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An Artificially Intelligent Device for the Intellectually Disabled

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Abstract: A new wave of artificial intelligence breakthroughs is making it possible for technology to do all sorts of things providing advances in machine learning, neural networks and probabilistic models. Implication of these power-packed technological developments for making a positive application in terms of helping the intellectually disabled people in our society is the key idea. This paper constructs a device, named AiderBot which is specially being designed for the improvisation of people having basic intellectual disability problems. The central concept is integrating various techno-devices like chip's, sensors and GPS trackers into the device which in turn provides communication and independence for the affected. Giving a hand over for such people and their caretakers, AiderBot behaves as a perfect example for Artificial Intelligence as it is designed to support when the human brain dysfunctions.

Keywords: Artificial Intelligence, Mental Retardation, AiderBot, Artificial Neural Network.

INTRODUCTION

Artificial Intelligence (AI) is defined as the science of making computers to do things that require intelligence when done by humans. It combines science and engineering in order to build machines capable of intelligent behaviour.

Artificial intelligence involves two basic ideas.

1. It involves studying the thought processes of human beings.
2. Next, it deals with representing those processes via machines (like computers, robots, etc).

Figure 1 shows how machines are beginning to work human-friendly. AI is the study of ideas that enable computers to be smarter and more useful. It is found to be less expensive than natural intelligence. [1]



Figure 1: Artificial Intelligence on par with human behaviours

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1. What is Mental Retardation?

Mental retardation or intellectual disability, (MR/ID), exists in children whose brains do not develop or function properly within the normal range. MR/ID can result in learning, speech, physical, and social disabilities.

Severe cases are diagnosed at birth. However, milder forms might not be noticed until a child fails to meet a common developmental goal. Almost all cases of MR/ID are diagnosed by the time a child reaches 18 years of age. Mental retardation involves both a low IQ and problems adjusting to everyday life. There are four levels of retardation:

1. Mild (IQ from 50-55 to 70-75)
2. Moderate (IQ from 30-40 to 50-55)
3. Severe (IQ from 20-25 to 30-40)
4. Profound (IQ below 20-25)

The common behavioural issues with mentally retarded persons are:

- Problems in learning to talk.
- Memory problems.
- Inability to think logically.
- Childish behaviour beyond a normal age.
- Lack of curiosity.
- Learning difficulties [2].



Figure 2: Better way of pronouncing Mental Retardation

2. Connecting Artificial Intelligence with Mental Retardation

Artificial Intelligence is not only the making of robots, but also making the machines think where humans can't.

The normal human brain keeps thinking without pause. To implement AI in human life, we need the scenario where the human brain slows down to think. That is where 'Mental Retardation' comes to role. Mentally retarded people cannot think, act, speak, read or write as fast as other humans. So we can use AI as an application in helping mentally retarded people to act independent.

Here, we design a device named AiderBot which provides the mentally challenged people (level 1 & 2) the ability to perform 3 most important tasks:

1. Learn
2. Communicate
3. Be independent

3. Tools within Aiderbot

- A chip having Artificial Neural Network
- A chip enabling communication
- GPS Tracking device
- Two sensors
- Two cameras
- Harmless alarm

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- Harmless vibrator ring
- Mike (Attachable when needed)
- Keyboard (Attachable when needed)
- Speakers (Attachable when needed)

Figure 3 shows the pictorial representation of the tools.



Figure 3: Tools AiderBot is made up of.

4. Model of Aiderbot



Figure 4: Model of AiderBot

AiderBot will have a two way connection. Let the mentally challenged person be the client and the parent be the server. The whereabouts of the client are always displayed in the server through a wireless connection.

The camera in the front keeps recording the actions of the client and parallelly displays it to the server either on a computer or mobile phone, like a live telecast.

The 2 chips are placed inside and enable learning and communication.

The GPS tracker keeps giving the location of the client to the server through a wireless network. If the client either goes in the wrong direction or does anything harmful, the alarm and the vibrator rings in both client and server side.

4.1 Solution for Learning

The mentally retarded people have an IQ below 70. They find it difficult to learn as fast as other people. Thus this AiderBot device has a chip that follows the procedure of Artificial Neural Networks (ANNs). ANNs are a family of statistical learning models used to estimate the functions that depend on large number of inputs. They are presented as systems of interconnected neurons which can exchange messages between each other.

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Example: A neural network for handwriting recognition is defined by a set of input neurons which may be activated by the pixels of an input image. After being weighted and transformed by a function, the activations of these neurons are then passed on to other neurons. This process is repeated until finally, an output neuron is activated. This determines which character was read, depicted in Figure 5. [4]. Deploying the ANNs into the chip will make the person identify the character, not immediately but definitely.

This device also facilitates learning through pictorial representations. When the projector is activated and the topic to be learnt is chosen, the projector projects the information and a voice reads the information displayed, so that it can get registered in the mind of the person with the help of ANNs.

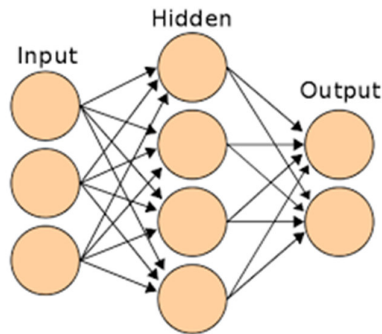


Figure 5: Artificial Neural Network Functioning

4.2 Solution for Communication

Mentally challenged people always find it difficult to communicate their needs and to have a conversation with other people. So a chip named 'easeCommunicate' brings a solution to this problem. It is an ASIC (Application Specific Integrated Circuit) specially designed for communication purpose. It has programmed answers to frequently asked basic questions. With this, the person wearing it can talk as well as answer to others talk.

To Respond to Others Talk

Using speech-to-text mechanism, the chip hears what others are asking and converts it to text. It finds the matching answer for the converted text within the program it has. Once the answer is found, it can be either said or displayed through projector. [3]. The microphone within the device keeps repeating the answer until the person wearing it opens his mouth and tells. Once this process is over, the question and answer asked is stored within the device. There is a 'reTeach' button on the side of the device, which when switched on, replays all the questions discussed that day multiple times, so that those answers are registered in the persons mind strongly. This will help the person to answer the question next time automatically without the help of this device. [5] Figure 6 shows the working of this chip.

To Talk by Self

Example: For food, every 2-3 hours from the day starts, the machine will speak a message for food to the person. The person, on hearing it multiple times will try to pronounce the same word and thus the guardian/parent will serve the food. Also, the chip can sense unusual feelings too. It will give an alarm in the guardian/parent side when the person's behaviour seems abnormal (ex: pain in body, urinated in same place etc) and then he/she can come for help.

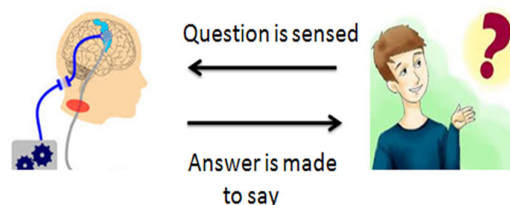


Figure 6: How the chip works

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4.3 Solution to Act Independent

Here, we make use of a GPS tracker, camera, alarm and vibrator which is present in both the ends (client and server). As the person wearing this device stays or walks alone, the camera keeps reflecting the actions of this person to the parent at other end via mobile or laptop. We use an active Autofocus camera as it focuses the person correctly despite disturbances. If any misbehaviour is sensed, the device rings an alarm or vibrates in both the ends. Either the patient will stop the misbehaviour as he hears a new sound or passersby can help him or the parent will come for help.

The GPS tracker will continuously send location of the person to the parent through the mobile number attached to this, which is represented in Figure 7. Here we make use of an active GPS as it two way and live process. The GPS tracker used in our device is SilverCloud Tag. The SilverCloud Tag is a real-time GPS tracker which is a compact and pocket-sized. The ultra-portable size, allows users to place it virtually anywhere and thus we place it within our AiderBot. Finally, this device will intimate the parent when the person moves beyond the prescribed limit and thus the patient can stay safe.



Figure 7: Mobile phone showing the location of the person while walking alone.

5. Conclusion and Future Enhancement

Mental retardation is a problem which is alive for more than years and yet, no proper cure is found. AiderBot may not completely cure the disease but can surely make the affected act better. This is specially designed for Level 1 (Mild) and Level 2 (Moderate) patients and can make them go to the lower level of the disease.

Thus, we conclude that this artificially intelligent AiderBot understands the human situation, supports him and grooms him for his betterment. Deploying this device in the upcoming years using the developing trends in technology will create a spark in life of the intellectually disabled, thus providing it a future enhancement.

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