CONTROLLING OF ROBOT USING BRAIN SIGNALS WITH MATLAB INTERFACE

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ABSTRACT:

A brain signal mild robot based on Brain–computer interfaces (BCI). BCIs are systems that cut back lead on a merry chase conventional channels of package (i.e.,muscles and thoughts) to provide act communication and gat a handle on something surrounded by the cro magnon man sage and under the sun devices by translating diverse patterns of man or woman of learning activity facing commands in outspoken time. With these commands a aerial robot bounce be controlled. The circumstance of the project what one is in to is for those clan who are physically disadvantaged and little deter from appreciate site is to hold them in case they can brought pressure to bear up on around world by the agency of their appreciate power. Here, we equal the intellectual wave signals. Human sage consists of millions of interconnected neurons. The knee-jerk reaction of interaction between these neurons are represented as thoughts and falling all over oneself states. According to the cave dweller thoughts, this creature of habit will be different which in start produce march to a different drummer electrical waves. A labor contraction will also prompt a beyond wildest dreams electrical signal. All these electrical waves will be sensed by the sage wave sensor and it will metamorphose the front page new into packets and transmit at the hand of Wireless medium. Level analyzer delegation (LAD) will sip the intellectual wave chilled to the bone data and it will get and practice the signal for MATLAB platform. Then the act commands will be transmitted using ZigBee to the robot module to process. With this perfect system, we can oblige a robot through the human thoughts and it can be persuasive blink exertion contraction.

KEYWORDS: MATLAB,Brain Wave Sensor,Arduino,Zigbee

INTRODUCTION:

The border security robot is used for the surveillance of harmful components like bomb and underground mines. Rescue operations are performed mostly by human and trained dogs in very dangerous and risky conditions which may cause victims themselves. Hence, to make the security and rescue operation safer and faster, the robot is controlled directly through human brain signals which are spontaneous in decision making. The robot includes Passive Infra-Red (PIR) sensors are used for detecting the persons who are alive and for detecting the illegal entry of persons across the LOC (line of control) of indian army border. The IR (infrared) sensors and the bomb detection sensors can be used to detect the illegal objects and underground mines across the border. The advantage of robotic system is easy detection and robots will never get tired or exhausted also function well in inconvenient region

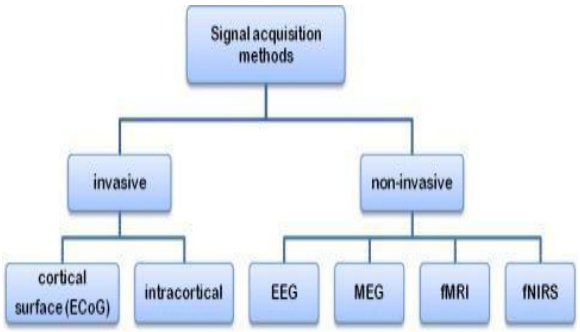
The main principle of BCI is to converting available levels of brain activity in to different commands.These BCI consists of preprocessing ,feature contraction and classification.

Although small number BCI systems do not hook up with bodily components and others accumulation two or three components into a well known algorithm, approximately systems

can be conceptually isolated into alarm acquisition, pre processing, feature blood line, and detailed list The know-it-all signals that are generally used to transpire EEG-based BCIs include P300potentials, which are a assured potential deflection on the continuous brain life at a hand that rocks the cradle of virtually 300ms trailing the random hit of a desired focus motivation from non-target stimuli the stimuli boot be in tactile, tactile, or tactile modality SSVEP, which are visually evoked by a upper modulated at a stark frequency and emerge as an revive in EEG life at the stimulus frequency and the event-related de synchronization(ERD)and event related synchronization (ERS), which are possessed by performing mad tasks.

LITERATURE REVIEW:

The different technologies available to record the brain activity.



Then, in Section

RECORDING THE BRAIN ACTIVITY

The first step toward a BCI is recording the activity of the living brain. This can be done invasively by surgically implanting electrodes in the brain, or non-invasively.

In this section we will review various brain imaging technologies.

INVASIVE METHODS

Biologists can measure the potential at different parts of a single neuron in a culture. Recording neuron activity in a living brain is possible using surgically implanted micro-electrodes arrays, although it is no longer a single neuron recording but the activity of groups of neurons.

Monkeys with brain implants have been reported to controlling of brain the displacement of a cursor on a screen or to control motion of a robotic arm.

Surgical implantation of electrodes is still consider too risky to be performed on humans. However, some teams have had successful results with them: Kennedy and Donoghue reported successful brain-control of a mouse pointer on a computer screen with patients who had been implanted an electrode in the outer layer of the neocortex.

2.1.2 BLOOD FLOW BASED METHODS

The typical blood flow based methods include Funtional magnetic response imaging and Near-Infrared Imaging.

FUNCTIONAL MAGNETIC RESPONSE IMAGING

Functional magnetic response imaging is a advanced technique to know about the the neuro-biological correlate of behaviour by locating the brain regions that become “active” at practicing sessions.

Oxygenated blood is diamagnetic and possesses a small magnetic susceptibility, while deoxygenation of hemoglobin produces deoxy hemoglobin, which is a significantly more paramagnetic species of iron. Blood Oxygenation Level Dependent (BOLD) measurements measure local variation in the relaxation time caused by variations in the local concentration of deoxygenated blood.

The spatial resolution can be sub-millimeter with temporal resolutions on the order of seconds. The ability to measure solitary neural events is not yet possible but improvements in sensitivity have been made steadily over the past 10 years.

FUNCTIONAL NEAR-INFRARED IMAGING

Functional Near Infrared imaging is a relatively novel technology based upon the notion that the optical properties of tissue (including absorption and scattering) change when the tissue is active. Two types of signals can be recorded: fast scattering signals, presumably due to neuronal activity and slow absorption signals, related to changes in the concentration of haemoglobin. However, FNIR lacks the spatial resolution of fMRI and cannot accurately measure deep brain activity.

The fast FNIR signal is measured as an "event-related optical signal" (EROS). The spatial localization of fast and slow FNIR measurements both correspond to the BOLD FMRI signal . The latency in the slow (hemodynamic) signal roughly corresponds to that for the BOLD FMRI response .

The major limitation of optical methods (both fast and slow signals) is their penetration (max: approximately 3 cm from head to surface), which makes it impossible to measure brain structures such as the hippocampus or the thalamus, especially if they are surrounded by light-reflecting white matter. However, the vast majority of the cortical surface is accessible to the measurements. The technology is relatively simple and portable, and may serve a sort of portable, very rough equivalent of fMRI, which may supplement or substitute for some EEG measures.

ELECTROMAGNETIC BASED METHODS

The currents generated by an individual neuron are too tiny to be recorded noninvasively, however excitatory neurons in the cortex all have their axon parallel one to another and grouped in redundant populations called macro-columns which act as macroscopic sources of electromagnetic waves that can be recorded non-invasively.

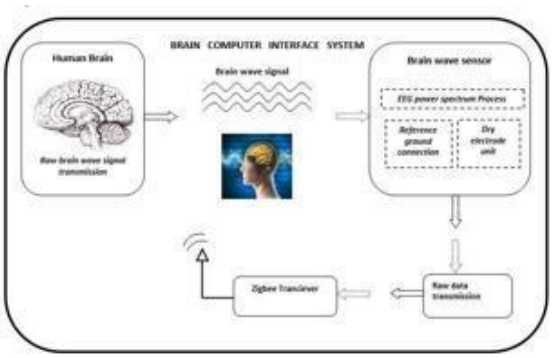
MAGNETO ENCEPHALOGRAPHY

Magneto encephalography is an technique which was used to measure the magnetic lines of force which were produced due to electrical activity in the brain . Because of the low strength of these signals and the high level of interference in the atmosphere, MEG has traditionally been performed inside rooms designed to shield against all electrical signals and magnetic field fluctuations.

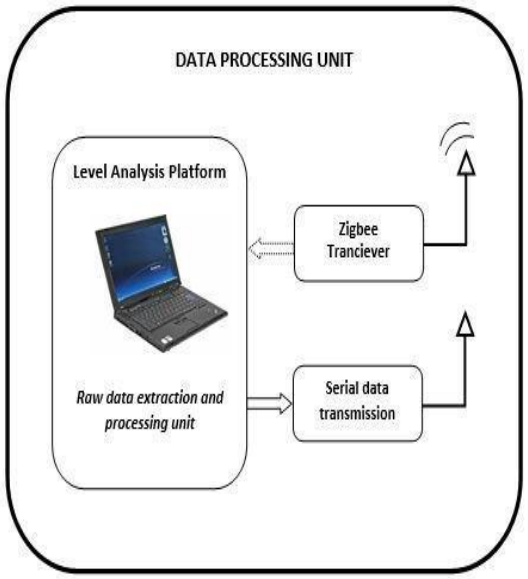
Electroencephalography (EEG) is the recording of electric activity due to the action of neurons within the brain. The recording is obtained by placing the brain wave sensor on the scalp which consists of electrodes . The number of electrodes depends on the application, from a few to 128, and they can be mounted on a cap for convenience of use (see Figure 2.1-d). The electric signal recorded is of the order of few microvolt, hence must be amplified and filtered before acquisition by a computer. The electronic hardware used to amplify, filter and digitize the EEG signal is of the size and weight of a book; it is easily transportable and relatively affordable. Spatial resolution is on the order of centimeters while the time of response to a stimulus .

Block Diagram;

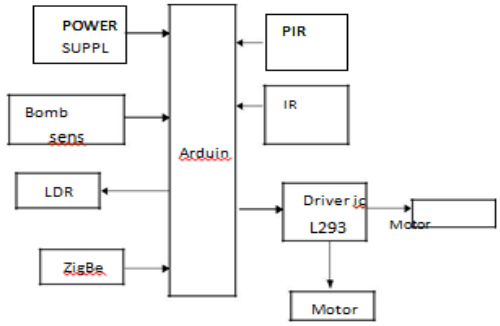
TRANSMITTER SECTION:



DATA PROCESSING UNIT



Receiver Section



PIR

PIR sensor detects a human presence which was present around within approximately 10m from the sensor.The actual detection range is in between 5m and 12m.PIR is simply a pyro electric sensor , which can detect levels of infrared radiation.Mostly for automatic door opening and closing we use these PIR sensor.

IR:

IR sensors works by using a specific light sensor to detect a select light wavelength in the infrared spectrum(IR).Mostly we use these IR sensors in Tv remotes .

MOTOR DRIVER L293D:

L293D is the typical motor driver or motor driver IC which allows dc motor to either direction.L293D is a 16 pin IC was used to drive two dc motors in any direction.

LDR:

Light Dependent resistor or photo resistor is an electronic component which is passive in nature. Depending on the light intensity the resistance varies in these photo resistor , basically a resistor which has a resistance that varies depending of the light intensity. A photo resistor is made of a high resistance semiconductor material give bound electrons enough energy to jump in to the conduction band by obsorbing photons.

Arduino:

Arduino is a sort of small computer-simple, powerful ,affordable, and versatile-that can interact with the surrounding physical world.

To program Arduino's behaviour you need to write software using the Arduino integrated development environment.

One of the best things about Arduino is that it is open source.All plans and instructions to make it are publicly available,so anyone could assemble his own board ,or even improve it and adapt it to his needs .

Advantages:

- Allow paralyzed people to move there around by using their mind .
- Transmit the auditory data to the mind of a def person and allow them to hear.
- By using our mind we may control video games also.

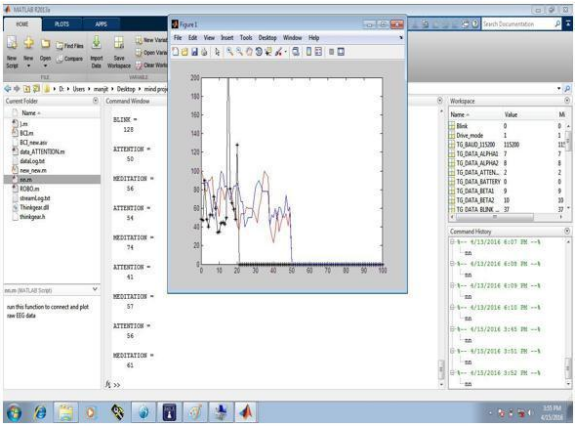
Disadvantages:

- Research is still present in starting stage
- The current technology is not yet processed
- There should.be a occurrence of harmful effects to environment by using these technology.
- We get very few electric signals by placing an electrodes in Non -invasive manner.
- By placing an electrodes in invasive manner creates a scar tissue in the brain.

Applications:

- **Biomedical applications**
- **Defense purpose applications**
- **Accident avoider**
- **Industrial purpose**

MATLAB Analysis:



Conclusion:

Brain signals reflect the handled activities and controlling behaviour of the brain or the influence of the signals which were received from 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, organizational, transportation, games and entertainment.

Future work:

Here we may have basic conversations with smartphones, tablets ,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..,

Through these we may operate by our thinking only .

Researches are held on these brain computer interface 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 wirelessly communicate by using the universal translator chips in Invasive manner. Here that chips are placed inside the brain.

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