

Mind Interface with Electrical Network

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Abstract

A platform that can manage appliance through human being thoughts and perform applications at the same time if an individual think with the intention then electrical equipment begins functioning. It determination exist more helpful designed for physically challenged human being. It might utilize in numerous applications. We designed an experimental model that permits people to manage residence or place of work appliances wirelessly through eye blink. The apparatus attached to the user's skull, receives the signal from the brain that will allow a person to control particular home appliance. User eye blink is able to switch on and off lights plus electrical appliances. Individual think processes are almost similar at the wave level, consequently, the mechanism works similarly well for each person.

Keywords: Brain-computer interface (BCI); Pattern recognition; Statistical signal processing; Electroencephalography (EEG); Magnetic resonance imaging (MRI)

Introduction

Brain-computer interaction (BCI)

Earlier period, numerous researchers throughout the globe have developed direct brain-computer interface (BCI) procedure as likely alternative communication and control solution designed for individuals with rigorous disabilities [1-4]. BCI technology function by mapping a user's cortical movement associated with an intentional BCI control paradigm (such as touch activities) openly to an application-specific control signal. Electroencephalography (EEG) is the measurement of electrical activity in the livelihood mind. The earliest electrical neural activities of the human being brain were recorded by Hans Berger in 1924 using an uncomplicated machine galvanometer. On the human scalp, just one electrode positioned by that wave was spotted. It was the alpha wave (known as Berger's wave) [5].

In the region of BCI investigate the major focus is on defining novel ways of human communication with computer systems. With the passage of time, a number of inventions have been made in this field. Complete the preliminary days, we used only Magnetic Resonance Imaging (MRI) to locate head vain troubles. In the following stage, later on the invention of electroencephalography (EEG) and with the aid of additional pointing devices, we started using graphical user interface devices which make the procedure more comfortable and are easier. At the present time, we are using electrode mechanism, even though it is not as universal in daily life, but it is very supportive for physically challenged personnel that can't walk, speak, see and are paralyzed. The day is not much farther when we wouldn't be having all that material. All of these innovations have been developed for balancing the necessities of civilization and consumer. In improver to these traditional BCI model, there is some more advance BCI technology too for adding more flexibility and, therefore, causing the

product more practical, e.g. Helmet and head band system at residence and workplace may be utilized to unlock a door from sitting on presiding over distance. The vocalization processing system is also there where we can access our electrical system via our verbal communication. Figure 1 shows most accepted conventional BCI system.

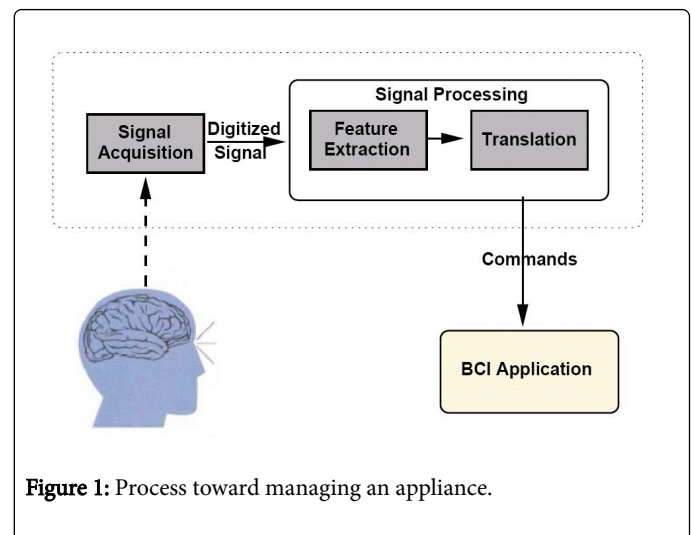


Figure 1: Process toward managing an appliance.

Description of brainwaves

The human brain consists of an enormous arrangement of neurons. Each nerve cell transmits information by means of electrochemical activity that brings on the minuscule electrical field. Whilst hundred thousand of neurons discharge their power at the same time, the resultant electrical fields are gigantic adequate to be measured exterior the skull [6]. This measuring process is called electroencephalography (EEG). As dissimilar cerebral states are characterized by unlike pattern of neural commotion, they can be analysed as the different pattern in

the EEG signal. By measuring, these brain waves, the headsets of Neurosky are capable of realizing the user's psychological situation [7].

Materials and Method

The material we are dying to employ in this research is made below: This research uses two significant programs.

1. Coding Platform
2. Execution Platform

Coding platform

In this system, a Matlab code is utilized which will execute the key part in the whole process. Initially, we got the data from the brain by using neuron arm tip sensor would store in the Matlab. Matlab saves all data on hard-magnetic disc. We have used the Matlab for processing code from hard-disk to Arduino's port.

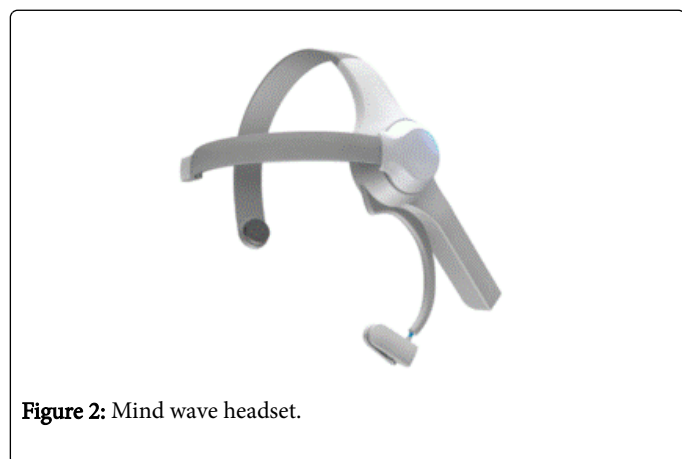
Execution platform

This incorporates all the physical hardware used in this research. We employ Mind wave Mobile headset (Figure 2) for sensing the electrical impedance value of waves from our forehead skin. Arduino is used to procedure data in the physical world and an electronic circuit that is capable of running the electrical appliance at 230 V and 6 A current.

Mind Wave Headset

The mind wave's headset is designed by neurosky in Silicon Valley by the world's leading research group of brainwave technology. Mind wave Mobile is the world's smallest amount exclusive research-grade EEG headset presented by neurosky.

The original mind wave mobile headset is evolving for today's mobile consumer. It is friendly to use with an Android phones, tablets, and PC. We too employ the mind wave mobile headset with an Android phone, Mac, and PC (compatible with XP, vista, 7 and 8 windows operating system) [6].



Overview

The Mind wave Mobile carefully measures and gives the output of the EEG power spectrum (alpha waves, beta waves, delta waves theta waves etc.) Neurosky E-Sense meters (attention and meditation) and

eye blink. The automobile consists of a headset, an ear-clip, and a sensor arm. The headset's orientation and ground electrodes are on the ear clip and the EEG electrode is on the sensor arm, put on the forehead over the eye. It uses a single AAA battery with 8 h of battery time.

Data measured by EEG

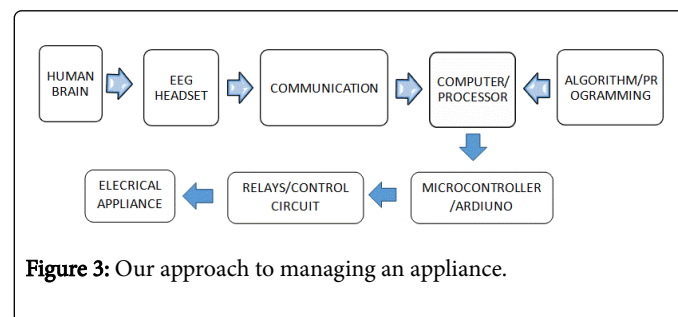
1) It gives Raw-Brainwaves. 2) It process data and gives the output of EEG power spectrums (Alpha, Beta, etc.). 3) It process data and gives output of Neurosky proprietary E-Sense meter for Attention, Meditation and other future meters. 4) EEG signal quality analysis (can be used to detect poor contact and whether the device is off the head).

Bluetooth description

1) The Range of the device is a 10 m range. 2) Power Consumption of the device is 80 mA (when connected and communicate). 3) Low Battery Indicator 1.1V. 4) UART (Serial): supply, Ground, Transmit and receive. 5) UART Baud rate of communication is 57,600 Baud.

Our Approach to Process Data

Figures 3-5 describes our approach, flow diagram and electronic circuits for our appliance. In our project initially we took the human brain-scalp impedance value through EEG headset thereafter we communicated it MATLAB with the help of programming and also added a program in Arduino for communicating the MATLAB data in the physical world in the form of binary output. On the basis of binary data, we made an electronic circuit that is enabled and disabled the electrical appliance to operate [8]. In order to continue all the diagrams of an appliance are given below.

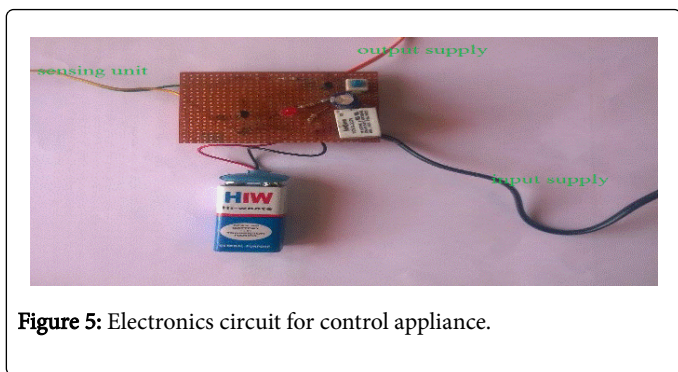
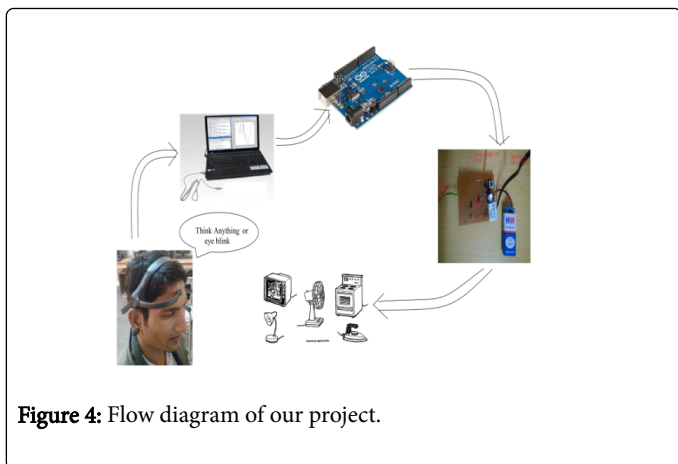


Results

We have successfully completed the project and we think our approach is precise to the constructed research successful and we can use this code for every person after simulating for five minutes. After the programming, we are capable of organizing all categories of electrical appliances enable and disable by human mind waves.

Scope

1) Controlling devices like switches, remotes. 2) Assisting elderly and disabled people to live independently. 3) Measuring mental awareness and tension of physical and psychological discourse. 4) Gaming and brain training techniques. 5) Controlling electric wheelchair for disable persons.



Waves	Received digital value of the wave
Attention Level	72
Meditation	56
High Beta	12988
High Alpha	10007
High Theta	61376
High Delta	59245
Low Beta	35834
Low Alpha	23674
Low Theta	35831
Low Delta	56345

Table 2: Brain waves.

Conclusion

We can say after this project that algorithm proved out the most efficient and easy method for processing of EEG signals used as the command for electrical appliances. As it has been developed in MATLAB, hence become more user-friendly and compatible for working in real time environment. These automatic computerized processes provide quantitative, good and reproducible results for every person that is employed.

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Discussion and Summary

In completion of research work we use eye blink value, but we receive other values that are given below in the Tables 1 and 2 [9-11]. Use of eye blink value in this project is making this more reliable and easy to use for every person. These are digital values that sent by EEG to Matlab platform in computer system over Bluetooth device.

Waves	Received digital value of the wave
Attention Level	59
Meditation	78
High Beta	12094
High Alpha	8949
High Theta	63291
High Delta	58746
Low Beta	37687
Low Alpha	20309
Low Theta	35156
Low Delta	54352

Table 1: Brain waves.

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