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Brain Controlled Robot using Brainsense

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ABSTRACT:

This paper primarily presents a real-time model of a low-cost robotic car for quadriplegics that is based on the guiding movement of the eye. This model, which provides a simplified low-cost model of the Robotic car, is expected to benefit the poor paralysed people. Data comparison through serial communication with a particular purpose Arduino uno ATMega328p is used to realise the model. This is detected in a transmitter and receiver as an object cross, and it will intimate. In this work, Eye blink is our object, which is recognised using brainwave signals and interacts serially with anArduino, which then controls the Robotic car motions using brain wave signals.

Keywords: Brain Computer Interface (BCI), MATLAB, Electroencephalography (EEG) waves, Think gear, Neuro Sky, Arduino Uno

1. Introduction:

In our proposed system, the system uses Arduino. but signal processing requires Matlab. An external Bluetooth connection is required for Arduino. Because Arduino is based on Matlab, these apps require a laptop or computer. Arduino which has inbuilt Bluetooth, so that there is no need of external Bluetooth. When the system is turned on, the robotic car travels autonomously, turning front when one blink is recognised, back when two blinks are detected, left when three blinks are detected, and right when four blinks are detected. If an aberrant blink or no blink is detected, the car will immediately come to a halt. This system's primary application is for crippled persons who can use it to move around in their wheelchair without relying on others.

2. Literature Survey:

The progress of a cerebrum Computer interconnection positioned on Steady State Visual Evoked Potentials (SSVEP), that enables a user to control a remote-control car. The visual technical precipitant conditions of area, frequency and shape were estimated with the purpose of obtaining the SSVEP signal with the highest amplitude in order to obtain the best performance of the developed BCI. A push button powered motor car was assembled and authorized by a well theme using the evolved SSVEP BCI, showing its proper functionality [1]. This work aimed to search out and measure a novel procedure for determine errors in continuous BCI applications. Instead of classifying errors on a single-trial basis, the new technique was supported multiple events (MEs) analysis to expand the accuracy of error detection. Methods: In the exceedingly BCI-driven automotive game, supported motor mental imagery (MI), distinct events were triggered whenever subjects collided with coins and/or barriers. Coins counted as correct events, whereas barriers were errors [2]. This possesses a propensity to conferred 2 hybrid BCIs, one comb motor Mental Imagery (MI) and P300 and another comb P300 and stable condition visual potential difference (SSVEP),andtheirapplications. A vital problem in BCI analysis is multidimensional management. Potential applications embody BCI controlled glide, records and electronic message process, application, chair and neuroprosthesis. The provocations for EEG-based multifaceted management are to get multiple freelance management waves from the clanging EEG data [3]. Numerous kinds of medical care are established to lower the number of kids Attentively Deficit Disorder (ADD). Some offered treatments aren't suitable for the youngsters since medication is employed and needs them to meditate. the employment of Neuro based mostly physical game to perform psychological feature coaching on ADD kids have not been reported [4]. Distinctive problems limiting the sensible potency of BCI model over inevitable incidence of physiological artefacts throughout electroencephalography (EEG) recordings. the outcomes of the artefacts are, however, principally discarded in sensible BCI systems, due to the long and complex process processes. The influences of the artefacts and also the potency of reducing these influences in an exceedingly sensible BCI. Ophthalmic and muscular artefacts are thought of thanks to the elevated-amplitude and repeated presence [5].

Problem Statement:

In the previous discussion from the relevance and literature survey, we defined problem statement now increases the paralysed peoples and they face to drive the wheelchair. We proposed this project Wireless assistance for physically challenged / paralysed people to drive wheelchairs via brain waves.

3. Proposed methodology:

3.1 Block diagram:

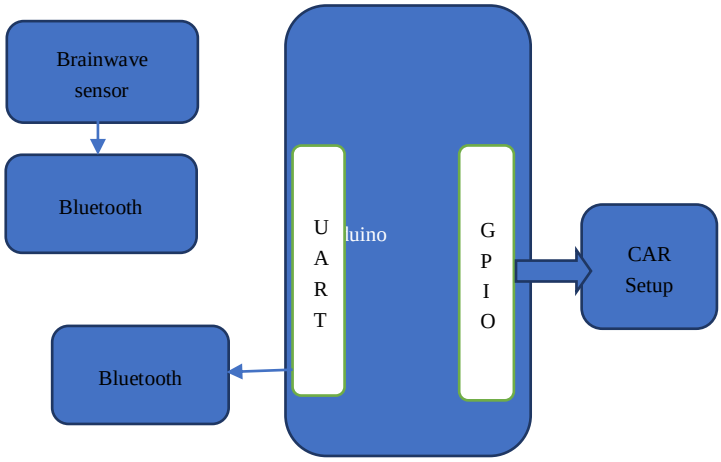

Fig.3.1Block diagram of proposed system

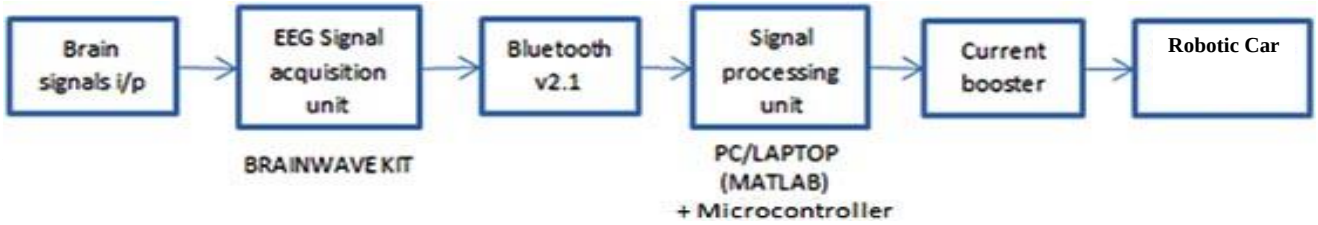

Fig. 3.3 system architecture

EEG signals are required to control the wheelchair. This study describes EEG signals as they are viewed through a BCI interface. We tend to utilise a basic unipolar electrode to record EEG data from the forehead in this system to build a Brain-Computer Interface (BCI) that primarily operates electrical wheelchairs for unfit people via Bluetooth.

3.4 BCI (brain computer interfacing):

The Brain-Computer Interface (BCI) is one of the communication channels that allows the human brain to interact with a digital computer. EEG waves from the brain are monitored using BCI. Electroencephalography, or EEG, tracks a brain electrical property as well as scalp activity (Non-invasive). The NeuroskyMind wave on computer analyses EMG(Electromyography) activity that is consciously guided (blink strength).

• Brain sense is interfaced with MATLAB in this project to get streaming on EEG packets, process the Blink waves, and feed control commands to the Arduino for car movement through Bluetooth. As a result, this project gets these processes.

Fig. 3.4 Brain sense

BCI on the basis of electroencephalogram: The recording of electrical activity along the scalp caused by the firing of neurons in the brain is called electroencephalography (EEG).

3.5 How does BCI work?

Because of its superior time resolution and relative simplicity, the scalp recorded electroencephalogram (EEG) appears to be an adequate candidate among the options. Furthermore, there is strong evidence that certain mental tasks cause detectable changes in EEG. EEG acquisition, EEG signal processing, and output production are the three subsystems that make up the BCI system as shown in fig.3.5.1.

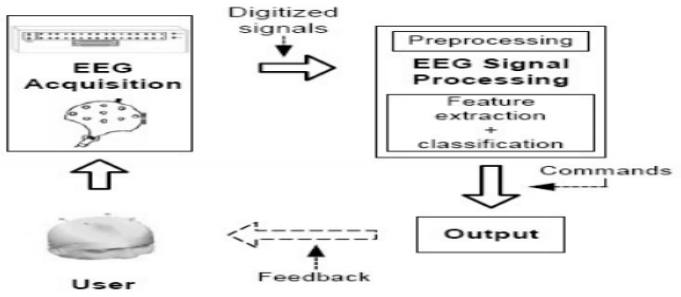

Fig. 3.5.1 BCI three subsystems

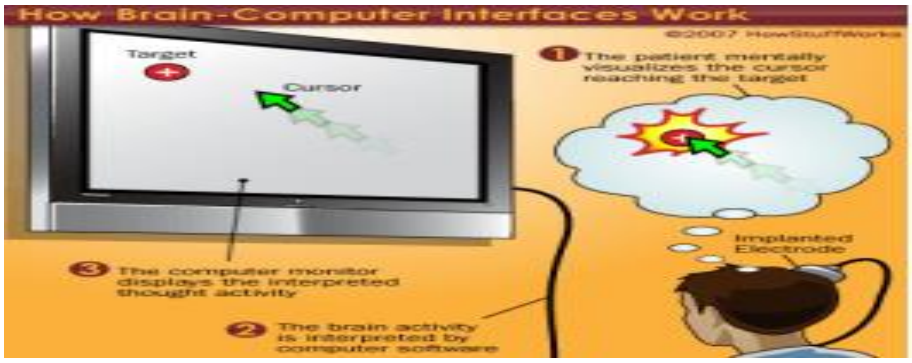

Fig.3.5.2 BCI interfaces works

3.6HC-05 Bluetooth Module:

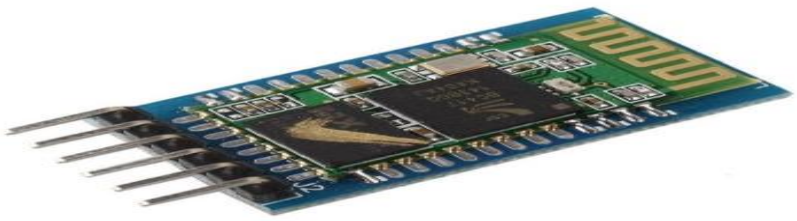

Fig.3.6.1 HC-05 Bluetooth

A Bluetooth module called HC-05 is designed for wireless communication. It's possible for this module to be used as a master or slave. The HC-05 module, created for unambiguous wireless serial connection setup, is an easy-to-use Bluetooth SPP (Serial Port Protocol) module.Port Bluetooth module is indispensable. Compliant Bluetooth V2.0+EDR (Enhanced information Rate) 3Mbps Modulation baseband and a two4GHz radio transceiver.By doing that, one can create wireless Networked Personal Area (PAN). It transmits data with frequency-hopping spread spectrum (FHSS) radio technology in air. To communicate with devices, serial communication is used. It speaks to the microcontroller by using the port (USART).

HC-05 module details:

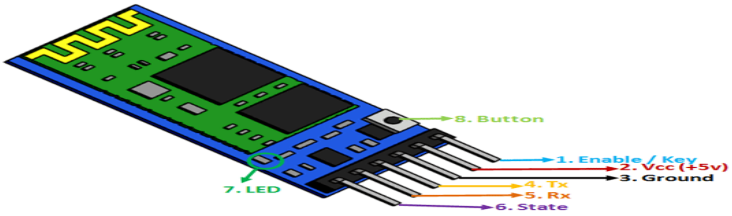

Fig.3.6.2 Pin Configuration

Whether or not the Bluetooth is connected, the HC-05 includes a red junction rectifier that shows affiliation status. This red junction rectifier blinks prior to connection to the HC-05 module. continuously in a regular pattern. When connected to another Bluetooth device, it starts blinking. slows down to 2 seconds overall. On 3v, this module operates. We will connect a 5 V supply at 3 V. nevertheless, as the module contains an internal 5 to 3.3 V regulator. There is no need to change the transmit level because the microcontroller will observe the 3.3 V level for RX/TX. Module HC-05.

3.7MATLAB:

A high-performance language for technical computing is called MATLAB. It combines calculation, visualisation, and programming in a user-friendly setting where issues and fixes are presented using standard mathematical notation. The features and tools that make it easier for you to work with MATLAB files and variables. The MATLAB desktop, which has tools (graphical user interfaces) for managing files, variables, and MATLAB-related apps, displays when you launch MATLAB. From the MATLAB Command Window, external programmes can be launched. This is helpful for starting other programmes or utilities without closing MATLAB.

3.8Arduino uno:

The project's brains are on here. It operates as a small embedded computer with a microcontroller just like its brain and header pins for connecting inputs (sensors) and outputs (actuators).

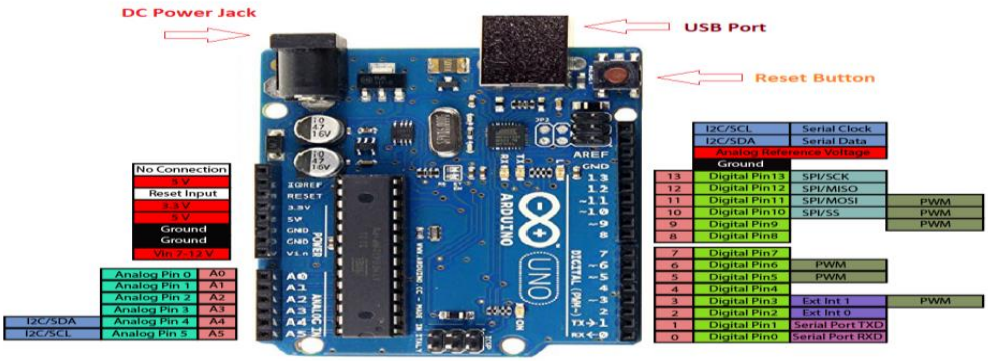

Fig. 3.8Arduino Pin Diagram

3.9 Robotic Car Prototype:

A Robotic car prototype is made up of two 60rpm motors. Aluminium sheets are used to form the frame. The motors receive control signals from the H-bridge circuit. The control signals will cause the motor to rotate clockwise, anticlockwise, or halt depending on the action performed.

4. Project Flowchart:

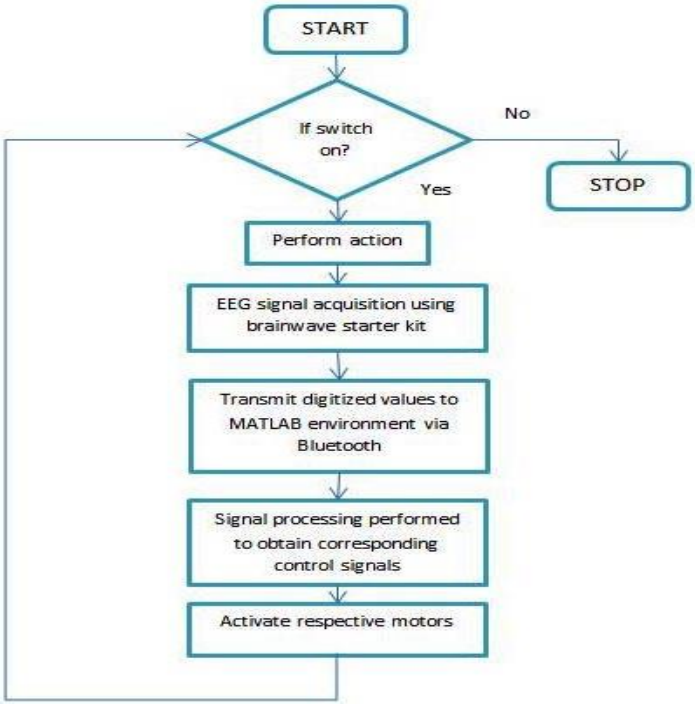

Fig.4. Flowchart of proposed system

5. Experimental Results:

The results of the experiments showed that this method will provide a convenient way to control an electrical wheelchair.

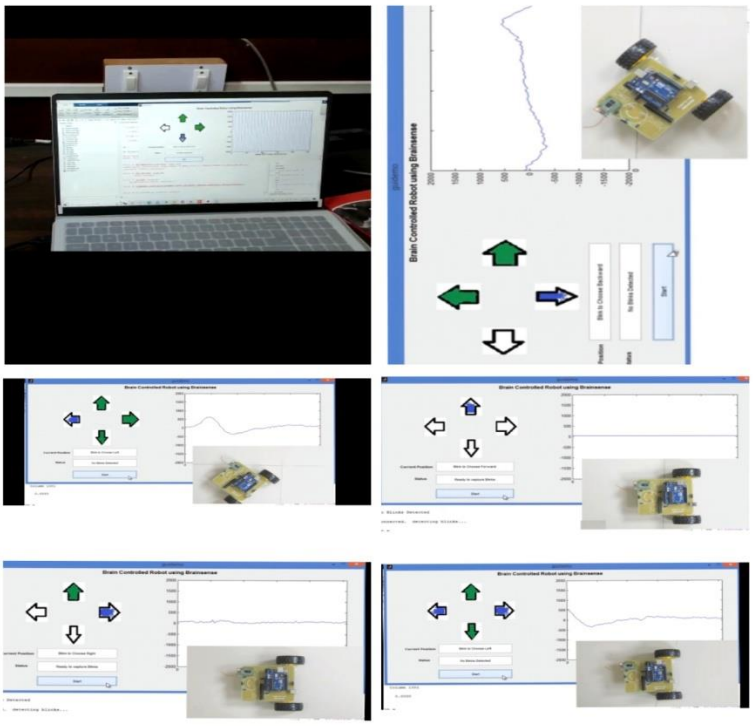

Fig.5. Experimental Setup Result

6 Conclusion:

The signal values acquired when various individuals carried out the identical behaviours were within the same range, but the latency differed from person to person. It was discovered that training the headgear for that person could shorten the delay duration.

7. Acknowledgment:

I take this opportunity to gratefully acknowledge the inspiration, encouragement, guidance, help and valuablesuggestions received from all my well-wishers. I would like to thanks my Project guide Prof.S.V. Matiwade madam who hashelped me and made available much useful information to complete this project.

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