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Mind Wave Controlled Wheelchair for Paralysed Patients

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ABSTRACT: The physically disabled people uses wheelchair, they apply their physical power for wheelchair movement or they may use electrical wheelchair which is operated by joystick. If the person is paralysed and unable to apply their physical power to move the wheel chair. So this paper describes our project entitled Mind Controlled Wheelchair which helps the paralysed patients to move their wheelchair themselves by varying the attention levels of the brain**.** An EEG-based brain controlled wheelchair has been designed using Brain Computer Interface (BCI) with the help of Mind Wave Sense EEG Headset. This project shows how Brain Computer Interfaces (BCI) works and how it can be used in certain applications. Electroencephalography (EEG) was used to read brain waves and then those waves were analysed to fetch fruitful results which are used in certain applications.

KEYWORDS*:* EEG, BCI, Mind Wave Sensor, MCU, Attention Level, Meditation Level, Eye Blink.

I. INTRODUCTION

The project titled Mind Controlled Wheelchair' is processed and designed under multiple software's, Core programming languages used Python and Flash Magic. The project aims to deal with creating an interface between human brain and a computer using Electroencephalography (EEG) technique, a technique to read brain waves using sensors that read delta, alpha, beta, gamma & theta waves from the brain, amplifies it and gives the output in form of numerical values toss the machine. The users just need to think of movement. Here a Python Interface is established to collect the Sense parameters and transmit it to the microcontroller.

II. LITERATURE SURVEY

In the present system paralysed patients are depends on another people for move the whellcair.This makes people inconvenient.

III. PROPOSED METHODOLOGY AND DISCUSSION

The proposed work deals with the engineering an interface between the human brain and an electric wheelchair using a portable EEG brainwave headset and firmware signal processing and filtering. The project eliminates the drawbacks of conventional EEG by using a dry sensor technology to pick up EEG signals instead of using a conductive gel and reducing the time it takes to setup. This project aims at creating a cost efficient solution, later intended to be distributed as an add-on conversion unit for a normal wheelchair. Doing so would be of Nobel importance to 'brain-active-body-paralysed' patients providing them the independence of mobility. The project uses a mind wave headset instead of traditional EEG to acquire brain signals thereby reducing the set up time.

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III A.***Block Diagram***

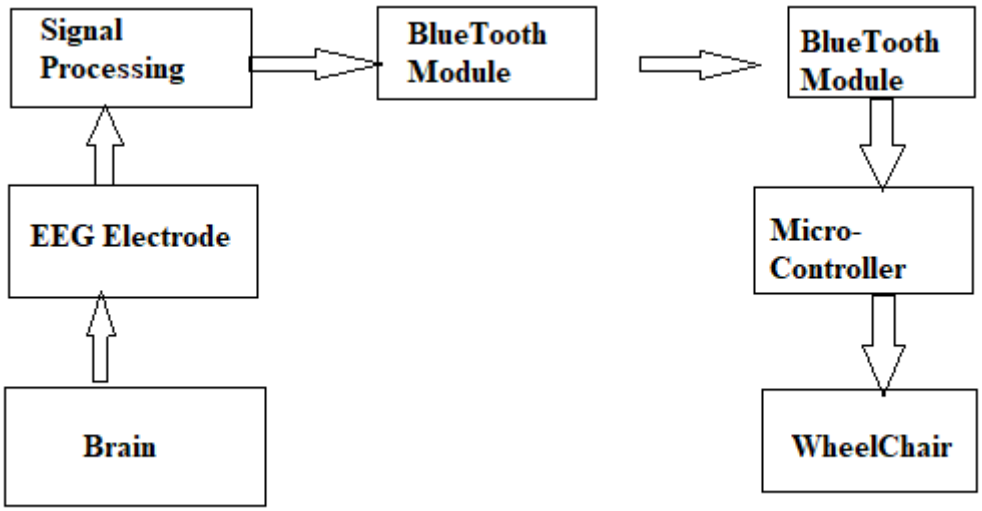

Fig. 1. Block Diagram of the Proposed Project

III B. ***Flowchart of the System***

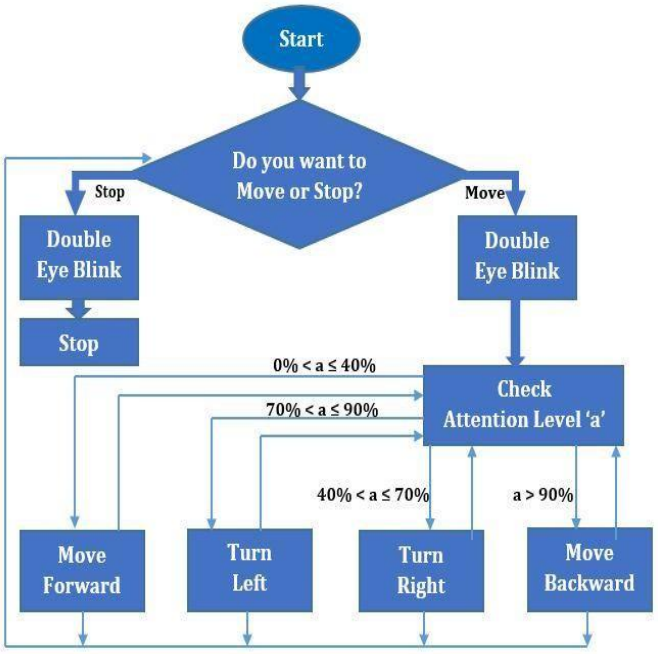

Fig. 2. Flowchart of the Proposed Project

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III C: ***Overview of the Project***

The components used in the project are Mind Wave Sensor, Arduino UNO Controller, BlueTooth Module (HC-05), L293D Driver, Flash Magic Software and Arduino IDE. First the mindwave sensor senses the EEG waves from the brain, the raw data from the sensor is further processed by TGM module which is available in Sensor. The processed data is send by the Bluetooth module to Bluetooth (HC-05) which is connected to the Arduino UNO controller. Then the controller controls the wheel chair directions by the attention levels sent by the Mind wave sensor. When the patient wants to move, the arduino on the wheelchair checks the state of the attention level of patient by analyzing the brainwave data received from headset through Bluetooth wireless communication. If the attention level is from 0% to 40% the wheelchair will move forward, if from 41% to 70% it will turn right, if from 71% to 90% it will turn left and if the attention level is greater than 90% the wheelchair will move backward.

III. C. 1: **Mind Wave Sensor**

Brain sense is the device that works under the Principle of BCI - Brain-Computer Interface, that is analyzing brain with EEG – Electroencephalography, the study of the electrical activity of brain neurons and developing brain actuated applications using this device.

In this generation, every industry is trying to build AI bots that are highly intelligent than Humans, which may be a threat to Humans. On the other hand, some industries are working to enhance the human, using this BCI technology. Industries such as Neuralink by Elon Musk, designing thinner electrode, can be planted around the skull, can be used to monitor the brain activity. The Brainsense is also one of the BCI devices, which has Non-invasive types of electrodes i.e, Electrodes can be just placed in the scalp of the brain, instead of injecting the electrode into the brain tissues and also it is a dry electrode, which doesn't require any gel before use.

Fig. 3.Mind Wave Sensor

III. C. 3: ***Arduino UNO***

Arduino is an open-source prototyping platform based on the easy-to-use ecosystem of financially affordable hardware and open source software. Arduino boards are available commercially in ready to use form original vendors or from third parties or it is possible to obtain Arduino boards as the do-it-yourself kits. Designs of the Arduino boards are published under the Creative Commons License. Programming of the Arduino microcontroller "Fig 4." is possible with the use of the Arduino Software Integrated Development Environment "I.D.E." that is programmed in Java language and is available for Windows, Macintosh OS X and Linux operating systems. Arduino boards are very popular and there are thousands of amateur, BCI professional, industrial and

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scientific commercial and open-source projects based on them.

Fig. 4. Arduino UNO

III. C. 4: ***BlueTooth(HC-05)***

The data of alpha wave and beta wave obtained from Mind Wave headset is sent to the Bluetooth module interfaced with the wheelchair. In this work, HC-05 Bluetooth module has been used for receiving data and for processing data and sending command for operation of the wheelchair Arduino Uno development board has been used. HC-05 bluetooth module and Arduino Uno development board is shown in Fig. 4 and Fig. 5 respectively.

Fig. 5. HC-05 Bluetooth module.

III. C. 5: ***l293d Motor Driver***

The Motor Driver is a module for motors that allows you to control the working speed and direction of two motors simultaneously .This Motor Driver is designed and developed based on L293D IC.L293D is a 16 Pin Motor Driver IC. This is designed to provide bidirectional drive currents at voltages from 5 V to 36 V.

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Fig. 6. L293D Motor Driver

IV. EXPERIMENTAL RESULTS

First the patient wear the mind wave sensor and changes the attention levels by blinking eye rapidly. This attention levels change is depends upon the practice. Depends on the attention levels, the EEG values are changed. These values are processed and transferred to the wheelchair's Bluetooth module from Mind wave sensor's Bluetooth module. Then the controller controls the wheel chair's motors according to the attention levels from the patient's brain.

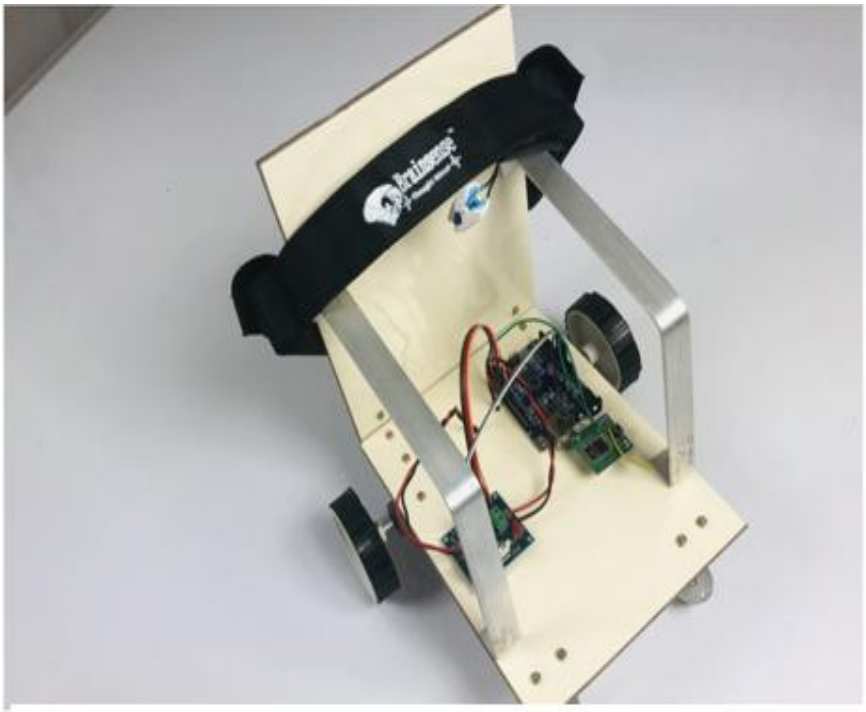

Fig.7 Final View of the Proposed Project

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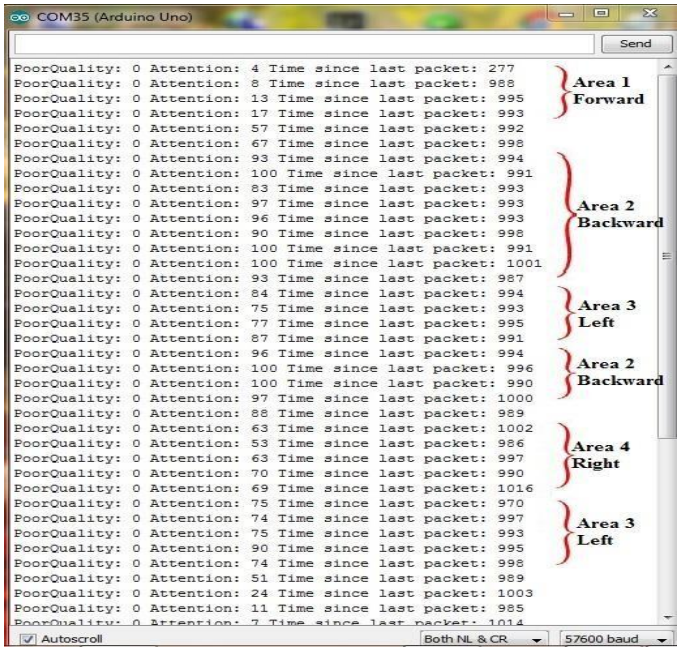

Fig.8. Attention level data for different areas from arduino com port and corresponding movement of wheelchair.

V.CONCLUSION

The project concludes into a functional Mind Controlled Wheelchair. Right, Left, Forward and Stop commands given by the disabled person are deciphered by embedded algorithms and suitably executed. By selecting suitable IC's and circuit design, cost effectiveness of overall project is optimized. The designed 'Mind Controlled Wheelchair' provides control of motion and direction of wheelchair by mind's attention and meditation level and eye blinks.

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