency so that, the design is safe.

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