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Detection of Depression Level Using EEG Signal

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Abstract - *Depression is the most prevalent psychological state disorder which lead to suicide. In step with recent survey there are almost millions of people suffering from depression. Our project provides an approach to determine the Depression level of a patient and relieve them from the depression level at that moment of time. EEG is the measure of the electrical activity (in volts) of brain by placing the electrodes on the surface of the scalp. EEG based features are acquired in order to determine the state of mind of a person. These signals are continuously conditioned as they are feeble. As the voltage produced by the brain signals are in the range of microvolts, the measured signal is sent to an amplifier and then to the microcontroller where the analog signal is digitized and the values are displayed in the LCD display. In case of a situation when the depression level of a person increases beyond a threshold value, a recorded audio will be played for the patient and an SMS will be sent to the caretaker. IoT in combination with Cloud Computing helps to overcome the limitation of storage and processing.*

Key Words: **Audio Playback module, Depression, EEG Signal, GSM/GPRS module, IoT.**

1. INTRODUCTION

The basic working unit of the brain is called neuron, which is a specialized cell that transmits information to other nerve cells. The three basic parts of a neuron are a cell body and two extensions called an axon and a dendrite. The nucleus is present inside the cell body which controls the activities of cell. The axon looks like a long cablelike projection that carries messages from the cell. Dendrites look kind of like the branches of a tree that enables neuron to speak with other nerve cells. Depression is fairly common with many people that sometimes get worse without proper treatment. Depression are often classified into different categories but under worse conditions it can lead to sleep disorder, obesity, cardiovascular disease and diabetes. EEG signals are read using EEG sensor. The signals are digitized using the PIC microcontroller and depression level analysis is made with the values obtained. A recorded audio will be played when a person is depressed and an SMS is sent to alert the care taker. The brain signal data is stored in cloud for future reference.

2. LITERATURE SURVEY

Existing System In this paper [1], they explore reliable and robust construction methods of functional brain network using different coupling methods and binarization techniques, supported high-density 128-channel resting state EEG recordings from sixteen MDD patients and sixteen normal controls (NC). Because, Existing studies have shown functional brain networks in patients having MDD have unusual constellation structure. But the present methods to construct brain network still has some issues to be rectified. it absolutely was found that the mix of ICoh and CST topped other methods. Supported this mixture, deficiency in right brain function, breaking the symmetry and randomized network structure were found in MDD, which confirmed that MDD had peculiar cognitive processing. Moreover, CC present in left central region of theta band and NBC present in right temporal region of alpha band were significantly negatively connected with depressive level. On the opposite hand this paper [2] tries to categorize person's psychological state either normal or depressed with the assistance of EEG signal using signal processing technique FFT and machine learning technique SVM. Non-invasive signal methods are helpful to detect depression disorders through EEG signals. The features are extracted from the EEG channels by using Fast Fourier Transform algorithm. The features extracted from this method are given as an input to the neural network it's classified by feedforward neural network. Three layer feedforward network like input, middle layer and output layers are used. The architecture of this network includes four nodes for the input layer, four nodes for hidden layer and two neurons for the output layer which determines depressed or normal subject.

3. EXISTING SYSTEM

Depression is that the foremost current psychological state disorder. Depression ends up in structural changes within the brain. By analyzing the brain signals, we will find depression in a person. The prevailing system utilizes a technique to shut to substantiate the beck's index by specific feature extraction from the electroencephalogram signal of the patient. To quantify depression, an algorithm is intended that uses membership values obtained from the fuzzy classifier and therefore the Support

Vector Machine(SVM). Using the algorithm expected results of numerical index for depression were obtained. The results were obtained with a percent relative difference(PRD) of 5% and a Pearson correlation of about 0.92. The results of the experiments reveals that the estimated numerical value of the designed system is of high correlation and low amount of PRD compared with the first beck number, associated with everyone. In this system, a unique algorithm is proposed to estimate the numerical index of the severity of depression. For this purpose, different linear and nonlinear methods employed to extract the features from EEG signals. Moreover, dimension reduction methods were utilized to preserve the generalization ability of classifier. a complete number of 75 subjects were employed in this research, and BDI of each subjects was at hand, and that they were categorized to 4 levels of depression. Since there are 19 channels for every subject, the Dempster-Shafer method was accustomed combine the data of various channels.

Fig 1: Existing system Block Diagram

4. PROPOSED SYSTEM

In our proposed system, brain signals are taken from a person in all sorts of environment like people in school, college, work and so on. The number of electrodes which are used is reduced compared to the existing system. All the brain waves are combined into a single wave and the digital values of that signal is seen through an LCD. When the depression level of a person exceeds the threshold value, a recorded audio will be played to the person. The audio to be played can be programmed by the user according to their wish as well. A SMS will be sent to the caretaker of the person at the same time. The data obtained using the sensor is stored in Cloud using IOT so that the person can use those data to consult a doctor in future.

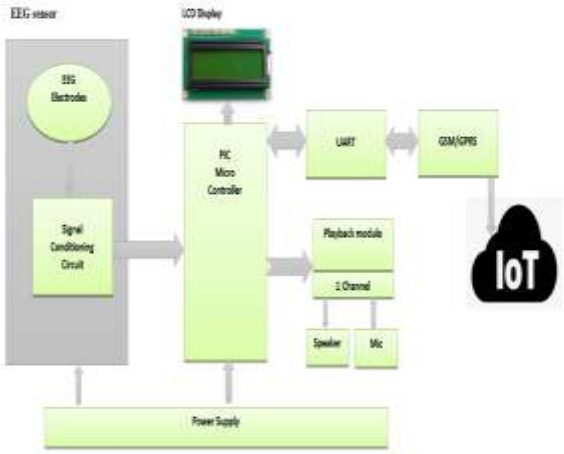

Fig 2: Proposed system Block Diagram

5. COMPONENT DETAILS

5.1 LCD

It is a 16 character, 2 line alphanumeric display connected to a single 9 way D-type connector with each character having 58 Pixel Dots. This permits the LCD device to be connected to most E-Block I/O ports. This display requires data in serial format. It also requires a 5V power supply. This display is capable of displaying 224 different characters and symbols. It utilizes 1mA of current and can work in two modes like 4-bit and 8-bit. It is available in blue and green backlight. The LCD has two registers namely data register and command register.

5.2 PIC16F877A

The PIC microcontroller PIC16f877a is one among the most preferred microcontrollers in industries. It is very convenient to use, the coding or programming of this controller is much easier. The supremacy of using this microcontroller is that it can be often written-erased as many times as possible because it makes use of FLASH memory technology. Its common applications include remote sensors, security, home automation and in many industrial instruments. EEPROM is inbuilt in it to store some of the information like transmitter codes and receiver frequencies permanently and some other related data. The cost is low and easy to handle. It can be used in areas where microcontrollers have never been used before as in microprocessor applications and timer functions etc. It has a smaller 35 instructions set. Operating range is up to 20MHz frequency. Its operating voltage is between 4.2 volts and 5.5 volts. It does not have an internal oscillator like other PIC18F46K22, PIC18F4550.It is available in four IC packaging. It consists of two 8 bit and one 16-bit timer.PIC 16F877 series normally has five input/output ports.

5.3 GSM/GPRS module

The SIM900A is a readily available GSM/GPRS module that can be used in many mobile phones and PDA. It can also be used for developing IOT and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that can work on frequencies EGSM 900MHz and DCS 1800MHz. It has GPRS multi-slot class 10/ class 8 (that is optional) and supports GPRS coding schemes like CS-1, CS-2, CS-3 and CS-4. It is a 68-terminal device. Operating supply voltage is in the range of 3.4V – 4.5V and power consumption in SLEEP mode is 1.5mA. Frequency bands: SIM900A Dual-band: EGSM900, DCS1800. SIM900A is capable of searching the two frequency bands automatically. The frequency bands also can be set by AT command. It features keypad interface, display interface and Real Time Clock. It supports UART interface and single SIM card and integrates AMR926EJ-S core.

5.4 UART

The main purpose of UART is to transmit and receive serial data. UART makes use of only two wires to transmit data between devices. It inbuilt DB9 female port together with data driver. The board has a filtering unit to reduce the unwanted noise in data transmission. The data format and transmission speeds are configurable. The input to UART is bytes of data and it transmits the individual bits in a sequential fashion. Serial transmission of digital information through a single wire is less costly than parallel transmission through multiple wires. It consists of shift register that converts between serial and parallel forms. UART contains a clock generator, input and output shift registers, transmit/receive control, read/write control logic. The supply voltage that is required is 5V and it is compatible with all microcontrollers. Data transmission is quite accurate.

6. CONCLUSION

In this paper, we have described a prototype system to detect the depression using EEG signals and this EEG signals are sent to a PIC Microcontroller (PIC16F877A) which has an inbuilt 10 bit analog to digital converter (ADC).And the digital data's are sent to the GSM SIM900A module and the collected data's are updated and stored in an IOT cloud which stores 15 data's for each second of the patient which can be viewed by the doctor or care taker from anywhere. The GSM module will make sure that a message is sent to patient's known persons or the caretaker in the case when the datas cross a threshold. We have created a mobile app using android studios which is directly linked with the IOT cloud. And then we have collected depression data's of the person if the person is stressed, the song will be played automatically and the care taker also have the control of it. The proposed work gives a better view in understanding the stress detection using EEG signals. In experimental results, it is observed that the output has high.

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