

# Design of an Electric Wheelchair Using Brain Computer Interface

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**Abstract:** The paper manages designing an electric wheelchair from a typical wheelchair and afterward building up a Brain-Computer Interface (BCI) between the electric wheelchair and the human cerebrum. A versatile EEG headset and firmware signal handling together encourage the development of the wheelchair coordinating personality action and recurrence of eye flickers of the patient sitting on the wheelchair with the assistance of Microcontroller Unit (MCU). The proposed framework is attempting to give every disabled individual and ALS patients the most straightforward approach to let them have a real existence in any event close to the typical life. The framework will rely upon the Electroencephalogram (EEG) signals and on the Electromyography (EMG) signs to place the framework in order and out of the direction. In this paper, a model has been made to propose a wheelchair, which utilizes the caught signs from the mind and procedures it to control the wheelchair. Electroencephalography (EEG) procedure sends an anode that is set on the client's scalp for the procurement of the EEG signals which are caught and converted into development directions by the Arduino microcontroller which thusly move the wheelchair.

**Keywords:** Electroencephalography (EEG), Micro controller, Smart Brain Controlled Wheelchair, Electromyography (EMG), Brain-Computer Interface (BCI)

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## INTRODUCTION

In this world several individuals were crippled, there is diverse innovation that enables physically debilitated to move around. Yet at the same time, many individuals have completely paralyzed yet just there mind work appropriately with the assistance of these mind power such a significant number of errands can be performed by these individuals. One of them is they can move far and wide utilizing this mind power. To improve the way of life of the crippled individuals, this work targets building up a wheelchair framework that moves as per the signs acquired from the neurons in the mind through the mounted tests on the scalp of the human and utilizing mems. [1]

Vertebral segment is the most significant part in our body where the significant capacities are to ensure the

spinal line, nerve root and inward organs. Spinal string damage happens when there is any harm to the spinal rope that squares correspondence between the mind and the body. At the point when the spinal rope harmed, a person's tactile, engine and reflex messages are influenced and will be unable to work. The higher the degree of damage, the more brokenness can happen.

Cerebrum controlled wheelchair is a wheelchair serving the full deadened patient. For the most part, it serves amyotrophic parallel sclerosis patients. The mind-controlled wheelchair will be comprised of sensors that get certain signs from the cerebrum or the deliberate activities done by the patient. The control unit will read those signs and transmit them to the engine that makes the wheelchair move in specific

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ways as indicated by signals received by the control unit.

This may bring about partial or complete loss of motion of the body just as complete loss of motion of the arms and legs. For people with the most significant level of Spinal Cord Injury (SCI), they are just ready to control muscle development from a neck or more. To increase autonomous portability, a force electrical wheelchair with another option or a hands-free interface is critical since the typical joystick isn't suitable any longer. The medium can be created by using data produced from eyes, tongue, voice, and brainwave. In this paper, a BCI based electric wheelchair driving guide structure that uses mental focus (EEG signals) and eye squints (EMG signals) of the client, is utilized. [2]

The plausibility of moving in a self-governing way gives the client with extreme debilitation conditions a striking physical and mental feeling of prosperity. As of late, it tends to be watched a developing of enthusiasm for Brain-Computer Interfaces (BCI) framework for medicinal and sight and sound applications. BCI is a gadget to give a direct interface between the human mind and the PC. The clients simply need to consider development to drive the framework. This paper utilizes a Steady-State Somatosensory Evoked Potential (SSSEP) worldview, which inspires cerebrum reactions to vibrio-material incitement of explicit frequencies, for a user's goal recognizable proof to driving a wheelchair. This wheelchair most part dependent regarding a matter focused on one of vibrio material boosts (appended on left-hand, right-hand, and foot) specifically for driving wheelchair (relating to turn-left, turn-right, and move-forward). Therefore the use of BCI is one of the unmistakable gadgets for empowering the serious disability client to control wheelchair dependent on the sign got from the cerebrum [3].

**LITERATURE SURVEY**

A huge number of individuals around the globe experience the ill effects of versatility debilitations. Individuals having portability impedances need new gadgets with advanced features to support them for agreeable versatility. Wheelchair clients having versatility debilitations experience an elevated level of development and utilitarian impediment [4]. Numerous patients can't control the automatic wheelchair utilizing traditional interface and they are regarded unequipped for driving securely.

The mind-controlled wheelchair is being created to give portability to the people who think that it's difficult to utilize a fueled wheelchair because of the engine, tangible, perceptual, or psychological debilitations. The future extent in robotics, sensor innovation, and computerized reasoning guarantees a gigantic extension for building up a propelled wheelchair. Brain-Computer interfaces (BCI) are frameworks that impart between the human cerebrum and physical gadgets by deciphering various examples of the mind action into directions continuously. The electrical movement of the cerebrum is checked continuously utilizing a variety of anodes, which are set on the scalp in a procedure known as electroencephalography (EEG). Conventional EEG sensors are costly and their utilization is restricted uniquely to emergency clinics and labs.

The cathodes of EEG sensors require conductive gel on the skin to encourage examining signals. The upside of utilizing a convenient EEG brainwave headset is that it utilizes a dry dynamic sensor innovation to inspect mind electric movement. Conventional gel-based EEGs can take as long as 30 minutes to begin getting information while the Neuro sky headsets are all set in a flash. Hence, headset dependent on Neuro sky innovation is financially savvy and simple to deal with [6].

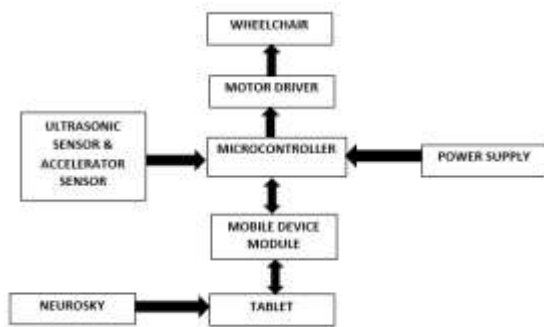
P300 configuration is an especially analyzed and stable difference at the central regions of the EEG estimations identifying with the exceptional or uncommon events. A plan of things is appeared on an LCD screen and flashed each in a steady progression for each solicitation, with only a solitary of them the goal being pertinent for the client. The patient is advised to focus his/her thought on the necessary target. P300 is the estimating of shock, and not visual banner. A positive potential normally occurs around 300 milliseconds after an exceptional event, from which the target can be settled. For the most part, the BCW has just two modes NC (not producing any order) and the IC (deliberate control) and four directions (forward, in reverse, left and right), to change the mode from NC to IC the client ought to announce in his visual glass he/she should move a laser bar to reach above 70% toward the intentioned mode, yet if the client couldn't arrive at the necessary mode so the BCW will keep on the last mode [7]. The two undertakings required from the client intellectually are to simply announce if he/she needs to push ahead or in reverse and the heading could be picked by just provide the laser bar the guidance with his/her eyes relying upon the exceptional route framework programmed particularly for this BCW.

The drawback of the framework is that the framework has an old control framework relies upon the joystick and furthermore the client ought to proclaim either to work with the BCI framework or the typical framework, the framework isn't fit to be utilized by any sort of patient with an SMR blunder under 70%. The decimation done by the glasses on account of the laser bars shows up before the client may keep the patient from arriving at the pointed objective. The expense of such a framework will be exceptionally high with the goal that it will never be accessible for large scale manufacturing [8].

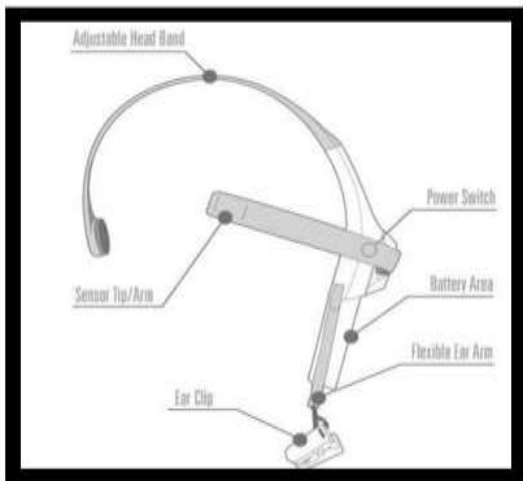
#### **METHODOLGY**

This paper clarifies that the speed and course of a wheelchair are controlled utilizing the situation of the head. The mems sense the adjustment in the bearing of the head, the sign is given to microcontroller that controls the wheel seat to move in bearing like right, front, left and back. The mind control wheelchair utilizing EEG and Arduino microcontroller clarified that the sign from the cerebrum and eyes are caught by EEG utilizing terminal put on the scalp and make an interpretation of the sign into development order by the Arduino microcontroller which makes the wheelchair to move [9]. The advantage of this proposed framework is the wheelchair can move in slants and it can identify the obstacles utilizing the sensor i.e., Ultrasonic sensor and accelerator sensor. The block diagram is shown in figure 1.

The Arduino's vitality supply requirements are amazingly fundamental; it could be associated with a PC or a battery pack, and it will start running code rapidly. If the force is isolated, it will stop; there's no convincing motivation to run a nearby down procedure. To help systems association an extra Ethernet card ought to be required. Likewise, for Wi-Fi accessibility, an extra card ought to be utilized. The open-source Arduino lets the client effectively start coding. It could run on various working frameworks, for example, windows, Macintosh bull, and Linux. There are various batteries are utilized, for example, Wet battery as a power supply in the proposed method. The mobile device module included Bluetooth, Wi-Fi.



**Figure 1: Block Diagram of the Proposed Method**



**Figure 2: NeuroSky Image**

NeuroSky Sense meters include a headset, ear-cut, and a sensor arm. The headsets comprise of reference and ground cathodes set to the ear cut and the EEG anode is put on the sensor arm, which lay on the sanctuary on the eye [10]. NeuroSky headset is a Bluetooth gadget engaged headset with a singular, biosensor where recognizes EEG and EMG inactive. The neuro sky image is appeared in below figure 2. The ultrasonic sensor sends a high ultrasonic wave and gets it back to the separation between the item and the impediment. The sensor has twofold openings, one to send the ultrasonic wave and the other one to get them [11]. The

upside of utilizing the ultrasonic sensor is primarily about the cost and it covers almost around six meters. The inconvenience of the ultrasonic sensors is where the existence time of the sensor is from 1 year to 2 years relying upon the utilizing procedure.

**RESULTS AND CONCLUSION**

The Brain-Computer headset records the electric action of the cerebrum and the wheelchair moves as indicated by the mind consideration or contemplation level. This task manages to build an interface between the human cerebrum and an electric wheelchair utilizing a compact EEG brainwave headset and firmware signal preparing and separating. This venture targets making a cost-productive arrangement, later planned to be circulated as an extra change unit for a typical wheelchair. The advantages of our proposed framework are the wheelchair utilizing two sensors: ultrasonic sensor and accelerator sensor. An ultrasonic sensor is utilized to distinguish the obstructions up to 2cm to 3m separation, acceleration sensors are added to figure the measure of increasing speed tilt to help explore entrance ramps and inclines and control the developments of the wheelchair through hands. The development of the wheelchair will be exclusively arranged for the signs produced by the brain. Client-based or explicit modules can be made hence producing an extraordinary impression. It utilizes up and coming and regularly advancing innovation that will empower simple and sensible cycles. The segment utilization is exceptionally minimal effort yet has an ideal presentation level.

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