BCI BASED ROBOT USING BRAIN WAVE SENSOR FOR DISABLED PEOPLE

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***Abstract* - Brain computer interface (BCI) is a technology, which will be used for controlling robot, by using a platform of MATLAB. The wave generated in brain is analyzed by using brain wave sensor. A direct communication is established between the brain and physical device by BCI, there are different electrical waves which are obtained from changing the pattern of human thoughts. All this electrical waves is sensed using sensors and are converted into packets that transmit it through a wireless medium. Brain sensor receives the waves and it is extracted using MATLAB. The signals are processed and transmitted to a robot using ZIGBEE through which the robot is controlled using eye blinking and eye movement.**

Keywords: Electroencephalogram (EEG), MATLAB Processing, Brain Computer Interface (BCI).

I.INTRODUCTION

Human brain is the central organ of human system. A robotic car is a topic of interest to all types of peoples, to measure their attention and meditation level of mind a brain sense head band is used. Brain sensor band digitizes brain wave signals to enhance the user interface of computers, games and health applications. The brain sensor extracts signals from the brain through forehead where the head band is placed, such processes is said to be Electroencephalography (EEG). BCI is one of the best technologies used in medicine. Using this technology we get feedback from the brain to make it useful in various applications. BCI uses EEG detecting the minute electrical activity happening in neuron. By the electrical impulse attention and meditation is sensed and drowsiness is detected.

II.LITERATURE SURVEY

The human brain consisting of numerable interconnected neurons and is responsible for transmitting and receiving any activity in the human body. This neural activity combines and produces electrical signals which are studied through EEG. The first electrical signal was observed in 1875 by Richard Canton, a physician and physiologist who discovered the electrical activities of the brain, which was measured using a galvanometer. Later the human EEG signal was first recorded by Hans Berger in 1924.

The five types of human brain wave given in Table.1 is classified depending on electrical activity. It shows the different types of frequency range according to the value of eye blink that occurs on the MATLAB process from the brain sense band.

S. No	Brain wave sensor	Frequency range	State of mind
1	Delta	0.5-4 HZ	Deep sleep
2	Theta	5-8 HZ	Drowsiness
3	Alpha	8-14 HZ	Relaxed but alert
4	Beta	14-30 HZ	Focused

Table 1: Human brain waves

III.EXISTING SYSTEM

In the BCI system, there are lots of prototypes like wheelchair for paralyzed people. A quadriplegic man can control a computer through thoughts. Based on home application, there are some devices to help paralyzed people to operate various gadgets such as TV, fan, light, etc., the electrical impulse generated in brain is also used for playing games in Computers, can move cursors, recognize objects and controlling robots.

IV.PROPOSED SYSTEM

In this proposed system, a real time car is designed for paralyzed and physically disabled people; where the car can be controlled by brain signals. In order to control the car, signal processing is done using MATLAB of real time brain values. This model also contains arm setup to pick or place the object in the path. The brain sensor has two electrodes; the main electrode is placed on forehead by the pre frontal lobe.

Brain sensor measures the brain waves through EEG signals and transmits data to Arduino using MATLAB platform, a threshold frequency is set for an active brain and inactive brain (sleep). The wave generated in brain, controls

the robot, where the data from Arduino is transferred to robot through Bluetooth medium which is controlled by the Arduino controller.

V.DESIGN OF SYSTEM

To transfer the brain wave signals to the devices, neurosky technology provides the brain wave headband given in fig.3. The brain wave head band has flexible ear arm, ground connection as ear clip, power switch and sensor tip. This head band does not provide pain to the user, so noninvasive method is used in the head band by using AAA battery. When the head band is switched ON, the LED will blink to indicate the Bluetooth connection. The electrical impulse generated in brain is sensed by brain sensor in the head band. The head band has Bluetooth transmitter, by this the signal is transmitted to the computer in wireless medium. The system will receive the signals through the Bluetooth receiver. After the process of MATLAB in the system, again the data is transferred to the controller. The controller is Arduino. The Arduino has ZIGBEE transmitter as shown in fig.1and the robot has ZIGBEE receiver.

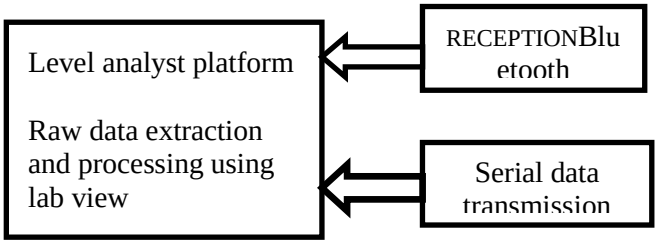

Fig. 1 Data Processing Unit

The ZIGBEE transmits; the signal from Arduino is received by ZIGBEE receiver in robot as shown in fig.2. After the data has received, the DC motor controls the vehicles. The determination of attention and meditation is analyzed.

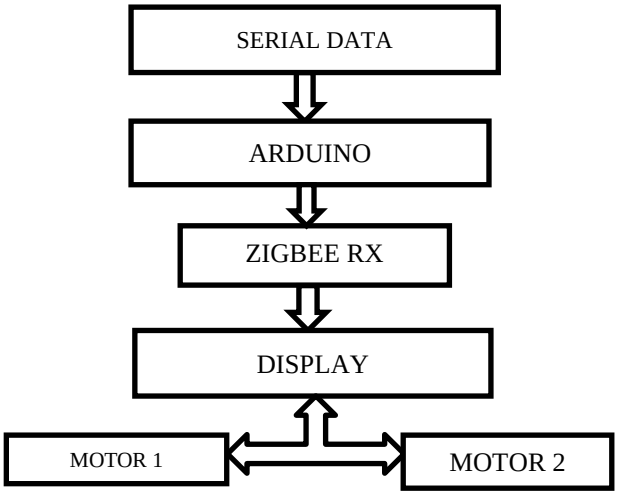

Fig.2.Robotic Module

Theta waves:

These waves are associated with drowsiness.

The frequency range is 4-7HZ.

Alpha waves:

These waves are associated with meditation, relaxation but in alert. The frequency range is 8-13HZ.

Beta waves:

The beta waves are associated with active, busy. The frequency is 14-30HZ.

Fig.3.Brain Wave Sensor Band

VI. WORKING PROCESS

The brain wave sensor has two sensors that sense different types of EEG signals based on the needs. The brain wave sensor picks an ambient noise generated in the muscles of humans, system, bulbs etc., the ear clip is grounded. The second sensor is to filter the electrical noise. The headband sense the attention, mediation level and eye blinking signal from human brain. The rateof 512 HZ is received by raw EEG signal. The EEG signals of the human brain are a source of information which is measured at every time. The maximum frequency of raw EEG is 512 HZ. Fig 4 shows the software design. The 512 HZ sampling frequency is set and sampling controls the time delay. In array data, the values of signals and data are written. The stored array data is compared to the threshold point. Here the robot is designed to obey two rules or two commands forward, and stop.

Fig.4 Hardware Design

According to the extracted signal, valuesare sending to the robot using ZIGBEE transmitter and ZIGBEE receiver will read the command Fig.5.Then Driver IC moves the robot forward.

Fig.5 software design

VII.ANALYSIS

It is difficult and challenging for paralyzed and physically disabled people to move around without any help. Researches on robots controlled by mind through EEG signals are explored and developing drastically. Many projects have been designed for people to control wheelchair using electrical impulse to move from one place to another. The upgraded version are controlling wheelchair on robots using different frequency patterns of human brain wave sensor that extracts data's when the mind is awake and working.

VIII. ADVANTAGE AND DISADVANTAGE

Some advantages are, to help disabled and physically challenged people to move around without help. To transmit auditory data to the mind of deaf person and helps to understand, and it is used to control computers play, electrical devices, and video games and control robots.

Some disadvantages are, researchers are still at its earliest, which can be developed. More hazards caused due to electrical malfunctions and environmental disturbance. Placing an electrode in invasive manner creates scar tissues in the brain.

XI.FUTURE SCOPE

Here we may have basic conversations with smart phones, tablet and pc games by using several voice recognition modules. But these modules are less efficient. We are controlling these consumer electronic goods in different manner like through remote or some gesture etc.

Researchers are held on this Brain Computer Interface (BCI) also known as the 'mind machine interface' .These mind machine interface is helpful to create a typical relationship between the mind and machine. People are communicating by wireless, using the universal translator chips in Invasive manner. Here, these chips are placed inside the brain.

X. CONCLUSION

Brain signals reflect the handled activities and controlling, the signals of the brain or the influence of the signals which were received from the other parts of the body. BCI applications have attracted the research community. Several studies have been presented in this paper regarding the growing interest in BCI application fields such as medical, organization, transportation, games and entertainment.

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