HUMAN EMOTION DETECTION USING ELECTROENCEPHALOGRAPHY SIGNALS

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ABSTRACT: *The main objective of our paper is to detect the emotions with high accuracy. Emotion is a feeling arising from one's circumstances, mood, or relationships with others. This is mainly designed for the children with autism. Autism is a serious developmental disorder that harms the ability to communicate and interact. Here we use only three EEG electrodes to acquire the brain signals. In experimental results, it is observed that the output has high efficiency and low noise compared to the existing systems because the brain waves have high intensity and gives better results for clustering of EEG data stream. Our results show that we can successfully classify the three emotions.*

1. INTRODUCTION

Emotion recognition in humans is an important research area in the following domains: software engineering, education and medicine. Recognizing emotions from the brain signal has gained an increased attention recently due to its intensity, because emotion recognition can help people to develop many application on human-machine interaction such as brain computer interface. Electroencephalogram (EEG) is a test that detects electrical activity in our brain using small, metal discs (electrodes) attached to our scalp. We aim to investigate several EEG-based features extracted from brain signals acquired to determine the significant features. These identified features can be used to classify the emotional states thereby aiding the diagnosis and treatment of patients affected by neurodegenerative diseases, having impaired face emotion recognition (e.g. Autism Spectrum Disorder).

2. LITERATURE SURVEY

Hayfa Blaiech proposed in his paper [1], an emotional recognition system based on physiological signals. They adopt the seven basic emotions that are: neutral, joy, sadness, fear, anger, disgust and surprise, and they choose the fuzzy logic techniques to classify the EEG signals and to analyze the results. Very less work has been approved using all the aspects such as of speech, emotion and EEG. Thus Priyanka Abhang [2] attempts to review the combine efforts of EEG brain signal and Speech to recognize the emotions in humans. EEG signals are taken using the Kernel Density Estimation (KDE) and classified via the artificial neural network classifier to find the emotional state of the human. The Prashant Lahane [3] method gives better estimation of emotion of the human from streaming EEG data by using the concept of cluster kernels. For detecting the emotions, there are several techniques and inputs that can be used. A brief description about all of the techniques along with comparison of all of them has been presented by Gayathri.P [4]. Valentina Bono have proposed a system to determine several EEG based features for classifying three emotional states (happy, fearful and neutral) using two classifiers LDA and SVM [5].

3. METHODOLOGY

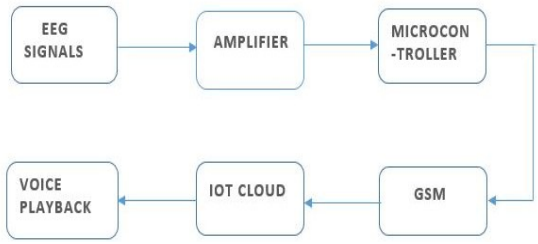

Fig 1 Block diagram of proposed system

In this work we have used only three EEG electrodes to acquire the brain signals and the acquired signals are amplified using dual opamp LM358N. The amplified data's are send to pic microcontroller PIC16LF1526,

which has an inbuilt 10 bit ADC. We use successive approximation to convert the analog data into digital data. The digital data's are displayed in 16x2 LCD and also sends the data to the GSM (SIM800C) using serial port connections. GSM sends information about the brain wave to the IoT cloud. IoT cloud which automatically updates the data's for every second, can be viewed by doctor or care taker from any location, we have collected data's of the person if the person is angry the respective song will be automatically played or else the care taker must take the control of it.

A. PIC16LF1526

Microcontroller used here is PIC16LF1526 which has an in build 10 bit ADC and many features like Self-Programmable under Software Control, Power-on Reset (POR), Power-up Timer (PWRT), Programmable Low-Power Brown-Out Reset (LPBOR), Extended Watch-Dog Timer (WDT), Programmable Code Protection and Power-Saving Sleep modem and data memory.

B. GSM SIM800C

Here we use GSM module of type SIM800C to transmit the digital data converted from analog data using microcontroller to the IoT cloud. They have some features like configurable baud rate, ESD compliance, audio jack, speaker pin, with push card sim holder and stub antenna.

C. EEG ELECTRODES

Fig 2. EEG Electrodes

Electroencephalography (EEG) is a method to monitor the physiological signals and to record the electrical activity of the brain waves. It is typically wired, with the electrodes placed along the scalp, although wired electrodes are sometimes used in electrocorticography. The EEG is used to record the electrical activity of the brain from the scalp. The recorded waveforms reflect the cortical electrical activity by using the electrodes.

D. 16x2 LCD

LCD Liquid Crystal Display screen is an electronic display module and used for wide range of applications. A 16x2 LCD display is very basic and commonly used in various devices and circuits. So only LCDs are preferred over seven segments and multi segment LEDs. The reasons are LCDs are cheap and easily programmable. They have no limitation of displaying special custom characters and animations.

4. RESULT

In this paper, we have proposed an emotional recognition system based on physiological signals. We adopt the three basic emotions that are: neutral sadness and anger. An experiment was conducted to verify the feasibility of the proposed system. This experience has allowed us to acquire EEG signals and to create an emotional database for automatic voice playback. For this, we have used PIC microcontroller, GSM and IoT cloud, these are used to classify the EEG signals and to analyze the results.

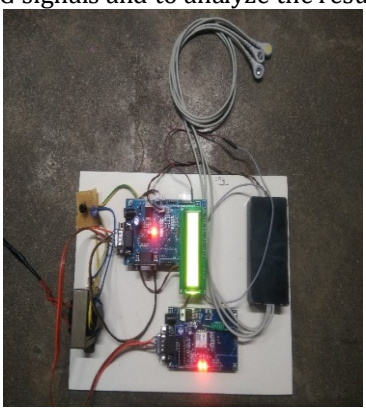

Fig 3. Working model

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LogID	DATA	Logdate	LogTime
1	EEG=037	02/27/2019	17:24:30
2	EEG=037	02/27/2019	17:25:14
3	EEG=039	02/27/2019	17:25:53
4	EEG=036	02/27/2019	17:27:26
5	EEG=032	02/27/2019	17:28:02
6	EEG=036	02/27/2019	17:28:40
7	EEG=036	02/27/2019	17:29:18
8	EEG=035	02/27/2019	17:29:56
9	EEG=037	02/27/2019	19:59:48
10	EEG=044	02/27/2019	20:00:25
11	EEG=045	02/27/2019	20:01:02
12	EEG=042	02/27/2019	20:01:40
13	EEG=042	02/27/2019	20:02:17
14	EEG=042	02/27/2019	20:02:55
15	EEG=010	02/27/2019	20:03:51
16	EEG=001	02/27/2019	20:04:28
17	EEG=035	02/27/2019	20:05:06
18	EEG=040	02/27/2019	20:05:44
19	EEG=040	02/27/2019	20:06:21
20	EEG=040	02/27/2019	20:06:59
21	EEG=057	02/28/2019	08:39:46
22	EEG=050	02/28/2019	08:43:40
23	EEG=052	02/28/2019	08:44:28
24	EEG=047	02/28/2019	08:45:17
25	EEG=050	02/28/2019	08:45:52
26	EEG=047	02/28/2019	08:46:45

Fig 4. Data's on IoT cloud

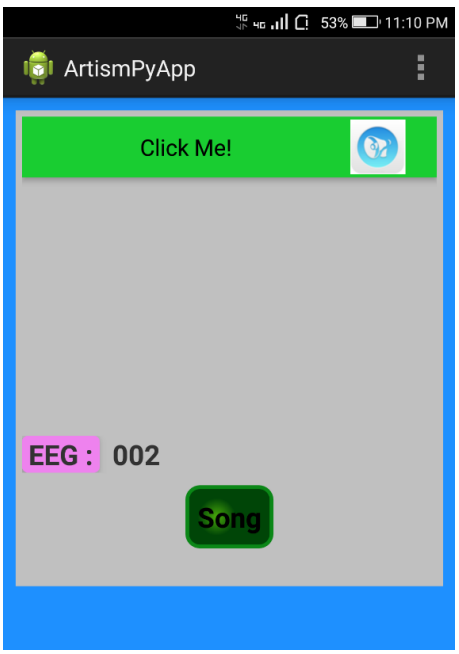

Fig 5 Mobile App

5. CONCLUSION

The proposed work gives a better view in understanding the emotion detection using EEG signals. We have used the EEG technique that gives better results of emotion detection. In experimental results, it is observed that the output has high efficiency compared to the existing systems because the brain waves have high intensity and gives better results for clustering of EEG data stream. Our results show that we can successfully classify the three emotions using PIC microcontroller, GSM and IoT cloud. Different applicants may have different things on their mind.So we can use music or video data to trigger the emotions in the person's brain.

6. REFERENCES

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