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DESIGN & IMPLEMENTATION OF BRAIN CONTROLLED WHEELCHAIR

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Abstract— *Improving the quality of life for the elderly and disabled people and giving them the proper care at the right time is one the most important roles that are to be performed by us being a responsible member of the society.*
It's not easy for the disabled and elderly people to mobile a mechanical wheelchair, which many of them normally use for locomotion or movements. Hence there is a need for designing a wheelchair that is intelligent and provides easy mobility. In this thesis, an attempt has been made to propose a brain controlled wheelchair, which uses the captured signals from the brain and processes it to control the wheelchair.

Electroencephalography (EEG) technique deploys an electrode cap that is placed on the user's scalp for the acquisition of the EEG signals which are captured and translated into movement commands by the arduino microcontroller which in turn move the wheelchair.

After measuring brain waves it delivers to brain to computer interface unit which analyzed and amplified and classify waves into alpha, beta, gamma, waves then arduino microcontroller controls the movement of wheelchair.

Keywords—*Microcontroller, Electroencephalogram,*

Introduction

The electric-powered wheelchair is a wheelchair acting by an electric motor controlled with a hand-operated joystick. However, some people suffering from severe motor disabilities cannot use the joystick, such as paralysis and physically disable people and locked-in syndrome. So they have other special devices available (touchpad, head /speech control, eye, EEG, etc). With the objective of responding to numerous mobility problems, various intelligent wheelchair related research have been created in the last years. In this research try not only to give mobility to handicapped people but, more importantly, independently of third party help. Despite these new types of control methods, can acquire users intention to control the wheelchair. However, each type of alternative control has its limitations.Wheelchair users are among the most visible members of the disability community; they experience a very high level of activity and functional limitation and also have less of employment opportunities. Elderly people are the group with the highest rates of both manual and electric wheelchair use.

Wheelchair users report difficulty in basic life activities, and perceived disability. It's not easy for the physically challenged and elderly people to move a mechanical or electric wheelchair. In recent times there have been a wide range of technologies that help aid the disabled physically challenged. These control systems are designed to help the physically challenged specifically. These competitive systems are replacing the conventional manual assistance systems. The wheelchair too has developed significantly with a variety of guidance systems alongside like using the joystick and a touch screen, and systems based on voice recognition. These systems however are of use to those with a certain amount of upper body mobility. Those suffering from a greater degree of paralysis may not be able to use these systems since they require accurate control. To help improve the lifestyle of the physically challenged further, this research work aims at developing a wheelchair system that moves in accordance with the signals obtained from the neurons in the brain through the electroencephalograph(EEG) electrode.EEG stands for electroencephalogram, a electrode commonly used to detect electrical activity in the brain. Detecting, recording, and interpreting "brain waves" began in the late 1800s with the discovery and exploration of electrical patterns in the brains and the technology has evolved to enable applications ranging

from the medical detection of neurological disorders to playing games controlled entirely by the mind.

DESIGN PROPOSED SYSTEM SETUP

In this Proposed system neurosky Mindwave headset used to record different brain waves and attention and meditation parameters.

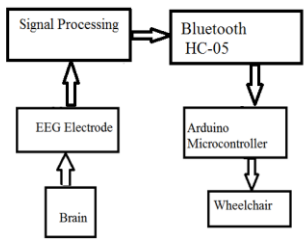


Fig .10 Block Diagram of Proposed System

Elements of setup

EEG Electrode.

Signal Processing.

Bluetooth Module(HC-05).

Arduino Microcontroller.

Wheelchair.

Arduino Microcontroller is 28 pin Atmega328 IC based Microcontroller.which is used to control wheelchair through commands given by EEG electrode fitted on scalp of user.Wheelchair is four brushless dc motor based vehicle for user is controlled by brain of user.

there are two types of brain wave acquisition techniques:

- **invasive acquisition**
- **Non invasive acquisition**

The non-invasive technique on the other hand uses the electrophysiological signals from the scalp and takes measurements using that technique. in this thesis research is done on the basis of non invasive acquisition technique. At the root of all our thoughts, emotions and behaviors is the communication between neurons within our brains. Brainwaves are produced by synchronized electrical pulses from masses of neurons communicating with each other.Brainwaves are detected using sensors(EEG electrode) placed on the scalp. They are divided into bandwidths to describe their functions , but are best thought of as a continuous spectrum of consciousness; from slow, loud and functional - to fast, subtle, and complex. Our brainwaves change according to what we are doing and feeling. When slower brainwaves are dominant we can feel tired, slow, or dreamy. The higher frequencies are dominant when we feel active or hyper-alert. brainwaves are complex reflect different aspects when they occur in different locations in the brain. Brainwave speed is measured in Hertz (cycles per second) and they are divided into bands of slow, moderate, and fast waves.

Infra low(<0.5HZ)

Delta Waves(0.5 to 3HZ).

Theta Waves(3 to 8HZ).

Alpha Waves(8 to 12HZ).

Beta Waves(12 to 38 HZ).

Gamma Waves(38 to 42HZ).

Attention.

Meditation.

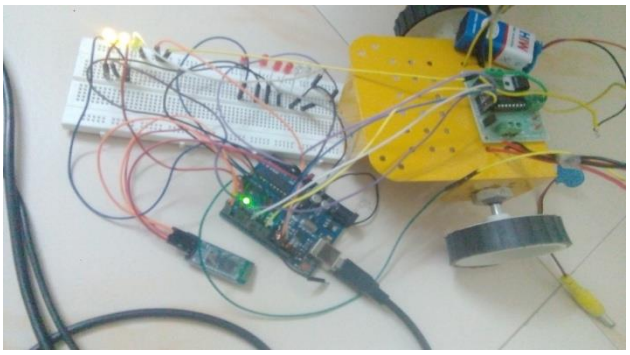
In this paper Attention and meditation Parameter is used to control Wheelchair Control.

RESULTS

In this paper, we have Controlled wheelchair via Bluetooth Module. MIndwave Headset include a electrode on front part of scalp.refrence electrode and ground electrode which is connected to ear lobe.

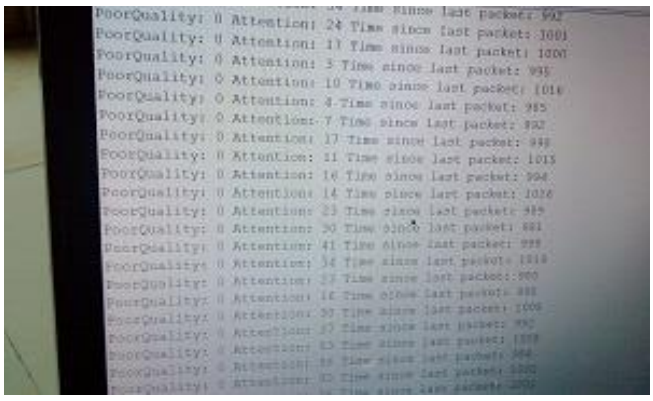
Figure (b) shows that Neurosky Mindwave Headset used as a EEG Electrode

(a)

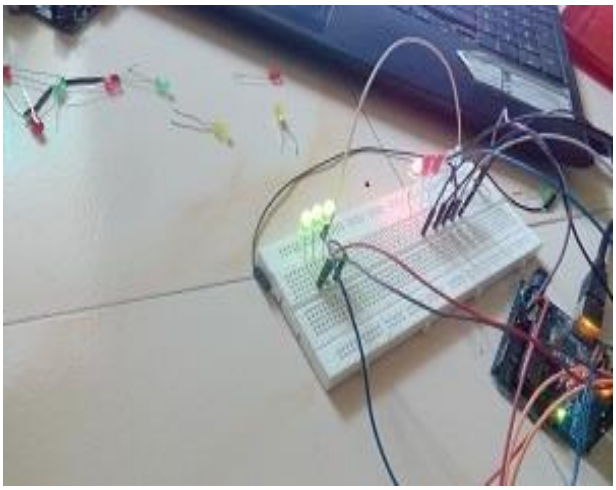


(b)

Figure (b) shows that the hardware setup of system, two wheel robot is controlled with brain wave headset.



(c)



(d)

Figure (c) shows that the output value measured on Serial port of Arduino. it Shows level of Attention.

Figure (d) Shows that the led are controlled by mind wave headset. Led's are more brighter when attention increases.

CONCLUSION

From the proposed system wheelchair can be controlled by brain waves. The advantage of brain controlled wheel chairs are that they respond to commands much faster and that patients who have lost the ability to speak may utilize them. The main purpose of this project is to design a wheelchair for severely disabled person to move them voluntarily. in this paper Attention Parameter is used to control Wheelchair .if Attention Value goes more then 50 then Wheelchair will go Forward otherwise stop.

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