



# HOME AUTOMATION SYSTEM USING BCI TECHNOLOGY FOR PHYSICALLY CHALLENGED OR AGED

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**Abstract:** BCI technology is a powerful communication tool between the users and the system and it doesn't require any external device or muscle intervention to issue commands and complete the interaction. The automation using BCI Technology gained importance since it not only helps illiterates but also aged or physically challenged person. In our design, the system will collect the signals from human brain and convert them into actions. The proposed system will be cost effective with more ease in the design. The system is specifically designed for paralyzed and disabled persons to help themselves in operating the appliances.

**Keywords:** Brain Computer Interface, Brain sense, Arduino, Home automation, Home appliances

## INTRODUCTION

BCI technique is an effective factor in facilitating interaction between people and computers because it doesn't need any output device or direct interaction to issue instructions or finish activities. Implementation of BCI in home automated devices was mainly targeting a support to the physically challenged or paralyzed people so that they can operate the devices without any physical work done they can easily operate the devices and make the work done, converting the received signals into action.

## EXISTING SYSTEM

The device built using IOT technology made the people to easily work without any physical work or taking too much strain but even these devices also stood as a limitation to the dumb people to operating the voice operating devices such as Alexa, Google Assistance, Apple Siri as they will not able to provide voice commands to the devices so they can't operate the devices. But even these stood as a limitation to the people who can't move their hands so the need of developing the devices using BCI technique came into existence.

## PROPOSED SYSTEM

Automation using BCI Technology was started in 1970's by Jacques Vidal at University of California, Los Angeles but the paper got recognised in 1973. In this design, the devices implemented using the BCI technology was provided with a brain sense headset and these headsets will collect the signals from the brain through the sensors and they will process the signals and the system is mainly designed for the physically challenged persons so that they can operate the devices anywhere.

## ARCHITECTURE OF THE PROPOSED SYSTEM

### Hardware requirements:

1. Arduino board –relays ,ports, pins , wires ,microcontrollers.
2. Brain sense headset –electrodes ,sensors.
3. EEG(Electroencephalogram) –to convert signal into waveform.

### Software requirements:

1. MATLAB.
2. NEUROVIEW SOFTWARE.



## IMPLEMENTATION

The implementation of BCI based home automation system with Arduino can be performed in the three stages and they are detection, acquisition and transmission of signals.

1. Detection - By using brain sense headset we can collect the signals from the brain which contain electrodes which has sensors and when a person thinks or remembers the neurons will start to work they fluctuate and these are recorded in a storage device called EEG and eye blink is detected and a waveform generated.
2. Acquisition – The signals are converted to waveforms and stored in EEG and MATLAB is used to extract the waveforms and they process the waveform and send it to the Arduino board and even the eye blink waveform varies in amplitude and they are used to switch ON/OFF the devices.
3. Transmission – Through Bluetooth the extracted waveform we will be send it to the Arduino board and the Arduino controller will convert the analog waveform into digital to ON/OFF the devices.
4. Procedure for generating waveform: Firstly, we need to switch on the brain sense headset and turn on the Bluetooth in the PC or Computer and pair both of them and then open a MATLAB code file and we need to change the COM port number by going to the Bluetooth settings and go to COM port tab and note down the port number and change it we need to command prompt for identifying the blink and run the program and then a controller window will open and click on start and make a blink to switch on the appliances and click on stop.
5. Procedure for operating the appliances : Open the Arduino IDE application and upload the code file and then join the brain sense and Arduino board through Bluetooth. connect the wires from the appliances to the Arduino board we can observe the LED and they get turned ON

## BLOCK DIAGRAM OF THE PROPOSED SYSTEM

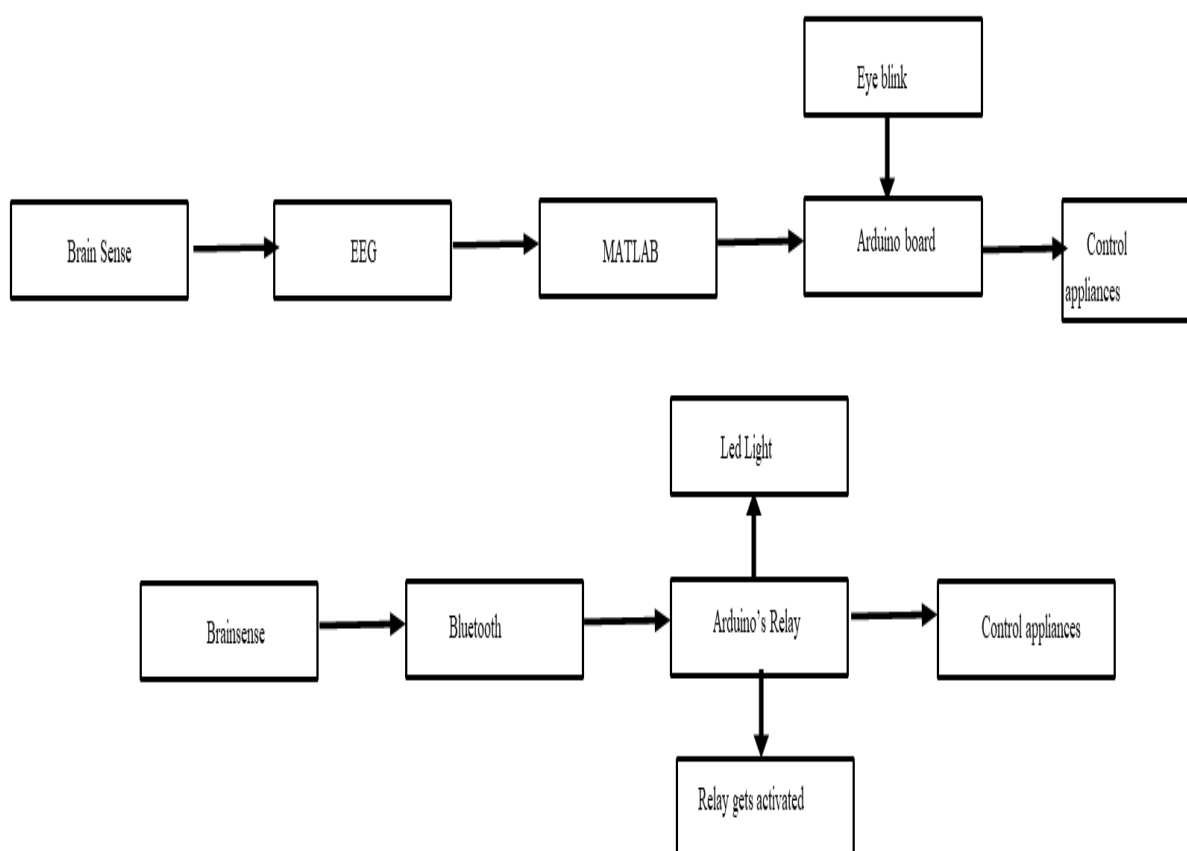
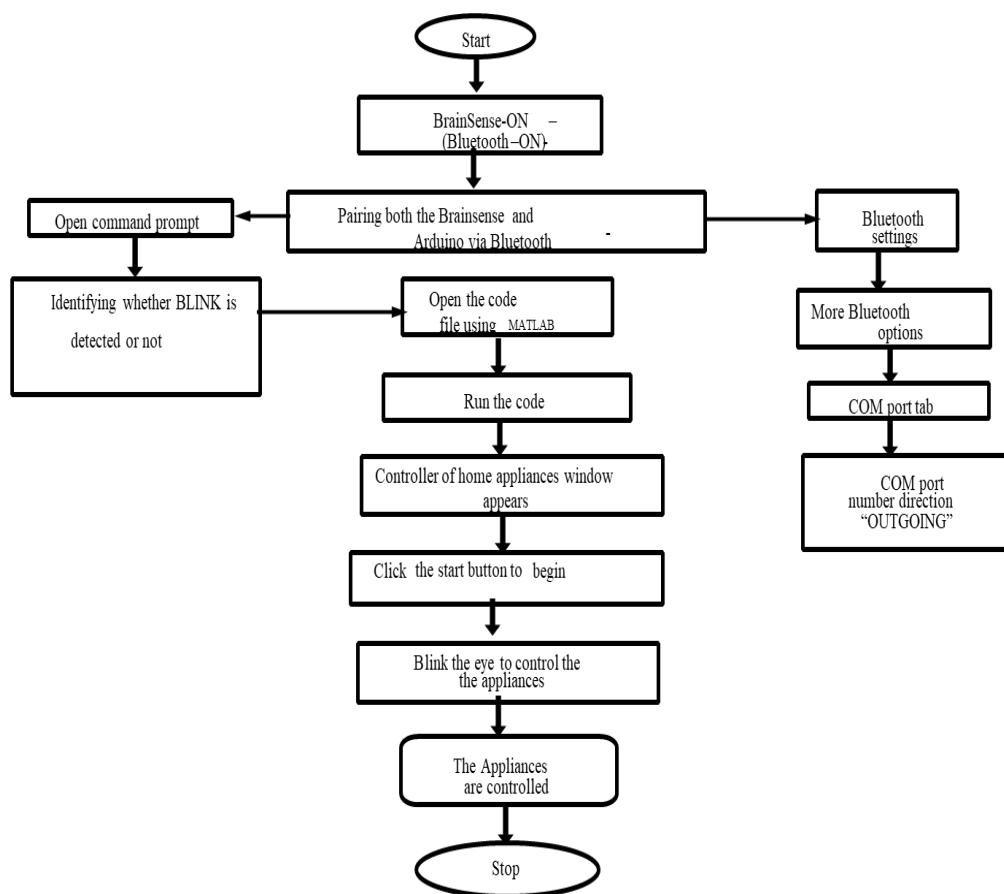


Fig. 1. Block diagram of proposed system

## FLOWCHART



## RESULT

We can see a blink wave generated by connecting the brain sense and Arduino board through Bluetooth and we can see the wave form in the Neuroview software and switch ON/OFF the applications.



## APPLICATIONS

Brain computer interfaces have contributed in various fields of research. As briefed in figure, they are involved in medical, neurorobotics and smart environment, neuromarketing and advertisement, educational and self-regulation, games and entertainment, Security and authentication fields.

## ADVANTAGES AND DISADVANTAGES

Advantages are cost effective, great comfort and convenience and user friendly and Disadvantages are High Cost, Low Speed, Direct attack to the brain cells and leads to brain damage, Ill effects to the brain can lead to neurosurgery.

**CONCLUSION AND FUTURE WORK**

Thus, this device proves to be useful for disabled/elder people who are facing difficulty to operate appliances in the home, using BCI technology we can connect brain and devices which contains sensors, electrodes to sense waves and operate accordingly. This design can be enhanced to any number of loads and can be extended to various fields as well like automobile, remote control, industries and the Brain controlled home devices have not been widely accepted but there are great expectations on the BCI based home devices and in the future it will be accepted and developed with the more advanced technology.

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