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ANDROID APPLICATION FOR DETECTING AND ALERTING METHOD OF EPILEPSY SEIZURES USING BRAIN SENSOR

Sathish.Y[1], Balaji.S[2], Surabhi.S[3], Pradeep Kumar.K[4]

Student, Department of CSE, Angel College of Engineering and Technology, Tirupur, India[1]

Assistant Professor, Department of CSE, Angel College of Engineering and Technology, Tirupur, India[2]

Student, Department of CSE, Angel College of Engineering and Technology, Tirupur, India[3]

Student, Department of CSE, Angel College of Engineering and Technology, Tirupur, India[4]

Abstract: Since it a technology era, we can perceive that the technical development has improved in every field. Using this development, the world has gained a great deal even in the medical field. In the aware of that, all disorders have being cured by many technical equipments and detected effectively before it occurs. In that case, the Epilepsy disorder can be recognized and makes an alert to the people using an application in Android smart phones. This kind of application is already exists but it will send unwanted alert message. In this paper, we mainly focused on to avoid the unwanted alert message using brain sensor. It has an in-built function which can trigger alert messages whenever the brain function goes abnormal.

Keywords: Epilepsy disorder, Alert message, Brain sensor, Abnormal function of brain.

I. INTRODUCTION

Epilepsy is a Neurological Disorder that produces sudden brief surges of electrical energy in the brain. These episodes called seizures, may alter a person awareness, movements, or actions for a few seconds or minutes. Anyone can have a seizure if the brain is stressed by infection, fever, injury, lack of oxygen or poisoning. Seizures that happen more than once for no apparent reason are defined as EPILEPSY. Epilepsy is sometimes called a seizure disorder. Epilepsy can begin at anytime or life but most often under the age of 17 or over 65.

Epilepsy detection and alert application makes use of very popular and versatile android technology. Android operating system is used as it is an open source platform where applications can easily be customized as per the user's requirement.

A. Symptoms

The symptoms of epilepsy are seizures. A seizure happens when the normal electrical activity in your brain goes wrong. There are lots of different types of seizures. They can look and feel very different, depending on where in the brain they start and how far and how quickly they spread.

Some people get a warning sign, such as a strange smell or feeling, before their seizure starts. These are called **auras**.

Other people get no warning and their seizure comes on suddenly. Sometimes, seizures are set off by things such as lack of sleep or flashing lights. Doctors call these things **triggers**.

II. EXISTING TECHNOLOGY TO DETECT AND ALERT EPILEPSY SEIZURES

A. Platform Overview

There are three major components to the platform: sensors to acquire the physiological signals, a microcontroller-based sensor board to perform feature extraction and data communication to the smartphone, and a smartphone that runs seizure detection and automatic caregiver notification.

B. Physiological Sensors

In addition to gathering EEG data, it is advantageous to monitor other physiological changes that are brought about by the clinical manifestation of a seizure. Indeed, it has been shown that changes in heart rate, electrothermal activity, and certain patterns of motion are indicators of seizure activity [4]. Hence, in addition to EEG, we have sensors for electrocardiography (ECG), galvanic skin response (GSR), accelerometer, and gyroscope.

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A commercially available ArduIMU module (SparkFun Electronics) provides 3-axis accelerometer and 3-axis gyroscope data for motion and orientation, respectively, for all three axes. The module provides digital outputs for both sensors and samples the raw data at a rate of 70 Hz. In order to compensate for drift with the accelerometer and gyroscope, a magnetometer, also embedded on the ArduIMU, is used for drift correction. Figure 2, left, shows raw data from the 3-axis accelerometer that indicates a free fall with a spike in the z-direction.

The ECG sensor is implemented using a 3-lead system: electrodes are placed on the left and right inside elbows, using the chin as a reference. An instrument amplifier and discrete filter amplifies the differential ECG signal and removes noise and power-line interference, respectively, before outputting the signal to the sensor board for analogto-digital conversion. An example of the processed ECG sensor acquisition data is shown in Figure 2, middle. The GSR sensor consists of a voltage divider and captures voltage differences between two electrodes placed on the fingertips. Its continuous voltage level outputs also feed into an analog-to-digital converter on the sensor board.

We gather EEG data from Neurosky Inc.V_MindSet, a low cost commercially available brain computer interface headset. The MindSet measures EEG potentials from a single-channel dry electrode placed on the forehead, using the ear as reference, and outputs raw waveforms in digital form. An example of a captured and filtered EEG signal can be seen in Figure 2, right.

C. Sensor Board

The sensor board consists of an Arduino Mega 2560, whose ATmega2560 microcontroller performs data acquisition and feature extraction for the sensors. Once the features from each sensor are calculated, they are then transmitted over a Bluetooth wireless channel to the smartphone. The transfer process is done via serial UART, using the Blue SMiRF Silver Mate module (SparkFun Electronics).

Features of interest for each sensor are then extracted from the digitized data: heart rate from ECG (by using the R-R interval), sudden changes from baseline in GSR (using a five-point moving average), motion detection from accelerometry, and orientation changes from gyroscope.

D. Smartphone

Our implementation uses an Android operating system (OS) smartphone, the Droid X, which operates on a consumer network with 3G connectivity, Wi-Fi, Bluetooth, and GPS capability. The EpSMART app realizes a multimodal seizure detection platform as described in [4]. However, this hardware system is intentionally modular in design and may be used for physiological monitoring, symptom detection, and emergency notification in any number of critical medical applications, such as continuous EEG monitoring of acute ischemic stroke [5] or arrhythmic syncope [6]. In such cases, only the particulars, such as the features extracted from the relevant sensors (such as EEG or ECG) and the classification algorithm need be changed.

III. DRAWBACKS OF EXISTING SYSTEM

In the existing system, the main drawback is that, the heart beat rate can be varied between standing and running, at that time the unwanted alert message has been send to the particular members. It is not possible to off the alert message at ever. To overcome this drawback we have proposed a new system.

IV. RECOGNITION AND ALERTING PERCEPTION USING BRAIN SENSOR

In the proposed system, we have implemented a new concept to recognize and alert using brain sensor or brain monitor. This can be done by Neurosky Think Gear chip. The Neurosky Think gear means that, it is a manufacturer of Brain-Computer Interface (BCI) technologies for consumer product applications. NeuroSky adapts electroencephalography (EEG) and electromyography (EMG) technology to fit a consumer market within a number of fields such as entertainment (toys and games), education, automotive, and health.

The human brain is made up of billions of interconnected neurons; the patterns of interaction between these neurons are represented as thoughts and emotional states. Every interaction between neurons creates a minuscule electrical discharge; alone these charges are impossible to measure from outside the skull. However, the activity created by hundreds of thousands concurrent discharges aggregates into waves which can be measured.

Different brain states are the result of different patterns of neural interaction. These patterns lead to waves characterized by different amplitudes and frequencies; for example waves between 12 and 30 hertz, Beta Waves, are associated with concentration while waves between 8 and 12 hertz, Alpha Waves, are associated with relaxation and a state of mental calm. (The contraction of muscles is also associated with unique wave patterns, isolating these patterns is how some NeuroSky devices detect blinks.)

Unfortunately all electrical activity produces these waves (even light bulbs), thus all electrical devices create some level of ambient “noise”; this “noise” interferes with the waves emanating from the brain, this is why most EEG devices will pick up readings even if they are not on a person’s head. Reading mental activity through these waves is like trying to eavesdrop on a conversation at a loud concert. In the past, EEG devices circumvented this problem by measuring these signals in environments where electrical activity is strictly controlled and increasing the signal strength of the data coming from the brain through the application of a conductive solution.

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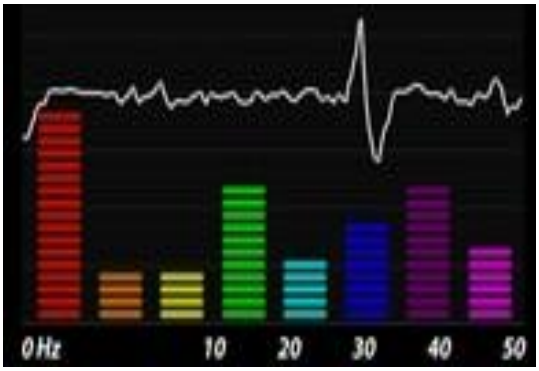

Raw Brainwaves and Power Spectrum

However, most people don't have rooms in their house devoid of electronic devices nor do they want to apply a conductive liquid to their head every time they use a BCI device. NeuroSky has developed complex algorithms built into their products which filter out this "noise". (only in reference to the noise bit)NeuroSky's white paper claims the ThinkGear technology has been tested at 96% as accurate as that within research grade EEGs.

NeuroSky is also selling non-contact sensors to research institutions. These are dry electrodes that can measure brainwaves millimeters from the scalp and thus can easily be worn over hair.

These sensors are a significant technological breakthrough in that they are the only non-contact EEG sensors ever developed. This can be done by integrating the Neurosky Think Gear chip into the hardware components of the Android mobile.

V. ADVANTAGES OF PROPOSED SYSTEM

The main reason behind the proposed system is that the brain function of person will same at ever. It could vary only at the time of any disease attack in the neural system. Hence the false identification can be easily reduced.

VI. CONCLUSION

In this paper, we report on a work in progress of the development and testing of Android application based seizure recognition and alerting system, with encouraging result. This application will definitely be a complete medical kit for a seizure.

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