EEE-Based Brain Controlled Vehicles Using Reachability Analysis

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Abstract--ROBOTS have been not only widely used in industry, but also gradually entering into human life. Assistive robots can provide support for disabled people in daily and professional life, thus creating a growing demand for them. In general, healthy users can operate the robots with a conventional input device such as a keyboard, a mouse, or a joystick.

This project discussed about a brain controlled robot based on Brain–computer interfaces (BCI). BCIs are systems that can bypass conventional channels of communication (i.e., muscles and thoughts) to provide direct communication and control between the human brain and physical devices by translating different patterns of brain activity into commands in real time. With these commands a mobile robot can be controlled. The intention of the project work is to develop a robot that can assist the disabled people in their daily life to do some work independent of others.

Here, we analyze the brain wave signals. Human brain consists of millions of interconnected neurons. The pattern of interaction between these neurons are represented as thoughts and emotional states. According to the human thoughts, this pattern will be changing which in turn produce different electrical waves. A muscle contraction will also generate a unique electrical signal. All these electrical waves will be sensed by the brain wave sensor and it will convert the data into packets and transmit through Bluetooth medium. Level analyzer unit (LAU) will receive the brain wave raw data and it will extract and process the signal using MATLAB platform. Then the control commands will be transmitted to the robot module to process. With this entire system, we can move a robot according to the human thoughts and it can be turned by blink muscle contraction. Also location finding is used to trace the vehicle movements. By using this we can able to find exact location also we can trace the vehicle.

General Terms

LAU (Level analyzer unit), EEG,RGC

Keywords: Robotics: BCI (Brain Computer Interface), muscle contraction sensing, Automated vehicles, reachability analysis

I. INTRODUCTION

A brain-computer interface (BCI) system processes and translates neuronal signals, mainly from electroencephalogram (EEG) instruments, into commands for controlling electronic devices. This system can allow people with motor disabilities to control external devices through the real-time modulation of their brain waves. An EEG-based BCI system that allows creative luminous artistic representations is presented here. The system that has been designed and created in our laboratory combines the BCI2000 platform, which performs real-time analysis of EEG signals, with moving luminescent twin robots. Experiments are also presented.

Brain-computer interface (BCI) [2] that provides a Direct connection (through the analysis of brain signals acquired from multiple electrodes placed on the scalp) between the brain and an external device.

1.1. STATUS OF THE PROBLEM

The research and development of brain-controlled mobile robots have received a great deal of attention because they can help bring mobility back to people with devastating neuromuscular disorders and thus improve their quality of life. In this paper, we presented a comprehensive up-to-date review of the complete systems, key

techniques, and evaluation issues of brain-controlled mobile robots. Assistive robots can provide support for disabled people in daily and professional life, thus creating a growing demand for them. It can be using multiple electrodes for operation. It cannot be used muscle contraction sensing.

1.2. Objective

- To develop a robot that can assist the disabled people in their daily life to do some work independent of others.
- Also location finding is used to trace the vehicle movements. By using this we can able to find exact location also we can trace the vehicle.
- It can implement in Self-controlled and operating facility.

1.3. Motivation

ROBOTS have been not only widely used in industry, but also gradually entering into human life. Assistive robots can provide support for disabled people in daily and professional life, thus creating a growing demand for them.The main motivation of the project work is to develop a robot that can assist the disabled people in their daily life to do some work independent of others. Also location finding is used to trace the vehicle movements. By using this we can able to find exact location also we can trace the vehicle.

1.4. Analysis

Analysis of EEG Signals

Since the event-related synchronization and resynchronization (ERS/ERD) can be quantified in time and space and can be displayed in the form of time courses or maps, the EEG data can be analyzed by the following ways:

Power Spectrum Analysis

Spectral plot shows a colored trace that represents the spectrum of the activity of one data channel (Yeom et al., 2008). It is a way to present the magnitude of signals at measurement points with colors. EEGLAB also shows the power spectrum on the brain model at chosen frequency. Therefore, it is easy to know the activated parts on the brain during the event. In this work, power spectrum at 4, 8, 10, 12, 14, 20, 22 and 40 Hz of epoched data was plotted to study the scalp distribution of power at these frequencies**.**

Time frequency Analysis

The neural processes that generate EEG are intrinsically dynamic. There are transient changes in the power or peak frequency of EEG waves which can provide information of primary 25interest. The non stationary nature of the EEG signals makes it necessary to use methods which are able to quantify their spectral content as a function of time. Time-frequency Analysis is a well suited tool for the study of spontaneous and induced changes in the oscillatory states.

System Design

This paper is implemented in an effective way we divide brain-controlled mobile robots into two categories according to their operational modes. One category is called “direct control by the BCI,” which means that the BCI translates EEG signals into motion commands to control robots directly who first developed a brain-controlled robot for automated vehicles whose left or right turning movements are directly controlled by corresponding motion commands translated from user brain signals .

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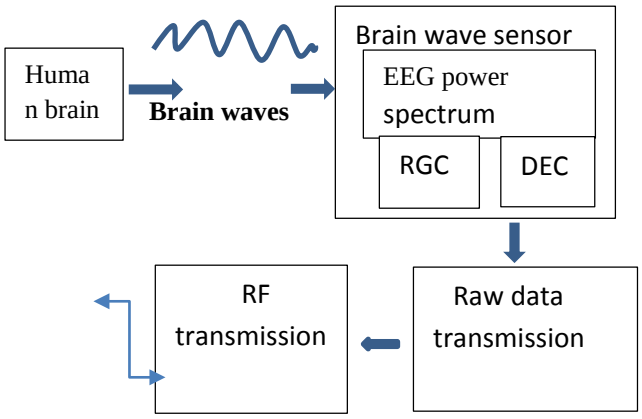
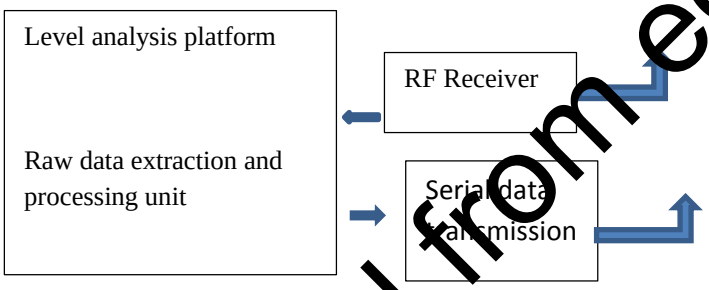
Brain computer interface system



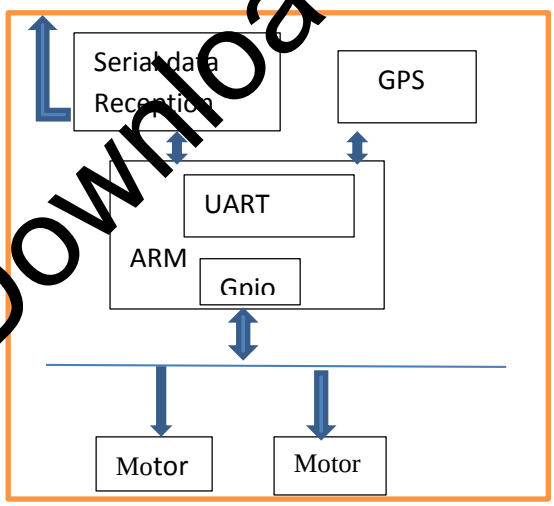
ARCHICTECTURE DIAGRAM OF BCI

Data processing unit

Data transmitted by the Brainwave headset will be received by the Computer's Bluetooth receiver. And then all these data will be analyses by the Level Analysis platform. The Level Analysis platform will extract the raw data using the MATLAB. After the analysis of this data, this data will be sent to the robot module using serial data transmission i.e. using XBee.



ROBOTIC MODULE



Robot module there will be an XBee receiver will receive the data which is transmitted by the XBee transmitter. According to the data received by the XBee the ARM processor will give the directions to the motors and the robot is self-controlled robot with ultrasonic sensor and connected with a relay and a driver circuit. and also used gps tracker to find the location of the vehicle.

CONCLUSION

The research and development of brain-controlled mobile robots have received a great deal of attention because theycan help bring mobility back to people with devastating neuromuscular disorders and thus improve their quality of life.In this paper, we presented a comprehensive up-to-date review of the complete systems, key techniques, and evaluationissues of brain-controlled mobile robots Also location finding is used to trace the vehicle movements. By using this we can able to find exact location also we can trace the vehicle.

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