Movement of Robot Joints Based on Visual Stimuli Using Samples For The Development of Brain Main-Frame Interface

K.M.Divya[1], A.Atchaya Priya[2], K.Hemalatha[3], V.Kanimozhi[4], R.Pavaiyarkarasi M.E.[5], S.Jeya Anusuya M.E.[6]
[1, 2, 3, 4]Dept Of Electronics and Communication Engineering
[5]Assistant Professor, Dept Of Electronics and Communication Engineering
[6]Associate professor, Dept Of Electronics and Communication Engineering
[1, 2, 3, 4, 5, 6]T.J.S Engineering College, Peruvoyal

Abstract*- This framework shows a Brain Computer Interface (BCI) to control an automated arm by mind signals. The accompanying sign handling steps were set up; obtaining of mind motions by Electro Encephalo Graphy (EEG) cathodes; clamor lessening; extraction of flag qualities and flag order. Solid mind signals were acquired by the utilization of the Emotive EPOC business equipment. The tests were led with and without hearing and visual clamor (ancient rarities) to discover the commotion impact in the flag grouping result. The got trial comes about displayed productivity in the recognizable proof stage up to 100% with and without hearing clamor conditions.*

Keywords- Brain Computer Interfacing, BCI, EPO, Electroencephalography.

I. INTRODUCTION

The main objective of this proposed work is to control the robot without any communication device as well as to provide a huge change in communication sector and to operate devices using brain wave signals. Neuromorphic and brain/cerebrum based robotics autonomy have colossal potential for encouraging our comprehension of the mind.

By exemplifying models of the mind on robotics stages, scientists can examine the foundations of natural knowledge and work towards the advancement of really canny machines. This system examines the historical backdrop of the field and its potential. We give cases of organically propelled robot plans and neural structures that prompt mind based robots For robots to do what we need, they have to comprehend us. Again and again, this implies meeting them midway: showing them the complexities of human dialect, for instance, or giving them express summons for certain errands. This system displays a Brain/cerebrum Computer Interface [BCI] to control an robotic arm by mind signals. The accompanying sign preparing steps were built up; securing of mind motions by Electroencephalography (EEG) electrodes; clamor decrease; extraction of flag qualities and flag arrangement.

Dependable mind signals were gotten by the utilization of the Emotive EPOC business hardware. The analyses were directed with and without hearing and visual commotion (relics) to discover the clamor impact in the flag order result. The acquired trial comes about exhibited productivity in the distinguishing proof stage up to100% with and without hearing commotion conditions.

II. LITERATURE SURVEY

In the year of 2013, the authors "J. P. Tello, O. Manjarrés, M. Quijano, A. Blanco, F. Varona y M" proposed a paper titled "Remote Monitoring System of ECG and Body Temperature Signals", in that they described such as: the framework introduces a remote observing framework for electrocardiographic and temperature signals. The framework comprises of an equipment module for procurement, a Bluetooth transmission module lastly a showing module (PC or cell phones). Data is sent by means of IP (GPRS or WiFi) to a database server containing clinical information, which can be gotten to through a web application. The framework was evaluated by testing distinctive patients with the help of a medicinal specialist, getting a positive execution.

In the year of 2011, the authors "M. A. Caamaño, C. E. Bonell, A. S. Cherniz y C. B. Tabernig" proposed a paper titled "Muscular Contraction Onset Detection from Surface Electromyogram Signal to the Command of Functional Electrical Stimulators", in that they described such as: expecting to identify the solid constriction beginning of a paretic muscle through the electromyography flag, a calculation in view of the ID of engine unit activity potential was executed. The executed strategy was assessed contrasting it and another detailed in the list of sources (control technique) and with signs of solid constriction beginning built up by a specialist. The two methods were connected to sound muscle signals adulterated with added substance commotion at various levels of SNR and paretic muscle signals. Despite the fact that the proposed calculation and the control strategy played out the recognition with comparative exactness, the calculation displayed in this work demonstrated minor mistakes and deviations from to the characteristic of the master.

In the year of 2012, the authors "L. F. Nicolas-Alonso y J. Gomez-Gil" proposed a paper titled "", in that they described such as: a cerebrum PC interface, likewise alluded to as a mind-machine interface (MMI) or a cerebrum machine interface (BMI), gives a non-strong channel of correspondence between the human cerebrum and a PC framework. With the progressions in minimal effort hardware and PC interface gear, and in addition the need to serve individuals experiencing incapacities of neuromuscular issue, another field of research has risen by understanding distinctive elements of the mind. The electroencephalogram (EEG) is an electrical movement created by mind structures and recorded from the scalp surface through terminals. Specialists principally depend on EEG to describe the cerebrum movement, since it can be recorded non-intrusively by utilizing compact gear. The EEG or the cerebrum action can be utilized as a part of ongoing to control outside gadgets by means of an entire BCI framework. A common BCI conspire by and large comprises of an information securing framework, pre-handling of the gained signals, include extraction process, arrangement of the highlights, post-preparing of the classifier yield, lastly the control interface and gadget controller. The post-prepared yield signals are converted into proper orders in order to control yield gadgets, with a few applications, for example, mechanical arms, computer games, wheelchair and so forth.

III. EXISTING SYSTEM ANALYSIS

In existing system many researchers trying to produce the robot based on mind sensors and some of them achieved it, but the only lacking is to achieve the accuracy and sensitivity. As well as all the existing brain controlled robots are wired robots not in wireless manner, we can control the robot. So the past researchers feel lots of difficulties in proposal and producing only partial outcomes during implementations.

IV. PROPOSED SYSTEM

The proposed were conducted with and without hearing and visual noise to find out the noise influence in the signal. The brain–computer is used to monitor the brain waves of the human and drive the robot as per the thought of the user. The advantage of this solution is that the EEG pulse located on the user’s head and the user can wirelessly control the robot. The data read by the EEG sensors are transmitted to the robot section using the Zigbee transmitter. The Zigbee value receives the signal and drives the robot accordingly. The status of the robot is read with the help of LCD.

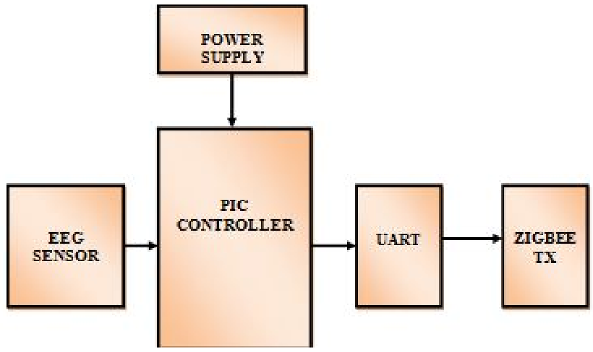

Fig.1 Proposed System Block Diagram – Brain Section

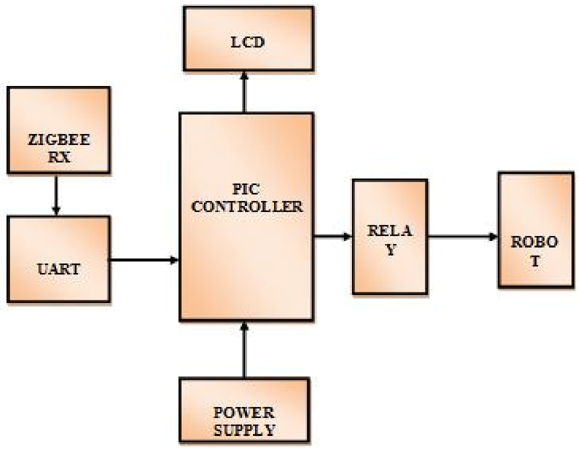

Fig.2 Proposed System Block Diagram – Robot Section

1. ELECTROENCEPHALOGRAM:

EEG Sensor is the world's slightest costly research-review EEG headset accessible. Intended for interface with cell phones (iOS and Android) and work area (Win and Mac), it can be utilized with a wide assortment of amusements, brain preparing and instruction applications. Its unmistakable brainwave flag depends on the TGAM, the bio-sensor chipset that upset an industry. It is a superb presentation into the universe of mind PC interface. The gadget comprises of a headset, an ear-cut, and a sensor arm.

Fig.3 EEG Sensor

The headset's reference and ground cathodes are on the ear cut and the EEG terminal is on the sensor arm, laying on the brow over the eye (FP1 position). It utilizes a solitary AAA battery with 8 hours of battery life. Electroencephalogram (EEG) sensors require conductive gel to guarantee low-impedance electrical contact between the sensor and skin. We exhibit a sans gel, non-contact EEG sensor with on-board cathode those capacitive couples to the skin. Dynamic protecting of the high-impedance input altogether diminishes commotion pickup, and lessens varieties in pick up. The deliberate info alluded commotion, more than 1-100 Hz recurrence go, is 2µvrms at 0.2mm sensor remove, and 17µvrms at 3.2mm separation. Examinations coupling the sensor to human scalp through hair and to chest through dress deliver clear EEG recorded Signals.

2. ZIGBEE:

ZigBee is a technological standard designed for control and sensor networks. It is based on the IEEE 802.15.4 Standard Created by the ZigBee Alliance.

Fig.4 Zigbee

It Operates in Personal Area Networks (PAN's) and device-to-device networks Connectivity between small packet devices Control of lights, switches, thermostats, appliances, etc. Developement started 1998, when many engineers realized that Wi-Fi and Bluetooth were going to be unsuitable for many applications.

IEEE 802.15.4 standard was completed in May 2003. Organization defining global standards for reliable, cost-effective, low power wireless applications. A consortium of end users and solution providers, primarily responsible for the development of the 802.15.4 standard. Developing applications and network capability utilizing the 802.15.4 packet delivery mechanism.

3. RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back.

Fig.5 Relay

Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts. Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

4. UART:

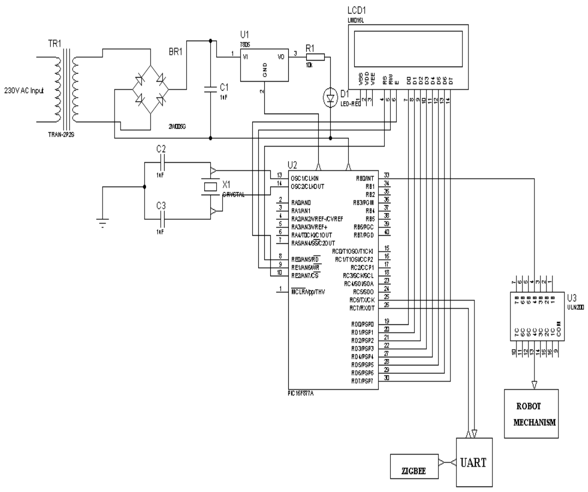

Fig.6 Circuit Diagram - Receiver Side

The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. UART is also a common integrated feature in most microcontrollers. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. Communication can be "full duplex" (both send and receive at the same time) or "half duplex" (devices take turns transmitting and receiving).

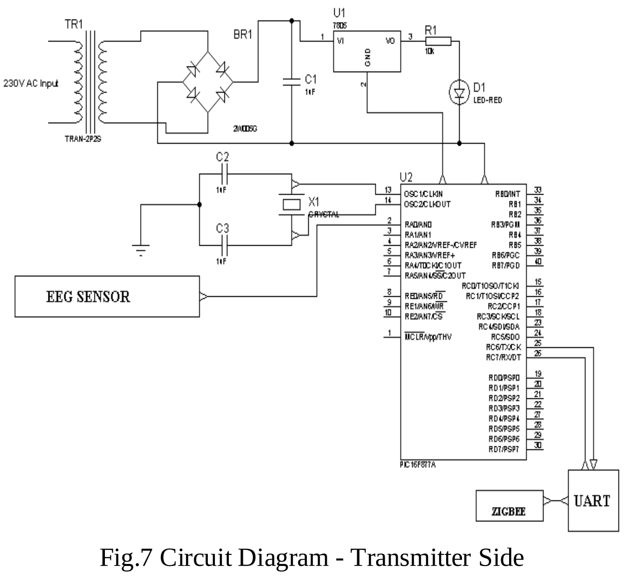

Fig.7 Circuit Diagram - Transmitter Side

V. METHODOLOGY

The brain signals used here are Spontaneous EEG signals. These signals are associated with various aspects of brain function related to mental tasks carried out by the subject at his/her own will. The mental tasks such as meditation, attention, eye blinks are used for forward, reverse, sideways and stop actions of robot. The brainwave starter kit makes use of dry sensors which does not require application of a conductive gel between the sensors and the scalp. Also this device is much lighter and convenient for usage when compared to the conventional EEG sensors as it requires only one electrode for sensing. Another advantage of using this kit is that the data or brain signals are transmitted to the signal processing unit via Bluetooth connection. The signal processing unit used in this application is a laptop/PC. The brain signals are transmitted from the headgear via Bluetooth to the laptop. The digitized value is then passed on to suitable microcontroller through USB port or through wireless communication for further mapping of brain signal values to control signals of the motors. An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forward or backwards. H bridges are available as integrated circuits. They can be built using discrete components. Two motors are used to form a robot prototype. The control signals from the H-bridge circuit are sent to the motors. Depending on the action performed, the control signals will cause the motor to run in either in clockwise, anticlockwise direction or stop. Here for this project consist of PIC16F877A microcontroller has been chosen, and we doing code using embedded C. The programming language is most widely used in embedded system because it is portable and structured programming language. By writing code in c language we can obtain accurate real-time output. ZigBee is one of the most widely used protocols for the wireless control of chair. In this project we are displaying the efficient use of the microcontroller and the ZigBee protocol. Here we are using Mind wave sensor to detect the bio signals of human being .Here we are using microcontroller kit for control the robot .As per the requirement of human being the bio signals will be detected by the mind wave sensor and the signal to the chair motor and control them like clockwise and anticlockwise. This process will be done automatically as per the requirement of the user.

VI. RESULTS AND DISCUSSION

Brain-computer interface is a method of communication based on neural activity generated by the brain and is independent of its normal output pathways of peripheral nerves and muscles. The goal of BCI is not to determine a person's intent by eavesdropping on brain activity, but rather to provide a new channel of output for the brain that requires voluntary adaptive control by the user. BCI robot can be used in Bioengineering applications: Devices with assisting purposes for disabledpeople Human subject monitoring:

Research and detection of sleep disorders, neurological diseases, attention monitoring, and/or overall ”mental state” Neuroscience research: realtime methods for correlating observable behavior with recorded neural signals, Human-Machine Interaction: Interface devices between humans, computers or machines.

VII.CONCLUSION

The system enables the brain based wheel chair controlling. The user can make the wheel chair move using their brain waves. The brain waves are constantly analyzed and the respective motors are activated. The system enables the independent use of wheel chair by the disabled person using their brain waves. Now the disabled people are free to operate their wheel chair without any constrain using control signals.

VIII. SCOPE FOR FUTURE WORK

The work presented in this can be extended in several directions. Here several research directions are presented which might be followed for further applications. The possible improvements that can be brought to the used method are as follows: Since the application of wavelet transformation in electro cardiology is relatively new field of research, many methodological aspects (Choice of the mother wavelet, values of the scale parameters) of the wavelet technique will require extra analysis in order to improve the clinical usefulness of this novel signal processing system. Simultaneously, diagnostic and prognostic importance of wavelet techniques in various fields of electro cardiology needs to be recognized in large clinical studies. Moreover the work can be further improved by developing disease diagnostic clinical applications with the assistance of this denoising and compression schemes for EEG and EMG signals.

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