Survey on BRAIN CONTROLLED CAR FOR DISABLED USING EEG

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Abstract: Thought is fundamental human activity, which can be recognized by analyzing brain signals. This chapter considers the development of EEG-based brain-controlled car, which can serve as powerful aids for physically disabled people. Since these cars will rely only on what the individual is thinking they will hence not require any physical movement on the part of the individual. It captures EEG (electroencephalogram) signals from the driver's brain using EEG head set which contains three electrodes. The instructions for the movement is programmed and stored using Arduino (ATMEGA 328) and the connection between head set and Arduino is established using Bluetooth(HC05).The instructions from the brain is displayed on a screen. The output from the Arduino is connected with driver motor (L293D).The project is focused on scope of BCI in the transportation filed and also for encouraging disabled people for driving.

Key Words: Electroencephalogram (EEG), Arduino, NeuroSky headset, HC05, Brain computer interface (BCI)

INTRODUCTION:

Imagine you could drive your car using only your thoughts. If it is possible we can witness a revolutionary change in the society where the demarcation between the abler and disabled people vanishes. Driver is principal part of traffic, According to scientists' study; the Electroencephalogram (EEG) of people can reflect his different state more accurately. So in the modern Intelligent Transportation Systems which mainly characters are network and information, if the driver's EEG information can be gathered in Real-time, we can drive the vehicle according to the instructions from the brain. Electroencephalography (EEG)   is an electrophysiological monitoring method to record electrical activity of the brain. If it can be used for controlling a car we can make a remarkable change in the transportation filed. Nowadays brain controlled wheelchairs are available. With a step ahead of that we are revealing the possibilities of EEG in the field of transportation. The car is created to inspire all disabled people in the society to have the confidence to drive the car. The cost of the device is highly accessible, and their computing power allows a variety of practical applications to be created.

METHODOLOGY:

The control of the car is according to the EEG signals from the brain. The electroencephalogram (EEG) is a record of the oscillations of brain. The recorded waveforms reflect the cortical electrical activity. Signal intensity of EEG activity is quite small, measured in microvolts (mV). And the main signal frequencies of the human EEG waves are Delta, Theta, Beta, and Alpha. We are capturing EEG signals using Neurosky interface. The human brain is made up of billions of interconnected neurons; the patterns of interaction between these neurons are represented as thoughts and emotional states. Every interaction between neurons creates a minuscule electrical discharge; alone these charges are impossible to measure from outside the skull. However, the activity created by hundreds of thousands concurrent discharges aggregates into waves which can be measured.
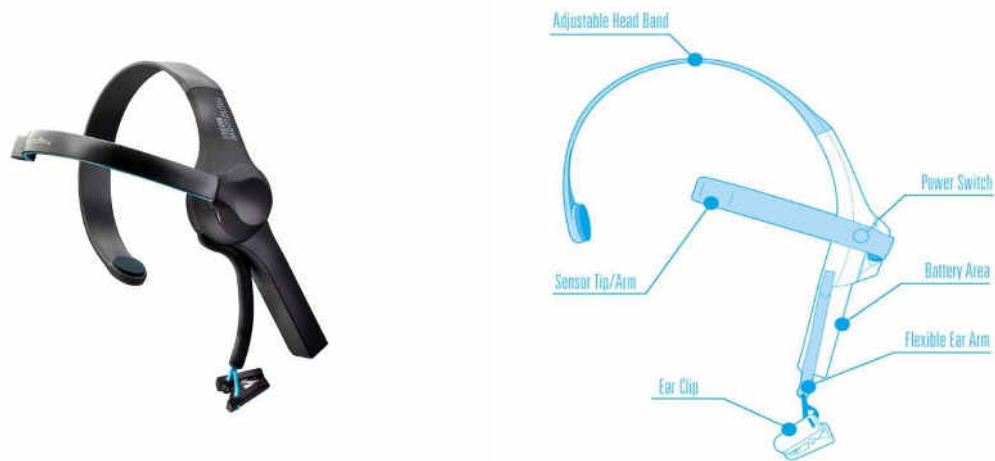
Fig.1. Neuro headset

Different brain states are the result of different patterns of neural interaction. These patterns lead to waves characterized by different amplitudes and frequencies; for example waves between 12 and 30 hertz, Beta Waves, are associated with concentration while waves between 8 and 12 hertz, Alpha Waves, are associated with relaxation and a state of mental calm. (The contraction of muscles is also associated with unique wave patterns, isolating these patterns is how some NeuroSky devices detect blinks.)
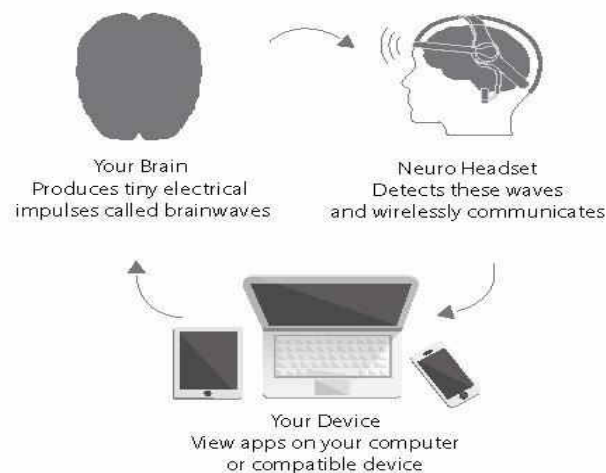

Fig.2. Working of Neuro headset

All electrical activity produces these waves (even light bulbs), thus all electrical devices create some level of ambient "noise"; this "noise" interferes with the waves emanating from the brain, this is why most EEG devices will pick up readings even if they are not on a person's head. Measuring mental activity through these waves is like trying to eavesdrop on a conversation at a loud concert. In the past, EEG devices circumvented this problem by measuring these signals in environments where electrical activity is strictly controlled and increasing the signal strength of the data coming from the brain through the application of a conductive solution.

IMPLEMENTATION:

The car will rely only on what the individual is thinking they will hence not require any physical movement on the part of the individual. It captures EEG (electroencephalogram) signals from the driver's brain using Neuro EEG head set which contains three electrodes. The captured signals is send to the Bluetooth module (HC05).It is connected with Arduino (ATMEGA 328) in which the instructions for the movement are programmed. The signals from the brain are compared with the instructions which we already stored. It comes with sensors to covert these signals into commands to drive the car. According to Reuters, the driver needs to wear brain signal-reading equipment following which one can control the car to go forward, backwards, come to a stop, lock and unlock vehicles without actually moving their hands or feet. The driving instruction from the brain will be displayed on a

LED screen. The output from the Arduino is connected with driver motor (L293D) to which the vehicle is associated. If above requirements are satisfied the car can become the future of driving and a great help for the disabled in every manner in the field of transportation.

The design and implementation part can be dividing as:

- Capturing brain signal using Neurosky head set
- Establishment of Blue-tooth interface HC-05 with head set and Arduino
- Control mechanism of the car

Capturing brain signal using Neurosky head set:

To control the robot car, EEG signals are required. This paper explains EEG signals through Neurosky interface. In this system we have:

i)   Signal intensity: it provides the EEG strength, which is low and given in micro volts (µV).

ii)   Signal frequency: The various types of frequencies in the brain EEG are:

Delta, Theta, Alpha, Beta and Gamma which has different frequency and these are produces in different parts of brain.

EEG signal from the brain is used to generate a Brain-Computer Interface (BCI) for the important part controls robot car through Bluetooth HC-05. We use Neurosky headset provides us with signals like meditation and attention. EEG signals from the brain are captured using Neurosky head set

Establishment of blue-tooth interface hc-05:

The brainwaves are transmitted by the internal Bluetooth wireless module. The output of Neurosky's mind wave mobile headset is received by Bluetooth module HC – 05 interface organized by using of Arduino UNO and it is also connected to a personal computer. Arduino is the hardware connecting all the links which are receiving Bluetooth, the car to be controlled and the computer from where the commands (programs) can be transferred to the Arduino board and at the same time that software shows us all the things happening on the serial communication port. The program in the Arduino analyzes the data received by Bluetooth and accordingly generates outputs on the terminals which are already stored in the program.
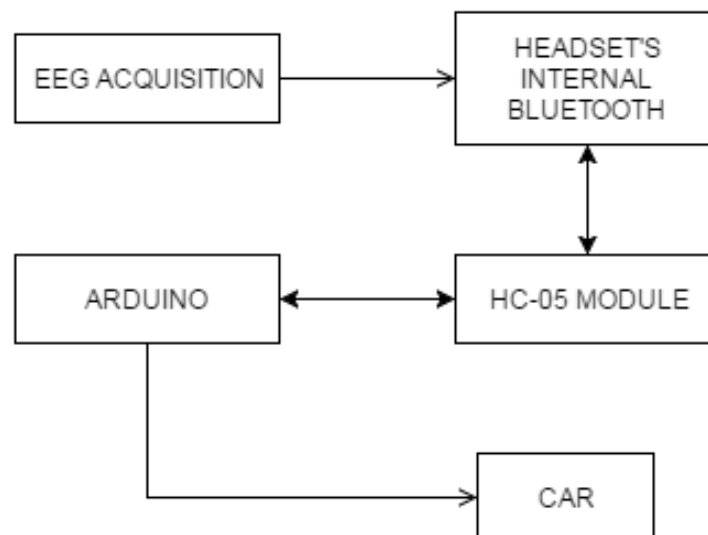

Fig 3: Bluetooth interface

Car control mechanism:

The output we need to develop a robot car, this includes four 12v dc gear motors which are driven by motor driver IC as they require handsome amount of current, which the Arduino is unable to provide. So external source is needed to supply the needed current. For making the robot car totally wireless we need to put that external source on the chassis of the car and the Arduino is to be supplied from the same supply source. There is a two type voltage supply (5V and 8V) used for Arduino and motor Drive, Arduino is drive by 5V and motor is driven by 8V. There is a requirement of motor drive IC L293D which has a dual H type bridge and it works as a current amplifier. L293D takes low current as input and gives high current for motor. It is also use for forward and reverse acceleration of motors. We can drive two motors in forward and reverse direction from single IC. According to shown in fig-5 In IC L293D we have 2,7,10 and15 for input and 3,6,11 and 14 are used to drive motors. For starting motor pins 1 and pin 9 is high these are ENABLE pins. Pin 4,5,12 and 13 are ground pins. +8V supply is given at pin 7 and 5V is connected at enable pin 1 and 16.
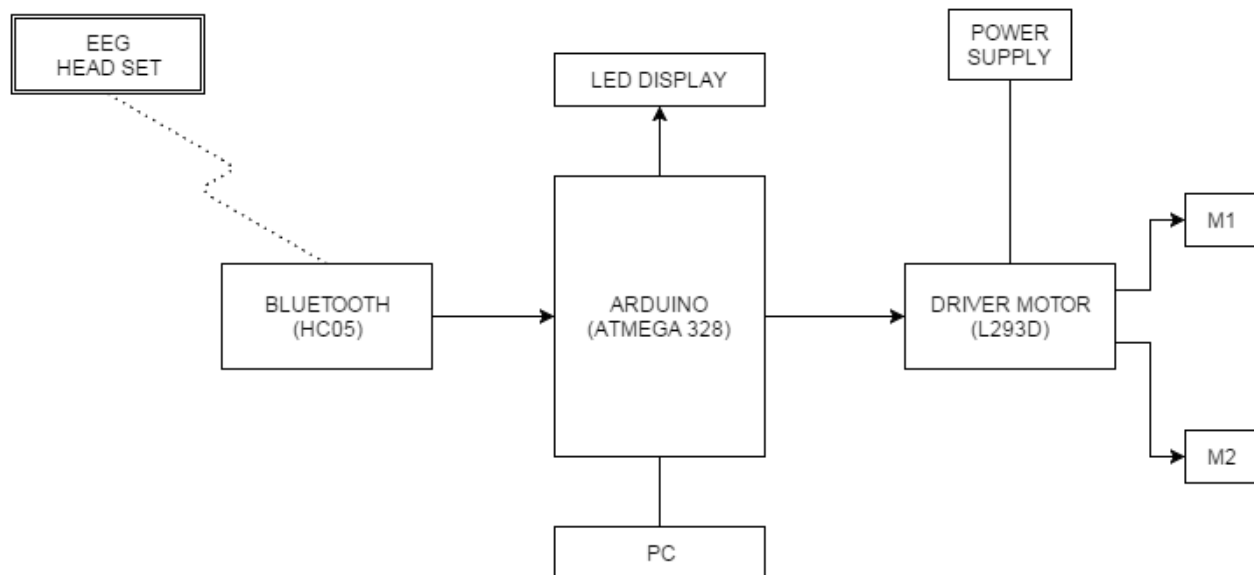

Fig.4. Block diagram of project

CONCLUSION:

With the worlds progress every one want to be advanced, as the automation in the field of engineering is increasing, it can be best understood by the laser operations where automation works, it has increased the success rate. This survey paper deals with the development of brain controlled car, which can be the future of driving and a great help for the disabled in every manner in the field of transportation. The driver would only need to concentrate on the thought when you want to actually change the status of your vehicle. For efficient and secured transportation, an obstacle detection and avoidance mechanism is included. If the development of the car becomes cost effective manner and more features and functions can be included then we can witness a revolutionary changes in the society as well as in the transportation field.

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