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Report on Design of distributed Energy Efficient and reliable Routing Protocol for Wireless Sensor Networks

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Abstract-A wireless sensor network (WSN) is a collection of nodes organized into a cooperative network, where devices are small c
The efficient use of energy in a sensor node is most desirable criteria for prolong the life time of wireless sensor network. S
routing for reducing energy consumption is the important factor. The energy consumed in cluster head (CH) selection pha
wireless sensor network (WSN) has been assumed as an insignificant factor in the previous research work. In this pap
during the transmission of data from sensor nodes to the sink has been calculated. Routing protocols in WSN along with the most energy efficie
protocol named LEACH (low energy adaptive clustering hierarchy) and STR protocol (shortest path routing protocol) alo
disadvantages are discussed here. In this paper we improve consumption of energy for the parameters result such as energy, dela
throughput, jitter and pdr.

Keywords-Wireless sensor network, hierarchical routing, cluster based routing protocol, LEACH, Shortest path routing

I. INTRODUCTION

A wireless sensor network is a collection of nodes organized into a cooperative network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single omnidirectional antenna), have a power source (e.g., batteries and solar cells), and accommodate various sensors and actuators. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. Systems of 1000s or even 10,000 nodes are anticipated. Such systems can revolutionize the way we live. Wireless sensor networks are comprised of large numbers of low-cost, low-power and multifunctional sensor nodes. Thus, it is predicted that wireless sensor networks will become conventional in our daily life. A wireless sensor network (WSN) is typically composed of a large number of sensor nodes, which work collectively to carry out some sensing and monitoring tasks within a specific area. The main constituent of a WSN are multiple number of sensor nodes and at least one sink. The number of sensor nodes depends upon the application. Energy efficiency is one of the most important factors in WSNs. Hierarchical (clustering) technique is a useful in reducing energy consumption. LEACH is a classical clustering hierarchical protocol, which incorporates randomized rotation of the high energy cluster head position among the sensors to avoid draining the energy of any one sensor in the network. In this way, the energy load of being a cluster head is evenly distributed among the

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The subsequent LEACH optimized protocols in literatures mostly improve the capability of cluster head distribution, so that the energy consumption of the whole network is reduced and the system lifetime is prolonged. However, all these hierarchical only consider the algorithm of cluster formation and give little consideration on aggregated data transmission. Since the aggregated data is important, the reliability of transmission should be guaranteed. The proposed model is on LEACH and STR protocol and also compared with LEACH, STR protocol and no protocol to get the parameters result such as energy, delay, throughput, jitter and LEACH is used for the cluster head formation and STR protocol is used for finding the shortest tree routing to nodes with score of the node and transmits the data by dividing into two way and then data aggregation is done in the next cluster head node neighbour to destination node. In this way we can minimise the energy consumption of the node.
The remainder of this paper is organized as follows: Section 2 presents the related works .Section 3 describes the proposed protocol details. In section 4 we make analysis and simulation, comparing with the previous multipath routing protocols. Finally, section 5 draws conclusions and shows the future works.

II. RELATED WORK

Routing Protocol for Wireless Sensor Network
Recent advances in wireless sensor networks have lead to many new protocols specifically designed for sensor networks where energy awareness is an essential consideration in protocol approaches like Direct Communication and Minimum Transmission Energy do not guarantee balanced energy distribution among the sensor nodes. In Direct Communication Protocol each sensor node transmits information directly to the base station, regardless of distance. On the other hand, in case of Minimum Transmission Energy routing protocol data is transmitted through intermediate nodes. we classified most important energy efficient routing techniques on various clustering attributes like cluster formation and data gathering process.

A.LEACH

W. R. Heinzelman, A. P. Chandrakasan and H. Balakrishnan proposed Low Energy Adaptive Clustering Hierarchy (LEACH) in 2000. It is one of the most popular hierarchical routing algorithms for sensor networks. This protocol incorporates the formation of clusters and cluster heads (CHs) for the respective clusters in which all the other sensor nodes send their data to the cluster head (CH). The received data is then aggregated and is sent to the base station (BS) periodically by the cluster head which reduces the amount of data that is to be transmitted to the basestation. The role of the cluster head (CH) is rotated among the other sensor nodes in the cluster so as to evenly distribute the power load between the sensor nodes in a particular cluster. A TDMA/CDMA MAC is used for avoiding the collisions among the clusters and within the clusters.
Working Principle: The LEACH protocol functions in two different phases, the setup phase and the steady state phase. The formation of clusters and selection of the cluster heads is done during the setup phase and the aggregated data is transmitted to the base station during the steady state phase which is of greater duration than the setup phase. During the setup phase, a random number between 0 and 1, is selected by the sensor nodes. If this random number is less than a threshold value T(n), that sensor node is selected as the cluster head. The threshold value T(n) is calculated as follows :

$$T(n) = p / [1-p(r \bmod (1/p))] \text{ if } n \in G$$

Where, p is the predetermined number of sensor nodes, r is the random number and G is the set of nodes that are involved in CH selection that have not been selected as cluster heads in the last (1/p) rounds. After the selection, the cluster heads sends an advertisement to all the other sensor nodes in the network. The formation of clusters is based upon the signal strength of advertisement. After the cluster formation, a TDMA schedule is created assigning time slots to the sensor nodes for data transmission.
After the cluster formation and the selection of the cluster heads, the network goes into steady state phase where the aggregated data from the sensor nodes is sent to the base station by the cluster heads. The network again goes back into the setup phase after a predetermined time period to select a new set of cluster heads as to rotate the role of the cluster head among the nodes of the cluster.
The network lifetime is increased as the load of power dissipation is distributed among the nodes in the cluster. Also the amount of data to be transmitted is less which in turn reduces the latency of the network. The LEACH protocol is not suitable for networks deployed in large areas. Also the predetermined cluster heads may not be uniformly distributed. The path taken by the aggregated data to reach the base station is not optimal.

B.PEGASIS

The Power Efficient Gathering in Sensor Information Systems (PEGASIS) proposed in is an improvement over the LEACH protocol. It is a near optimal chain based protocol. The idea of cluster formation and cluster head is discarded in PEGASIS. Instead of clusters, a single node in the chain communicates with the base station. The sensor nodes in this protocol only communicate with a single node closest to them and communication with the base station is done in rounds so that the power dissipation in communicating with the base station is distributed evenly among all the nodes.
Working Principle: PEGASIS assumes that the sensor nodes maintain a database of the location of all the other nodes in the network. Each node determines the distance of its neighboring nodes using the signal strength and adjusts the signal strength to communicate with the closest node. In PEGASIS, the sensor nodes closest to each other are in the chain and they form a path to transmit the aggregated data to the base station. The chain is constructed using Greedy algorithms. Each sensor node sends the s

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data to its closest node in the chain. The data is aggregated at each node in the chain and finally only the aggregated data is s base station. The lifetime of each node is increased as they only have to communicate with their closest node which, a increases the network lifetime. Delay is caused in data transmission from the distant node in the chain. There is significant ove the nodes need the know about the other node location and the path for transmitting data. To overcome the problem of occurrence in transmitting the aggregated data to the base station (BS) an extension to PEGASIS, called Hierarchical PEGASIS was introduced in which the transmission of the data was allowed only by the spatially separated sensor nodes parallel data transmission and reduced the delay.

C. TEEN

Threshold-sensitive Energy Efficient sensor Network (TEEN) is a hierarchy based routing protocols proposed in, for time critical

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