BCI for Controlling Home Automation Using EEG

Aakib Qureshi[1], Prakash Bhure[2], Priyanka Wakdikar[3], Puja Patil[4], Kalyani Sonkusare[5], Manisha Khapekar[6], Gauri Vaidya[7]
[1,2,3,4,5,6,7] *KDK COLLEGE OF ENGINEERING UMRER*

***Abstract*- The aim of this study to control home device using non-invasive brain computer interface (BCI). The electroencephalogram signal (EEG) recorded from the brain activity using the mind wave headsets are interface with the help of Ardunio and HC-05 bluetooth module. The user will controlled various devices in smart home by using their attention and eye blink value. This application will be very useful special for disabled people with special needs.**

The aim of this seminar is to aquire and identify the EEG signal that is related with the user intension to operate a device in the smart home. In this study we use have use the simple feature that is every eye blink to create an event blink a particular device will be selected, after then give high attention to change state of selected device. For that every eye blink will counted and use for selection of device and device was controlled by attention level of mind wave.

In order to control and operate the home using brain signals, a virtual home environment has been created .It consist of many devices like light, fans to operate the user will select desire application using of an eye blink that will cause a select on the toggle for example, the subject can turn on the light by selecting the light device using eye blink and give attention.

INTRODUCTION

In this present world many people are coming across many problems, one of those problems is physically handicapped and aged people depending on others to complete their tasks.BCI is the system that captures the electrical activity in the form of EEG signal and translate those specific features of the signal that represents the intent of the user into computer readable command. These commands can control and operate an electronic device. This technology developing very rapidly, as it has innumerable uses, the most important of which improving the quality of life of human being in general and elderly and disabled people in particular. The BCI can be divided into non-invasive and invasive type, where in later IC implanted in the brain by surgery. Hence people prefer non-invasive BCI which involves only wearing of a headset or cap equipped with an active electrode system. In this project, our main aim is to developed thought control smart home system .we will use a non-invasive BCI device known as mind wave headset to capture EEG signal. The EEG signal are transmitted via Bluetooth to the interface Arduino. Hence Electroencephalographic (EEG) signal produce by the brain electrical activity can be print and use to control the home appliances. The selection of application was done by using are blink signal.

CONCLUSION

The main goal of this project is to design, develop and implement a brain controlled smart home system. In this system, the brain EEG signals are acquired using Mind wave headset. A single feature i.e. eye blink and mind attention values are used to control a virtual home environment. Each selection on the desired home application done by eye blink signal (feature).And will control that home item, like turn off the light. All this will happen in real time. It is possible to add more controls to the virtual environment by using a combination of activities like blinking an eye and a single or multiple blinks. The system hasbeen trained and tested with 4 subjects. The preliminary results show a thought controlled smart home system can become a reality in the near future. It will result in a drastic change in the type and quality of life of individuals and disabled and elderly people. In addition it will also result in an increase in demand of consumer electronics devices that can be easily interfaced with BCI systems

LITERATURE REVIEW

This proposed method describes how the brain activity is measured using mind wave EEG signal data transmission device. It provides a very promising technology for physically disabled people

who are unable to access their hands and in the paper [1] the author have discussed briefly how the data acquisition can be done by using biosensor BCIs are systems that can bypass conventional channels of communication to provide direct communication and control between the human brain.[3]Brain signals will be sensed by the brain wave sensor and it will convert the data into packets and transmit through Bluetooth medium.[2] The Neurosky brain wave sensor is used to sense the attention values of the brain singnal and eye blink. The ARM7 processor is used as main interfacing device according to the eye blink and the brain attention values the device will be selected and through relays the switching on and off the home appliances is done accordingly. The project discuss about the brain control home appliances based on brain computer interface BCI are system that can bypass conventional channel of communication to provide direct communication and control between the human brain physical devices by translating different pattern of brain activity into commands in real time[4].Home automation develops the life style by automating the appliances. It saves energy as well as time. This project aims to achieving the home automation using the wireless technology. We are using Bluetooth technology for exchanging data within a short

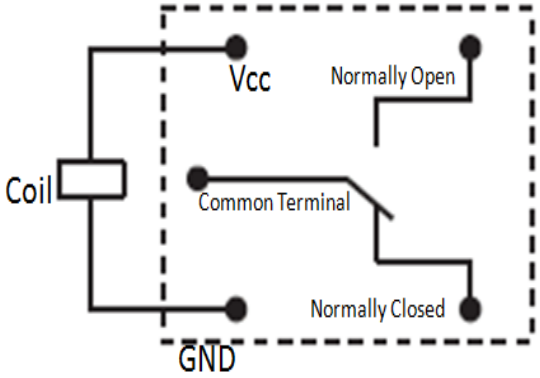
HARDWARE REQUIREMENTS

1. ELECTROENCEPHALOGRAPHY(EEG)

EEG signals can be collected with electrodes that are placed on the surface of the scalp. The most widely used electrodes are silver/silver chloride (Ag/AgCl) because they have low cost, low contact impedance, and relatively good stability. Furthermore, there are rather mature commercialized acquisition systems including the amplifier and EEG cap with integrated Ag/AgCl electrodes, which have been successfully applied in scientific research and clinical diagnosis. However, using Ag/AgCl electrodes requires removing outer skin layer and filling gel between electrodes and scalp (and thus, this kind of electrodes is also called “wet” electrodes). These operations take long time and are uncomfortable to users. To address these limitations of “wet” electrodes, some researchers have been exploring “dry” electrodes, which do not need to use gel and skin cleaning. The main disadvantage of existing dry electrodes is that the acquired EEG signals are worse than those acquired with conventional electrodes due to the increase of contact impedance. Some companies (such as Quasar, Emotiv Systems Inc., and NeuroSky Inc.) have been commercializing acquisition systems based on dry electrodes. Here we are using NeuroSky Brainwave headset. However, they are not yet mature, and some researchers have doubts about what physiological signals these systems actually acquire.

1. RELAYS

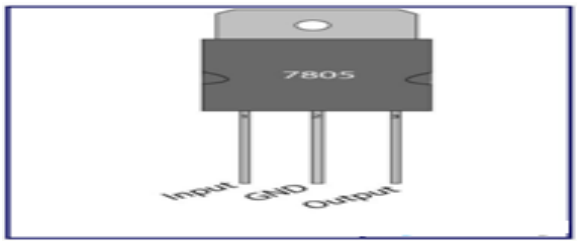
which generates magnetic field when a small voltage from an electronic circuit is applied A relay switch can be divided into two parts: input and output. The input section has a coil to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like SPST, SPDT, DPDT etc, which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off.



You have seen controlling home equipments such as light, fans and equipments that run on 230V using parallel port of computer or a microcontroller or any other digital IC’s. This is possible through relays. Relay is an electromagnetic device which works on magnetic field. If you apply proper low voltage on one side the metal will get contacted.

2. Voltage regulator (7805)

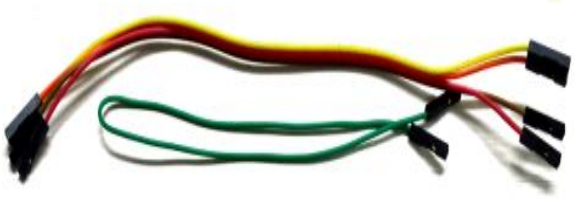
7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels



4 . ATMega328 Microcontroller

Microcontroller can be term as single on chip computer which includes number of peripherals like RAM, EEPROM, Timers etc., required to perform some Microcontroller can be termed as a single on chip computer which includes predefined task.

5.Cable



6.Arduino kit

7. brain Wave sensor

- **APPLICATIONS**
- It used in switch on / off fan and lights.
- It is also used for official work.
- It can also be used in industrial area.
- It is used to play video.
- BCI can be used to generate a sequence of password (personal identification number,PIN) that can be used in ATM & computer logic.

ADVANTAGES-

- Flexibility for a new devices and appliances smart home system tend to be wonderfully flexible when it comes to accommodation of new devices and appliances and other technology.
- Maximizing home security when you in corporate security and surveilliance features in your smart home network your home security can sky rocket .
- Remote control of home function don't underestimate the power of being able to control your home function from a distances.
- Improved appliances functionality smart home help you run your appliances

FUTURE SCOPE

However, with the emerging technologies, this idea can be implemented in various fields starting from common house-hold applications to high end applications like military and space technology and medical application .

1. Wireless implants in brain.
2. Injectable implants better interpretation of waves .
3. Non motor brain signal .
4. Brain to brain communication.