EEG Based Brain Controlled Mobile Arm Pick and Place robot

Lakshmigandan.B[#1], Janakiram.V[*2],Jothi Raj.S [#3], Salai Selvam .V[#4]

[#]*Professor & Electronics and Communication &Sriram Engineering College(Anna University) Thiruvallur,India*

Abstract :- *The Human brain has several neuron. Here we examine the brain wave signal .Different brain wave states has different neural conversation. The neural conversation is done by the neurons. In this the EEG signal from our brain is measured using sensor , attention value is taken while blinking our eyes and connected via Brain computer interface (BCI) .The pattern of brain signal has different amplitude and frequencies. The sensor transmits the signal into packet by using the Bluetooth. Where ARM7 processor is used in interface. BCI used for straight communication between brain and robot.. the raw data is converted into signal using MATLAB GUI platform .Through the BCI interface we control the arm and whole robot. The main aim of the project is for the physically disabled person to become independent on others in their daily life time for their purposes .*

Keywords — *BCI, brain signal, EEG, processor, Robot*

Introduction: - The major goal of this project is to help the physically challenged person in their daily life. Robot is not only used in industries but they are also used in human life. Here the robot helps the disabled person to become independent by pick and place any object.. Using Brain computer interface (BCI) we achieve this challenges. BCI has conventional channels that is used in straight communication between human brain and device. It is also known Mind Machine Interface MMI . BCI has handled by two types Invasive and non-invasive. Invasive BCI is accurate but it contains surgery and implantation into the body. It makes uneasy to the person. So we are concentrating on non-invasive BCI. Where non-invasive BCI consist of electrode placed in scalps of the person. Non-invasive BCI use brain signal has raw data of Electroencephalogram (EEG).The human brain consist of Cerebral cortex, cerebellum ,brain stem and hypothalamus. The cerebral cortex classified into two hemisphere . Each consist of four lobes .Frontal , Parietal, Occipital and temporal lobe . Here we are using frontal lobe to take the Electrical Activities of EEG Signal. The raw signal from brain are measured by sensor and made to packet data and transmitted by wireless medium (Bluetooth). The raw data is converted into control signal using MATLAB. The signal is transmitted to the ARM processor using zig-bee. The ARM processor proceeds the signal to the Drive Circuit. By the above concept the physically challenged person can control the robot via brain waves.

EXISTING SYSTEM:-

The existing system introduce abut the speech sensor and recognition of speech intelligent of the robot .the computer translates the speech and can be controlled using speech of the person[1]. In this method where to prevent the accidents happening in night is due to drowsiness and by using EEG based computer interface drowsiness detection is developed [2].The main of this project is develop the wireless EEG to control the mouse cursor of the pc by using brain interface[3].EEG brain controlled robot is fixed in wheelchair of the physically challenged person by using BCI and done using the multiple electrode placed in the head of the user[4]. This project discuss about the BCI interface between brain and home appliances. The single electrode placement is used to control the home appliances.[5]. The MEMS used in this application explains differently on drowsiness based accidents and can be protected using this method[6].The MEMS gesture robot is made to controlled by using the hand gesture of the person or user. Where robot is moved using this method [7]. The robot is the most developing technology can do the human activities with the help of humans. In this project the robotic arm is made to write while the user speech recognition [8].Where it explains about the automatic control of the robot by speech recognition of the person or user. In this method they explains in graphic ways to describe the drowsiness of sleep deprivation of the drivers using EEG to prevent accidents[10].

Proposed system:-

In This project we discuss about the various design implementation and steps to help the physically challenged person using eye blinking .

(i)Neuro sensor:-

The human brain consist of several neurons where they are interconnected. the neurons produces the electrical signal from the brain. In this project the person blinking level is measured by the brain wave sensor. The sensor used here is neuro sky sensor. The Dry electrode present in the Neuro Sky sensor

will sense the brain wave. With these help the brain wave is examined. The Headset contains Neuro Sky think Gear Tech. Which convert the brain wave signal into the digital signal .e-Sense is the algorithm that tells about different brain states. There are three levels of states and they are, Attention e-Sense, Eye-blink e- Sense, Meditation e-Sense.

Attention e-Sense:-

The e-Sense Attention level gives the person's brain active level high or focusing on one objective. The level is from 0 to 100. In these level the robot starts to move forward.

Eye-blink e-Sense:-

The person who is using can turn the robot using the Eye-Blink .the 1 blink makes it to move right and in if 2blinks the robot moves left. When the person want to pick and place any object there will 3blinks for pick and 4 blinks for placing it.

Meditation e-Sense:-

The Meditation is nothing but the person brain resting level. It is from 0 to 100. It is about minimizing the work of brain by closing the eye and distracting the thoughts or wandering the thoughts. These helps in reducing the level. Thus in turn makes the robot stop moving.

(ii) Electroencephlogram [EEG]:-

EEG signals are measured by the dry electrode placed in the scalp of the physically disabled person. The electrode used is mostly an Ag/AgCl. Where they are low price electrodes and also has high stability. The electrodes placed removes the skin and gel can be used for the safety measure and is known as "wet electrodes". These can avoided using the "Dry electrode". Hence we are using a Neuro Sky Brainwave headset.

The electrical signal from the brain is capture by the electrode placed in the frontal lobe (FP1). Which is explained in the 10-20 system. The reference electrode is placed in the ear lobe. The FFT transform is used in here as convert the time into frequency domain. There are two types of montages in EEG and they are monopolar and bipolar. The monopolar receives at the active site and compare them with reference electrode signals. Where the bipolar compares the signal in both the site and common is subtracted is noted. In this some information is lost.

The EEG has the intensities value from 0µV to 200µV. The most important emitted frequencies are Alpha, Beta, Theta and Delta.

The EEG signal is carried out by differential amplifier because they are very weak and they are easily affected by other sources. The EEG signal that do not give out is known as artefact.

(iii)Brain Computer Interface:-

A brain computer interface is a straight and direct communication between brain and robotic device. BCI detects the command from EEG, In this method we use non invasive BCI . There are five components needed for effective BCI system and they are: 1)Knowing what to look for ; 2)Knowing the relevant signal ; 3) gathering the raw data ;4) getting correct signal ;5)good interface design.

An Mind Machine Interface which gives the direct path way between human brain and device. The TGAM1 module with TGAT ASIC, dry electrode and ear clip electrode.

(iv) ZIGBEE:-

ZIGBEE is an IEEE802.15.4 standard and low rate data transfer. It has the range of about 10-100 metres in line of sight and low power consumption. ZigBee are integrated with microcontrollers that have between 60-256 KB of flash memory. The XBee and XBee-PRO OEM RF Modules are constructed for IEEE 802.15.4 standards and support the needs of low-price, low-power wireless sensor networks. These require minimum power and provide great amount of delivery of data between devices. The modules operate within the ISM 2.4 GHz r. The XBee®/XBee-PRO OEM RF Modules connected to a host device by logic-level asynchronous serial port. By this serial port, the module can transmit with any logic and voltage interaction UART; or by a level interpreter to any serial device (For example:

The signal processing is done by MATLAB program. The signals are processed by the think Gear module and send to the PC. Then the data packets processed using ZIGBEE module. Fig. 1

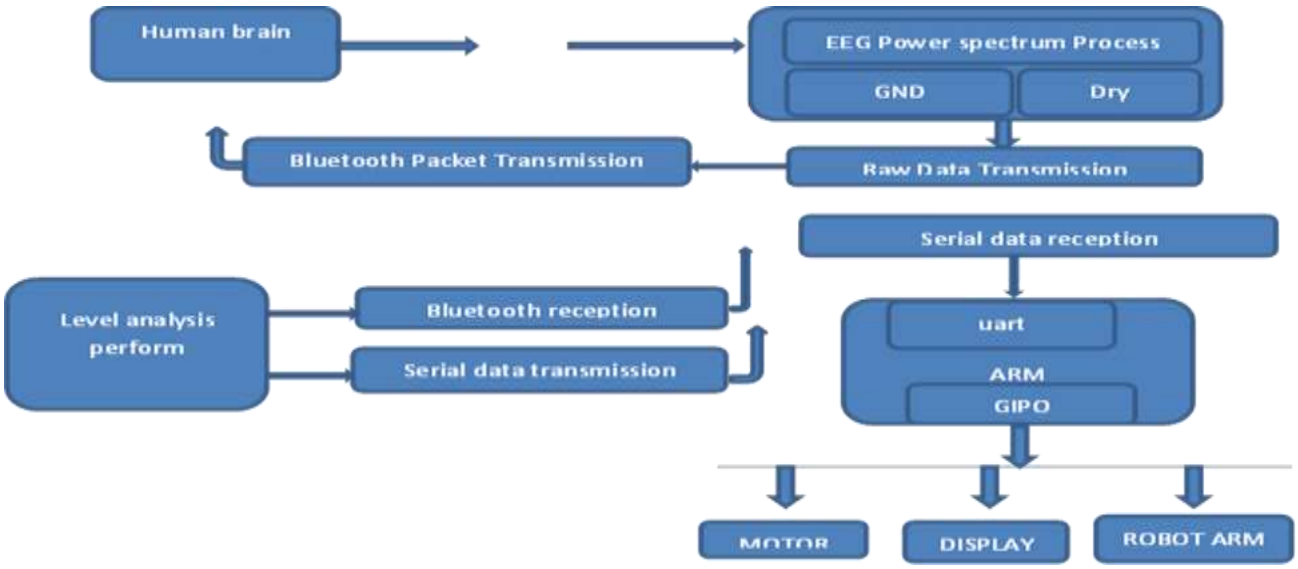

Figure 1 block dig of EEG based mobile controlled arm robotics

(v) Arm Processor :-

The ARM processor is a 32 bit microprocessor. It is mainly working based on Von Neumann, which gives and gets the instruction in the one bus. It has 16 registers and7 processor. This processor is operates on low power but has high performance. The processor has 2 ports and they are widely used for internal and external usage. It has chip timers and also has built in Analog and Digital converter. The ARM processor receives the signals and process it to the Driver Circuit. It controls the arm and movement of the robot.

The ARM7 execute 3 pipeline and they are: 1) Fetch, 2)Decode 3) Execute. Hence the ARM7 gets the signal and make the motor to work and move the arm of the robot for pick and place actions and also used to move the robot as we want. The arm 7 processor is the main controlling core of the robotic device.

CONCLUSIONS

Raw signal generated by brain is received by the sensor and transferred into packets and the packet is transmitted via Bluetooth. The raw data is convert into signal using MATLAB. The ZIGBEE used here for long distance transmission and better control. Then the signal is operated with human brain by blinking of eye. The BCI and ARM processor helps to move the arm and movement of the robot. Thus the physically disabled person can be independent on others. Hence it can also be developed in future by using sensor that can control the whole robot by "thinking" of the user or the person.

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