Driver Attention Tracking

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Abstract:
The latest trend within the brain wave technology has been mentioned in this paper, and the way the brain Wave controlled mechanism works based on Brain– Computer interfaces (BCI) conjointly discussed. BCIs are systems that can bypass standard channels of communication (i.e., muscles and thoughts) to produce direct communication and management between the human brain and physical devices by translating totally different patterns of brain activity into commands in real time. With these commands a mobile robot will be controlled. The intention of the project work is to develop a mechanism that can assist the disabled individuals in their everyday life to do some work independent on others. Here, we are analyzing the brain wave signals. Human brain consists of several interconnected neurons.

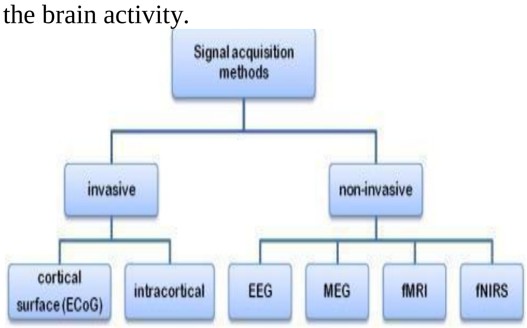
KEYWORDS: EEG Sensor, MATLAB, LabVIEW Brain Wave Sensor, Arduino, Zigbee

INTRODUCTION

Robots are not only wide utilized in industry, however conjointly step by step getting in human life. Helpful robots can provide support for disabled individuals in daily and professional life, therefore creating a growing demand for them. In general, healthy users will operate the robots with a traditional device like a keyboard, a mouse, or a joystick. These devices are, however, tough to use for aged or disabled people. For this reason, some special interfaces like sip-and-puff systems, single switches, and eye-tracking systems are planned. with diseases like the amyotrophic lateral sclerosis (ALS), MS (MS), or strokes. These severely disable people cannot convey their intentions or operations to robots with these interfaces. As a result, even autonomous robots aren't yet able to transport severely disabled users to desired locations. moreover, individuals want to be responsible of their motion the maximum amount as potential even if they have lost most of their striated muscle control; Brain Wave Controlled Robot Using MATLAB choices that square measure created by autonomous systems will cause awkward feeling and stress to the users. Therefore, though autonomous systems exist, it's still necessary to develop various interfaces which will be employed by the severely disabled population for communication with autonomous systems. Brain–computer interfaces (BCIs) are developed to deal with this challenge. BCIs are systems which will bypass typical channels of communication (i.e., muscles and speech) to produce direct communication and management between the human brain and physical devices by translating completely different patterns of brain activity into commands in real time. Signal recordings of brain activity employed by BCIs will be either invasive or noninvasive. Invasive BCIs need surgery to implant electrodes directly on or within the cortex, whereas non-invasive BCIs don't do therefore. Non-invasive BCIs will use numerous brain signals as inputs, like electroencephalograms (EEG), magneto encephalograms (MEG), blood-oxygen-level-dependent (BOLD) signals, and (de) ox Hb concentrations. because of the low value and convenient use in follow, eeg has been the foremost standard signal that's used to develop BCI systems. to form this paper manageable, we focus here on EEG-based BCIs. though the domain of EEG-based BCIs is broad and includes varied applications like controlling a pointer on the screen, choosing letters from a virtual keyboard, browsing web, and taking part in games, for the rest of this paper, we'll specialize in the subject of EEG based brain-controlled robots. Thus, the BCI systems that are accustomed develop these robots want higher performance (i.e., higher accuracy and shorter classification time). Recently, analysis and development of Brainwave controlled mobile robots have received an excellent deal of attention due to their ability to bring quality back to individuals with devastating fiber bundle disorders and improve the standard of life and self-independence of those users.

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.

BLOOD FLOW BASED METHODS

The typical blood flow-based methods include Functional 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.

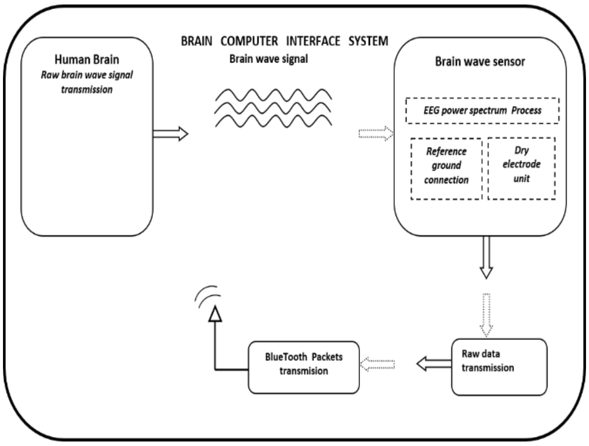
MAGNETO ENCEPHALOGRAPHY

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 toshield against all electrical signals and magnetic field fluctuations.

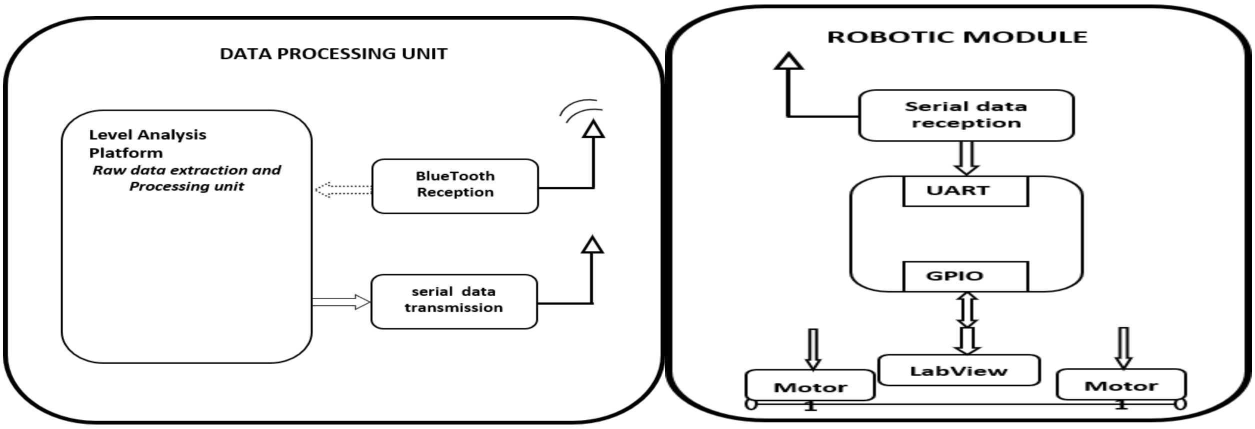
Electroencephalography (EEG) is the recording of electric activity due to the action of neurons within the brain. The recording is obtained by placing the brain wave sensor on the scalp which consists of electrodes . The number of electrodes depends on the application, from a few to 128, and they can be mounted on a cap for convenience of use. 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:

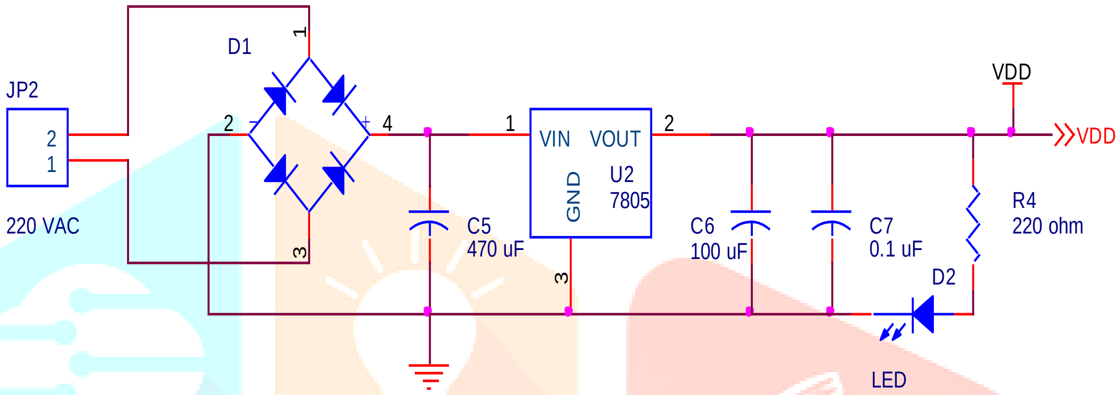
Transmitter Section:



Receiver Section:



Power supply Unit:



The AC voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired DC output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes.

METHADOLOGY:

The brain signals used here are Spontaneous EEG signals. These signals are associated with various aspects of brain function related to mental tasks carried out by the subject at his/her own will. The mental tasks such as meditation, attention, eye blinks are used for forward, reverse, sideways and stop actions of robot.

The brainwave starter kit makes use of dry sensors which does not require application of a conductive gel between the sensors and the scalp. Also, this device is much lighter and convenient for usage when compared to the conventional EEG sensors as it requires only one electrode for sensing. Another advantage of using this kit is that the data or brain signals are transmitted to the signal processing unit via Bluetooth connection.

The signal processing unit used in this application is a laptop/PC. The brain signals are transmitted from the headgear via Bluetooth to the laptop. The digitized value is then passed on to suitable microcontroller through USB port or through wireless communication for further mapping of brain signal values to control signals of the motors.

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forward or backwards. H bridges are available as integrated circuits. They can be built using discrete components.

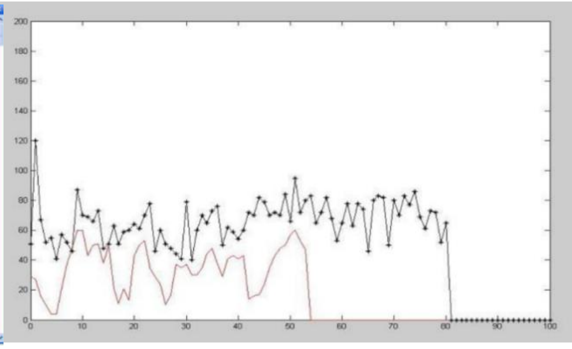
Two motors are used to form a robot prototype. The control signals from the H-bridge circuit are sent to the motors. Depending on the action performed, the control signals will cause the motor to run in either in clockwise, anticlockwise direction or stop.

Here for this project an Arduino Uno microcontroller has been chosen, and we doing code using embedded C. The programming language is most widely used in embedded system because it is portable and structured programming language. By writing code in c language we can obtain accurate real-time output. ZigBee is one of the most widely used protocols for the wireless control of chair. In this project we are displaying the efficient use of the microcontroller and the ZigBee protocol.

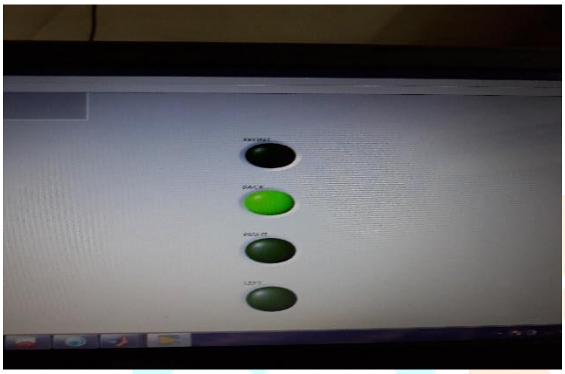
Here we are using Mind wave sensor to detect the bio signals of human being. Here we are using microcontroller kit for control the robot. As per the requirement of human being the bio signals will be detected by the mind wave sensor and the signal to the chair motor and control them like clockwise and anticlockwise. This process will be done automatically as per the requirement of the user.

Results:

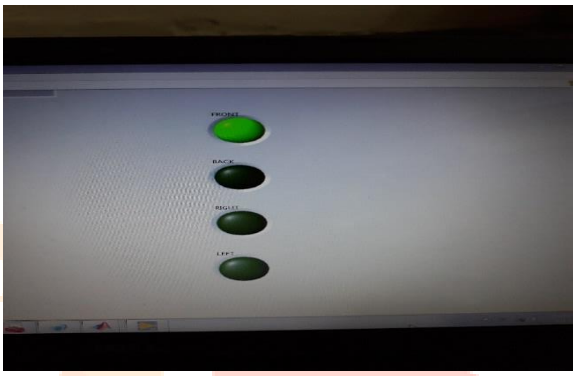
Attention Values: **Graph for values:**



Back:



Front:



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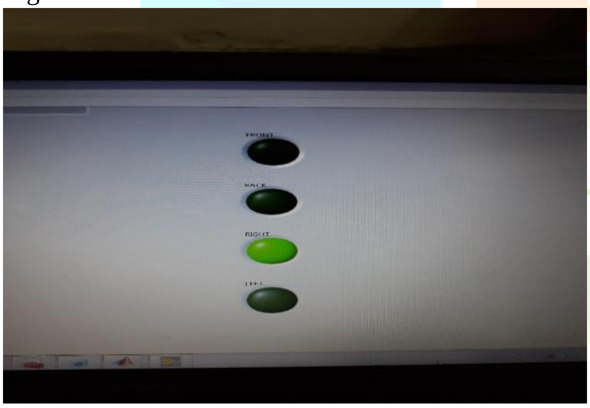

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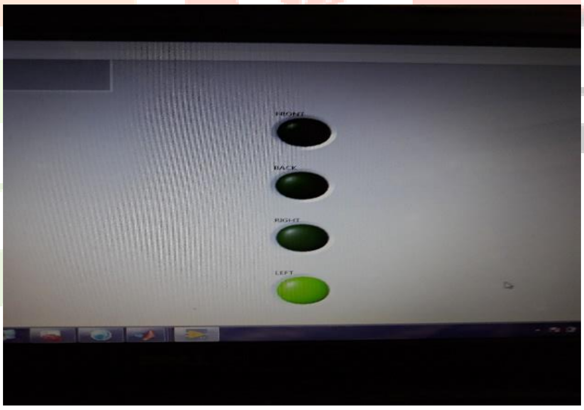

Conclusion:

The signal generated by brain was received by the brain sensor and it will divide into packets and the packet data transmitted to wireless medium (blue tooth). the wave measuring unit will receive the brain wave raw data and it will convert into signal using MATLAB gui platform. The robot will be moved in different directions based on the code (i.e. the threshold points).

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 communicating by using the universal translator chips in Invasive manner. Here that chips are placed inside the brain.

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