EEG Interface Brain Computing and Balancing Wheel Chair

S.Praveena,
Assistant professor,Paavai Engineering College, Namakkal,

M.Selvakumar,
UG Students,Paavai Engineering College,Namakkal,

E.Dhejjaswani,
UG Students,Paavai Engineering College,Namakkal,

R.Viswa,
UG Students,Paavai Engineering College,Namakkal,

S.Pavithra,
UG Students,Paavai Engineering College,Namakkal,

Abstract - Brain Computer Interface (BCI) sometimes called Brain-Machine Interface (BMI). It is a direct communication pathway between the Brain's Electrical Activity and external device. Computer based system that acquires brain signals, analyzes them and translates them into commands that are relayed to an output device to carry out into desired action. We can measurethe brain waves using technique known as ELECTROENCEPHALOGRAPHY (EEG). Successfully use of P300 BCI has also been reported for people with disabilities resulting from stroke, spinal cord injury, cerebral palsy, multiple sclerosis and other disorders. Therefore, the BCI system may be used to improve the quality of life of such patients. Hence the development and Implementation of BCI system is complex and Time consuming. Brain Computer Interface (BCI) offers a solution to independent mobility for people with moving difficulties. This paper proposes a BCI to smart control of a wheelchair. The paper describes the experience of developing a complete BCI system consisting of hardware and software parts to instruct a wheelchair by human intention to move to different directions, left, right, backward, and forward using non-invasive EEG brain waves.

I. INTRODUCTION

Brain computer interface (BCI) is a technology in which the brain waves of a person are used to control an external object. It acts as a mediator between the brain and a device. BCI based systems record the electrical activity of a human brain via different technologies, such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), and functional near infrared (f NIR). Among these alternatives, EEG is the most popular solution because of its low cost, hightemporal resolution, and noninvasiveness features. This technology can be applied in different fields, being one of the most important the health area. BCI brings a capable and efficient way of aiding users with Motor Neuron Diseases (MND) such as Amyotrophic Lateral Sclerosis (ALS), Progressive Bulbar Palsy (PBP), Primary lateral sclerosis (PLS), among others. According to the United Nations, the number of individuals in the world above the age of 60 is expected to increase rapidly, and this is especially significant in developing countries where the proportion of older individuals will increase from 9% in 2015 to 16% by 2040. Additionally, according to the ALS association, most people develop ALS between the ages of 40 and 70, with an average age of 55 at the time of its diagnosis. In many cases, the disability is so severe that the patients cannot have any kind of movements.

II.SYSTEM DESIGN AND DEVELOPMENT

INTELLIGENT WHEELCHAIR BASED ON BRAINWAVE. With the acceleration of the aging population and the increase of accidents, the number of people with disabilities, especially those with hands and feet, continues to increase. The disabled are a special component of the human society, and they are faced with many difficulties in

their lives. In order to improve their quality of life, the disabled wheelchair based on brain wave detection was studied. Based on the key technology of brain wave module identification, multiple sensors, GPS module, wireless transmission module, single-chip microcomputer and Android, the intelligent wearable device is designed and equipped with the functions of brain wave control, automatic obstacle avoidance, navigation and positioning, mobile phone terminal control, etc. With many kinds of technology integration, multi-intelligence network to realize the multi-functional disability tools, the main goal is to solve the problem of disabled people's travel and mobility. The system designs an intelligent wheelchair controlled by brainwave technology Using the GAM module Neuro Sky neuro sky Limited launched, through smart wearable devices to extract the EEG signal and the angle signal of gyroscope. The intelligent wheelchair is processed by brainwave control based on ARM processor which realize the real-time control of wheelchair behavior and direction. Experiments show that the system is fast and stable, simple structure, low cost, easy operation, strong human-computer interaction, high practical value

BLOCK DIAGRAM FOR TRANSMITTER SIDE

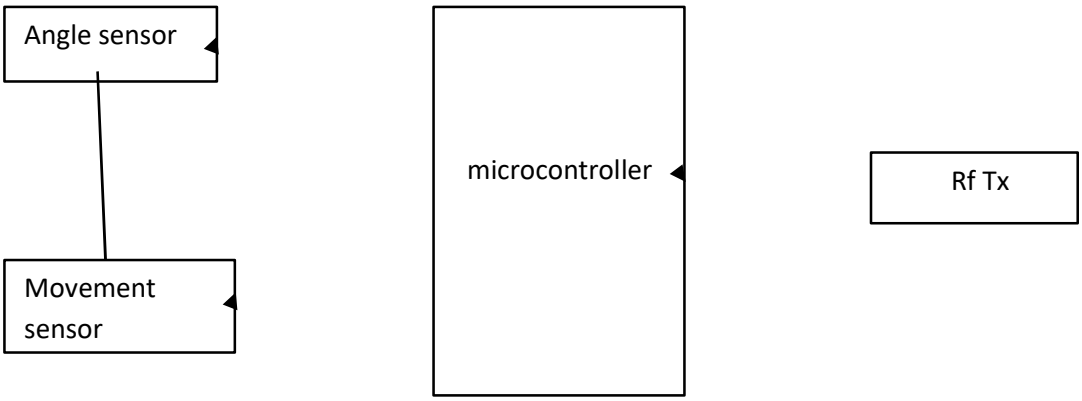
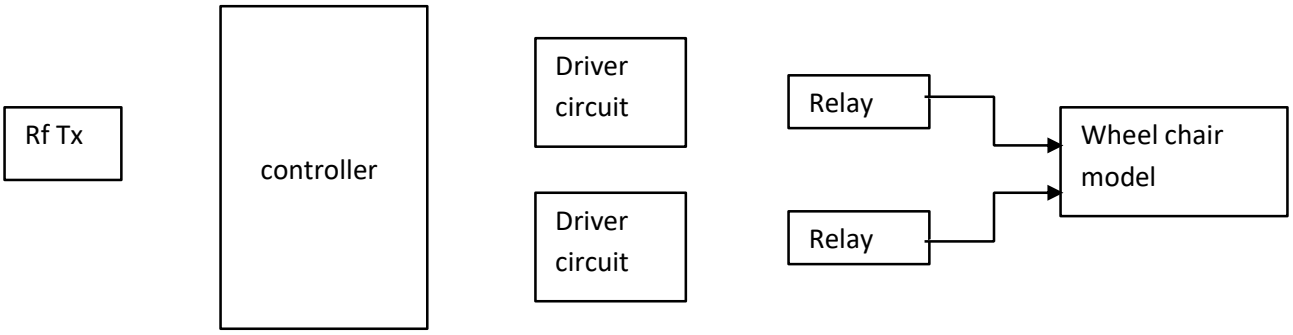


Figure1. Block Diagram Proposed System

BLOCK DIAGRAM RECEIVING SIDEFOR

Figure:2



III.EXISTING SYSTEM

We can move a wheel chair with various methods like joystick, hand gestures, Brain control, android applications and so on.But in majority wheelchair have a fixed seating arrangement which is not suitable in slope and slides.but in this wheel chair we proposed a balancing seat for the paralyzed patient.

IV.PROPOSED SYSTEM

A brain-computer interface (BCI) controlled wheelchair with seat balancing system could greatly enhance the mobility and independence of individuals with physical disabilities. Here is a proposed system for such a wheelchair:

Electroencephalography (EEG) Headset: The BCI wheelchair system would require an EEG headset to measure the user's brain activity. The EEG headset would consist of several electrodes placed on the user's scalp to detect the electrical activity of the brain.

Signal Processing Unit: The EEG headset would transmit the user's brain signals to a signal processing unit, which would filter and amplify the signals. The signal processing unit would convert the brain signals into commands that can be used to control the wheelchair and the seat balancing system.

- Microcontroller: The microcontroller would receive the commands from the signal processing unit and execute the corresponding actions. The microcontroller would be responsible for controlling the speed and direction of the wheelchair, as well as adjusting the seat balance to maintain stability.
- Motor Control: The motor control system would receive commands from the microcontroller to control the movement of the wheelchair. The motor control system would consist of motors, gears, and wheels to drive the wheelchair.
- Seat Balancing System: The seat balancing system would be responsible for maintaining the user's stability while the wheelchair is in motion. The system would use sensors to detect the user's center of gravity and adjust the seat position to maintain balance. The seat balancing system would be controlled by the microcontroller.

Overall, the proposed system for a brain-computer interface controlled wheelchair with a seat balancing system would enable individuals with physical disabilities to navigate their environment independently and safely. The system would require careful design and testing to ensure reliability and easy to use.

V.HARDWARE SYSTEM

MICROCONTROLLER (ATMEGA328PU) ATMEGA328-PU is a low power CMOS 8bit microcontroller based on the AVR enhanced RISC The architecture. By executing powerful instructions in a single clock cycle, the ATMEGA328-PU achieves throughputs approaching 1MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. t is a microcontroller which belongs to the family of ATMEGA controllers. It includes a quartz crystal of 16 MHz, a USB interface, ICSP header etc. The robot is given commands through Arduino and run by a DC motor which is attached to the wheels of robot body. Based on the info taken from brain sense band followed robot movement will be there. Figure 4.1.Pin configuration of ATMEGA 328PU 37 38

2. BATTERY(12V,7.5AH) -LEAD ACID This 12V 7.5ah Sealed Lead Acid Battery is completely Maintenance Free. 100% sealed and will never leak, even when mounted in an any position. You can expect a long battery life, up to 10 years in float and back up applications. It is 100% compatible fit to OEM applications. Depending on the product, on a single charge, you can mow up to 1200sqm, line trim up to 210 minutes, hedge trim up to 225 minutes, saw up to 450 cuts or leaf blow up to 300 minutes.

3. BUCK CONVERTER (LM2596) LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. Buck Converter Step Down Module LM2596 Power Supply is a step-down(buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version The LM2596 series operates at a switching frequency of 150kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators.

4. MOTOR DRIVER L298D The L298 is an integrated monolithic circuit in a 15-lead Multi watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Figure 4.2. Motor Drive L298D

5. DC MOTOR (JOHNSON MOTOR),12V 30 RPM Motor is a simple DC motor featuring a metal gearbox for driving the shaft of the motor, so it is a mechanically commutated electric motor that is powered from a DC supply. The Johnson Geared motor is famous for its compact size and massive torque. This Johnson Motor comes with a side shaft also known as an off-centered shaft and six M3 mounting holes. The shaft of the motor has a hole for better coupling. It is the best motor between DC Geared Motor and Side shaft Motors at a reasonable cost. The motor will run smoothly between the voltage range 6 to 18 V DC and give you 30 RPM at 12V supply. It provides the torque of 10 kg-cm at 30 RPM. Depending on the product, on a single charge, you can mow up to 1200sqm, line trim up to 210 minutes, hedge trim up to 225 minutes, saw up to 450 cuts or leaf blow up to 300 minutes

. 6. SERVOMOTOR (MG900) MG90S is a micro servo motor with metal gear. This small and lightweight servo comes with high output power. servo motor was connected to the Arduino micro-controller through pins (5V), (GND) and D9PWM. Here we chose this type of servo motor in order to eliminate the use of external power supply, since it is small enough that can be powered by

V. SYSTEM DESIGN

The system integrates brain-computer interface technology with an advanced wheelchair design, allowing individuals to control the movement of the wheelchair and maintain balance through their thoughts.

• The system works by measuring the electrical activity in the brain and translating it into commands that control the wheelchair's movements. Additionally, the seat balancing system continuously monitors the individual's posture and adjusts the wheelchair's position to maintain balance and prevent falls.

• This technology has the potential to revolutionize the lives of individuals with mobility impairments by providing greater independence and freedom of movement. It is an exciting advancement in the field of assistive technology and has the potential to greatly enhance the quality of life for those who rely on wheelchairs for mobility.

VI.RESULT AND DISCUSSION

BCIs may become a major new communication and control technology for people with disabilities and possibly for the general population also. Research and development in Brain Computer Interfaces have exploded, both in the technologies available and the number of organizations involved in the field. BCIs have now evolved beyond laboratory experimental systems and some are now offered as commercial products. BCI proved successful for communication and control in patients with severe paralyses. BCI allow users to directly communicate their intention with the help of the EEG and without any involvement of the motor periphery. Research and design efforts on a new wheelchair invention has successfully produced an inexpensive, highly-portable which has an automated seat balancing system that can adjust itself in slopes and slides and prevent falling the paralyzed Human body in locomotio

VII.CONCLUSION

BCI proved successful for communication and control in patients with severe paralyses . BCI allow user directly communicate their intention with the help of the EEG and without any involvement of the motor periphery. Research and design efforts on a new wheelchair invention has successfully produced an inexpensive highly-portable which has an automated seat balancing system that can adjust itself in slopes and slides and prevent falling the paralyzed Human body in locomotion

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