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Mind Controlled Wheelchair Using Neural Networks for Specially Abled and Old-aged Persons

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Abstract: The proposedwork helps in improving the quality of life for the specially abled and old-aged people.Providing them appropriate attention at the proper time is one the most important roleand it is our dutyas a responsible member of the society. Controlling a mechanical wheel chair on their own is not possible for the specially abled and old-aged people, which many of them generally use for theirmovement. Hence there is a need for designing a wheelchair that is intelligent, efficient and provides easy movement. In this context, an attempt is done to present a mind controlled wheelchair usingEEG signals captured from the brain and eye blink. Signals are inturnprocessed to control the movement of wheelchair. For capturing the EEG(Electroencephalography) signals,brainwave headgear is used which is placed on the user's scalp. EEG signals are acquired and converted into digital commands by the Arduino microcontroller.This commands helps in the movement of wheelchair in the forward, backward, left and right directions.

INTRODUCTION

A mind-controlled wheelchair is a mind and machine interfacewhich uses brain waves (neural impulses) to control the movement of wheelchair. The wheelchair is very useful to the patients particularly suffering with Locked-In Syndrome (LIS).With LIS, a patient will be aware of the surroundings but he/she will not be able to move or communicate physically due to full paralysation of voluntary body musclesexcept the eyes. The wheelchairis also usefulforMuscular Dystrophy patients. Muscular Dystrophy weakens the musculoskeletal system and affectswalking or moving of the persons during their oldage at early seventies and eighties.In this proposed work, a BCI (Brain Computer Interface) system is developed, consisting of both hardware and software, helping the needy patient for navigation of wheelchair based on the eye blink which is detected by capturing EEG signals from the brain. This helps the user in controllingthe movement of the wheelchair in four directionsleft turn, right turn, forward and backward locomotion. The wheel chair can be used for selecting any destination in the house by the user's eyeblink so as to communicate with the real world.Several applications viz., communication, neuroprosthetics, environmental control and robotics/mobility devices use Electroencephalogram (EEG) based BCIs. Also BCI is one of the alternatives for bringing back the ability of movement for the persons sufferingwith motionless diseases such as Amyotrophic lateral sclerosis (ALS), brainstem stroke, brain or spinal cord injury, cerebral palsy, muscular dystrophies, and multiple sclerosis. The BCI wheelchair appears to be one of the methods to obtain this objective. Constant threshold level input should be maintained by the user for movement of the wheelchair in the desired direction.

EXISTING SYSTEM

For movement of wheelchair in the existing system, patient depends on anothernormal person for assistance. Obviously, this is not much effective as it is more time and energy consuming operation. Also, availability of the normal person will not be possible all the times.Hence, it becomes difficult for both the needy person and his/her supporter. Additionally, pushing a wheelchair is not an easy task and it needsmuch concentration. Finally, the hospital getsovercrowded due to more number of visitors.

PROPOSED SYSTEM

In this system, the disabled people can move the wheelchair by their own without the help of other person.A robotic car that consist of various components viz.,Arduino, Brainwave Sensor, and HC-05 Bluetooth Module will perform the task for the user. In other words, the signals from the brain nerves of the patient are captured by using wireless technology that helps in the movement the wheelchair. The movement of the wheelchair is controlled by the eye blink of the patient.

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OBJECTIVES OF THE PROJECT

The main objective behind this work is to develop areliable and moreefficientlow cost brain and eyeblink controlled wheel chair using wireless communication system. So the user can communicate via eye blink which is detected from brain waves using headgear. The same,inturn is used to control the movement of wheel chair. For achieving maximum efficiencywithminimal cost, wireless technology is to be used to the extent possible. The wheel chair and the complete system is battery powered. Recharge facility is provided for use in any Indoor area.

Finally the following goals are achieved through the proposed project work.

1) To develop EEG Based eye blink detection system for wheel chair movement control.

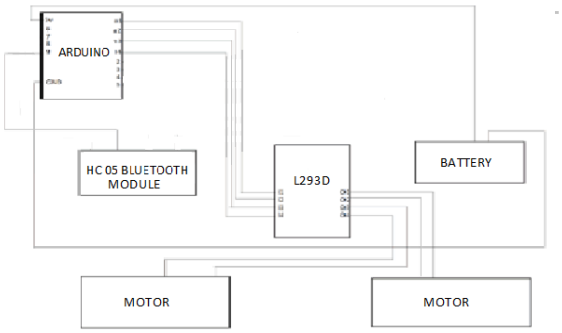
2) To develop a user interface monitor where the user can select the directions he want to move and can navigate using eye Blink.

3) To develop an Emergency Alert system using EEG signals captured from the Brainwaves.

4) To design and develop an all directional Wheel Chair with recharging facility.

5) Path navigating system based on Neural Networks. The main goal of the project is to identify the individual's ability to self-control the movement of the wheel chair through their brain and eye activity. Also it is needed to ensure that the orders are executed correctly. As a whole, the objective is to construct a relatively low cost hardware,an easily deployable intelligent and effective wheel chair using which user can control and communicate with the surroundings.

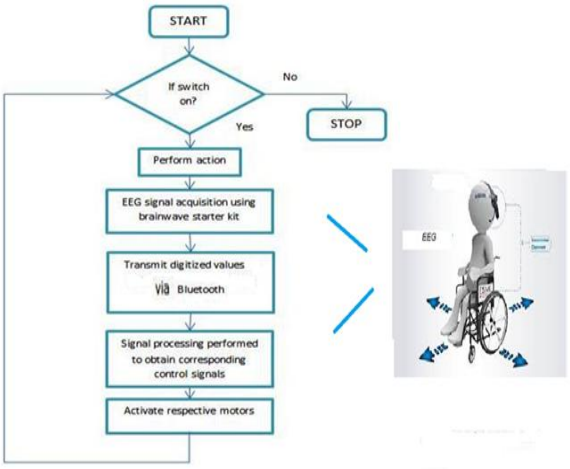
FIG: 1BLOCK DIAGRAM



WORKING OF SIGNAL ACQUISITION AND PROCESSING BLOCKS

Initially wireless transmission is established using Bluetooth mediumbetween the headset and the signal processing unit (Laptop). Once the headset is switched on, basing on the needs of the motor movements, subsequent actions are carried out. EEG signalsacquired using Brainwave headgear are sent via Bluetooth medium to the signal processing unit.Microcontroller isconnected to the signal processing unit that converts the signal obtained from EEG head set to digital values. These values are then processed and converted into control signals of required amplitude using Arduino Nano (ATMega328p).Later these are used to activate theprototypewheelchair motors required to drive the wheelchair towards Left, Right, Straight, Reverse directions. L293d, motor driver IC used with H-Bridge is the current booster connected to the microcontroller and is used to amplify the threshold level required for the movement of wheelchair.

FIG: 2FLOW CHART



ALGORITHM

Step 1: Initialization start ()

Step 2: Whenthe Brainwave Head setplaced on the scalp of the head is switched on, it captures the EEG signals from the brain required to perform the desired action. The head set contains a wireless Bluetooth medium that acts as slave when switched on and pairs with the Bluetooth module connected to the

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microcontroller.Here the Bluetooth module connected to the microcontroller acts as master.

Step 3: The acquired EEG signal is then transmitted to the signal processing unit (Laptop) and the microcontroller is connected to the signal processing unit.The Bluetooth module connected to the microcontroller converts the obtained EEG signals to the required digitized values.

Step 4: The obtained digitized values are then fed to the L293d motor that helps in driving the motored wheelchair. The arduino itself can be used to move the wheelchair but the voltage obtained from the arduino is not sufficient to move the wheelchair.L293d motor driver connected to the arduino,acts as an amplifier by increasing the voltage level required for driving the wheel chair.

Step5: The battery is connected to the microcontroller as it is the main power supply required for the movement of wheelchair.

Step 6: The digitized values are then fed to the dc motors via L293d motor and dc motors moves the wheelchair in the respective forward, reverse, left and right directions basing on the signals received from the person sitting on the wheelchair.

Step 7: stop ()

RESULTS

The following results are obtained through this work

1. The movement of wheelchair depends onEEG signals obtained from the brain and eye blink
2. Transmission of EEG signals from brain to motors using wireless Bluetooth medium.
3. 3. This is areal-time data transfer via Bluetooth medium and access control.
4. 5. The user can move by his/her own without the need to look for a helper to push the wheelchair.
5. FIG:3 Mind Controlled Wheel Chair
6. – ProtoType model

The EEG signal based wheel chair is very useful for patients suffering with Locked-In Syndrome (LIS) and during old-age at early seventies and eighties. It is observed in this work, that data is transmitted wirelessly via., Bluetooth module without involvement of any hand muscles indriving the prototype model.

APPLICATIONS

1. Provides an opportunity forspecially abled people to interact with the surroundings and helps in their restoration of movement.
2. Improves the quality in controlling wheel chairs, vehicles, or assistance robots for specially abled and old-aged persons.
3. Provides an optionalcontrol of channels in playing computer games.
4. Development of reliable and more efficientintelligent devices.
5. Helps in monitoring attention of long-distance travelling drivers or aircraft pilotsby sending alertand warningsignals.

CONCLUSION

The main aim behind the project is to provide a handless support to thespecially abled, paralysed and old-agedpeople at their early seventies and eighties. EEG signalsfrom the brain are captured by using brainwave head gear and sent to the microcontroller via Bluetooth module which converts EEG signals into digitized values required for the movement of wheelchair. The distance is very small, as the patient is very close to the wheelchair. The attention and meditation levels vary fromperson to person. However, in case of specially abled peoplethey are very low. Henceforth the threshold values for specially abled people are set too low. Moreso, with this setup, the doctors can readilyhave the information regarding the patient's brain signals. The literature survey on earlier designed systems usingdifferent methodologies depicts theirmerits and demerits. To meet the required design objectives, mind controlled wheelchair using Arduino Nano and brainwave headset is designed.

The major aim of the project is as follows:

1. To design the electric wheelchair which can control movement in different directions (forward, backward, left and right) by using eye blink and the EEG signals.
2. This project is user friendly and is designed to meet real time application, where usercanmove the wheelchair on his/her own without the need of assistance of another person.
3. The wheelchair can be moved in different directions such as moving forward, turning left/right and moving

backward.Setup provides a good opportunity of observing all possible combinations of commands, such as non-control / control, move forward/stop, turn/move forward just like arealtime wheelchair control.

FUTURE SCOPE

The future scope of work is presented intwo different aspects. First one is by integrating thedesigned model with databases that are available via a wireless network with internet access, where the user can have the option to download maps showing buildings, streets, and on board sensors (cameras, laser range finder). GPSassist the user to identify destinations at peak navigation level.

Second one happens to pursue the feedback of potential users and then proceed working for the subsequentdesign with anaim for coming out with a muchmore practical, aesthetically satisfying prototype.

Some additional features can be added such as Artificial intelligence, Cruise control, distress call, Robotic arm and an alarm. Moreso, the basic working remains the sameand in the case of blind people, an electrode has to be placed in the brain.

REFERENCES

1.https://www.pantechsolutions.net/brain-controlled-wheelchair

2.https://www.seminarsonly.com/Engineering-Projects/Electronics/brain-controlled-wheelchair.phphttps://q=brain+controlled+wheel+chair&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjRzf_TobboAhWg7HMBHWEcAdwQ_AUoAnoECBYQBA&biw=1366&bih=625#imgrc=TFmeUb4EglLvXM

3.https://ieeexplore.ieee.org/document/7095887

4.https://en.wikipedia.org/wiki/Mind-controlled_wheelchair

5.https://www.researchgate.net/publication/313397939_Mind_Controlled_Wheelchair

6.https://www.omicsonline.org/open-access/eeg--controlled-wheelchair-movement-using-wireless-network-2155-6210-1000252-100219.html