

Brain Wave Monitoring By Using Open Source Tools

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Abstract: - People have no control over their mental state which may change depending on the circumstances. Therefore monitoring these changes is really important in case of a person suffering from depression, or mental disorder. We aim at developing an android application that will monitor the brain waves and provide an appropriate mental condition depending on the values of the waves obtained. We are developing an android application using android studio and interfacing it with arduino board and EEG sensors using bluetooth. Existing system makes use of this technique just for moving objects depending on the value of the waves. Also existing system monitors the mental condition by using facial expressions, heart rate, body temperature and gestures. There does not exist any application which will allow the users to see their mental condition not in the form of just graph but also actual condition after analysing these graph values. In our project we directly attach the sensors to the head so that we get correct brainwaves. So, that we can monitor and provide an appropriate graph and estimated result.

Keywords: - EEG sensors, arduino board

I. INTRODUCTION

Masses of neurons within our brains communicate with one another by sending electric impulses. Their communication results in different thoughts, actions, emotions, and behavior. These electric impulses are called brainwaves which are of different bandwidth depending on function they perform, but are best thought of as a continuous spectrum of consciousness; from slow, loud and functional - to fast, subtle, and complex.

The low frequency brainwaves are like a deeply penetrating drum beat, while the higher frequency brainwaves are more like a subtle high pitched flute. Like a symphony, the higher and lower frequencies link and cohere with each other through harmonics.

Delta Waves range from frequency 0.5-3 Hz and they are slow and loud brainwaves. They are emitted during deepest meditation or dreamless sleep.

Theta waves range from 3-8 Hz and emitted during dream, nightmares, or state of conscious awareness.

Alpha waves are emitted during calmness state and range from 8-12 Hz.

Beta waves are emitted during focused mental condition and range from 12-38 Hz

Gamma waves are rarely emitted during state of spiritual emergence and range from 38-42 Hz.

Electroencephalography is a technique used to monitor the electric impulses emitted by brain. Brainwaves are detected using Electroencephalogram sensors (EEG sensors) placed on the scalp. EEG sensors are used to detect these waves. So these waves can be useful determining the mental state of a person.

In our project we use mind wave headset which consists of EEG sensors and an in-built Bluetooth module for communication. This makes it easier to determine the mental condition rather than using other techniques like body temperature monitoring or heart rate monitoring or other ways to determine mental state.

II. ARCHITECTURE:-

1. HARDWARE ARCHITECTURE :-

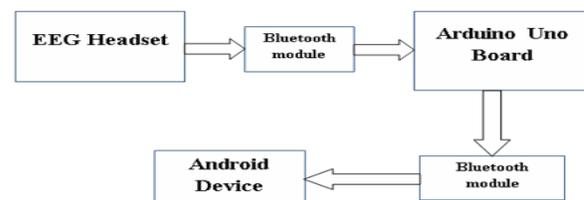


Fig: Block diagram of brainwave monitoring system

EEG Headset:

Keeping in mind the portability, comfort, easy to use and remove, we have used Neurosky headsets in our project. Other EEG sensors, consisting of electrodes and mesh of sensors over the scalp, that are used for clinical applications may not satisfy the above requirements. The Neurosky EEG Headset is equipped with built in Bluetooth protocol stack that controls any paired device which is arduino in this case. This is further interfaced to android cell phone to monitor the brain waves. All of these components will work together to achieve the ultimate goal of monitoring brain waves.

**Arduino & Bluetooth Interface:**

Communication between Bluetooth modules to NeuroSky MindWave headset is necessary to establish a complete link for monitoring the brainwaves. This is done by interfacing the Bluetooth module with Arduino microcontroller.

Arduino:

The Arduino is an open source electronics prototyping platform by Google, based on flexible, easy to use hardware and software. The Arduino environment has been designed to be easy to use for beginners who have no software or electronics experience. With Arduino anyone can build objects that can respond to and/or control light, sound, touch and movement.

Arduino is the small sized hardware. On the arduino board both analog and digital input and output pins are placed. It requires less wiring. Programming is simple and easy to understand.

Bluetooth module:

The Bluetooth module that we have used is HC-05 which can function as both master and slave. The default baudrate of module is 38400 and data-bits is 8 with no parity. Some configuration is required to be done on the Bluetooth module of connecting it with the neurosky headset.

Android Device:

The android application receives the data about brainwaves using Bluetooth. It produces a graph based on the values of different frequencies of waves emitted. The application further analyzes the waves and depending on the values determines the estimated mental condition of the user.

III.SOFTWARE ARCHITECTURE:-

Arduino programming language is used to develop a program that receives data from headset and processes it and transmits it to the android devices. Different header files for accessing data from headset are required. The android application then provides the user their respective mental condition.

IV.CONCLUSION:-

Through our project we show that it is possible to determine one's mental condition by analysing the waves emitted by the brain in a simpler way just by using android application and not going through difficult clinical procedures. This research oriented project aims at providing estimated mental state without any hectic procedure and ease of use.

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