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Stereotyped Behavior and Epilepsy Monitoring System for ASD Patients

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Abstract: The Autism Spectrum Disorder (ASD) is a developmental problem which was caused by the difference in the brain. The people with this problem will have difficulties to read, write and speak and will have problem to concentrate in a particular work. The person suffering with ASD will do the repetitive stereotypical movement without their knowledge. Due to this, they lack concentration in their work. Apart from this the person with the ASD will have the problem of epilepsy since both Epilepsy and Autism are brain related problem, the person affected with the Autism will have a large chance of getting the problem of epilepsy, also the people affected by the ASD will have a great chance of being affected by smell sense disorder. We proposed an idea to help the people who have been affected by the mild and medium Autism to live their life on their own by creating a supporting device which will help them for the problems faced by them.

Keywords: Autism Spectrum Disorder, Epilepsy, Heart rate, Accelerometer, Internet of Things, smell sense disability, SMS and E-mail alert system.

I.INTRODUCTION

AUTISM Spectrum Disorders (ASD), characterized by Problem in communication and social interaction of people. Along with this they have problem in restricted, repetitive, and stereotyped patterns of behavior. The patient who have been affected by these have greater problem in leading their life on their own. The growing technologies in the world are improving the quality of health care and medicine treatments. Today in this modern world there are new technologies which are emerging to cure the new disease and syndromes which are new to the world. One comes out in those situations where the recognizing and the logging of patients' gestures are significantly important to improve the quality of healthcare providers.

In this work we focus attention on the autistic spectrum disorders (ASD), a group of variable neuron-developmental disorders that first arise during childhood, and generally follow a fixed progress without remission. Manifest symptoms gradually begin after the age of six months, become established by an age of two or three years and tend to continue through adulthood. The person affected by the Autism Spectrum Disorder (ASD) are not identified by a single symptom because the people with this problem have a greater chance of affected by some other problem. Till now there is no treatment to treat the patients with this disorder.

II.LITERATURE SURVEY

Talking and literature reading is difficult for the ASD patients to make them active from their problem of repetitive behavior, we have to alert them when they perform stereotypical movement. To perform this we need biosensors which completely monitor the health of the ASD patients so that if any problem is detected we can do the necessary step to overcome the problem. The biosensor which is mainly needed for the proposed system is the Heart rate sensor which will continuously monitor the heart rate of the patient, since we focus on the epilepsy detection for the Autism spectrum disorder patients the pulse rate monitoring is very important. All this data are stored in the cloud and using IOt the data are also been transmitted to their close ones by creating an application and also by giving notification by E-mail.

III.METHODOLOGY

In this paper, we introduce a system based on Wireless Sensor Network (WSN) that provides a continuous monitoring without limiting the freedom and privacy of the patients. The main goal is to distinguish between data with and without autism movement. The main objective of our project is to provide a device which will be useful for the Autism Spectrum Disorder patients to live their life on their own.

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The aim of our project is to create a small hand held device which continuously monitors the health of the person with ASD problem with the biosensors, accelerometer and the tilt sensor for detecting the Epilepsy, gas leakage and their stereotypical movement. Datasets from patients suffering from heavy autism disorder were used for the development of automatic detection autism. In this, the system includes the tilt sensor, 2D accelerometer sensors, vibrator, ARDUINO UNO (ATmega 328 Microcontroller), IOT module, gas sensor, driver circuit with relay and heart beat sensor are used. Accelerometer sensor is used to measure the change of velocity it depends upon the gravity of the earth. With the accelerometer we can find the repetitive movement of a person. The tilt sensor is used to monitor and detect the sudden fall a person, the tilt sensor value depends upon the gravity of the earth. There are numerous uses for these basic sensors, also along with these sensor the code are written in the microcontroller to control these sensor according to our use. The tilt sensor is placed in the neck of autism disorder affected patient. The heart beat sensor is the main bio sensor used in this project which is used to find the BPM of a person and to store the value and change the value after a minute, that is the pulse rate should be calculated for every minute if there is any abnormal changes takes place then the respective condition of problem will be checked. These sensors output is given to ARDUINO UNO (ATMEGA 328 microcontroller), Which is a programmable IC.

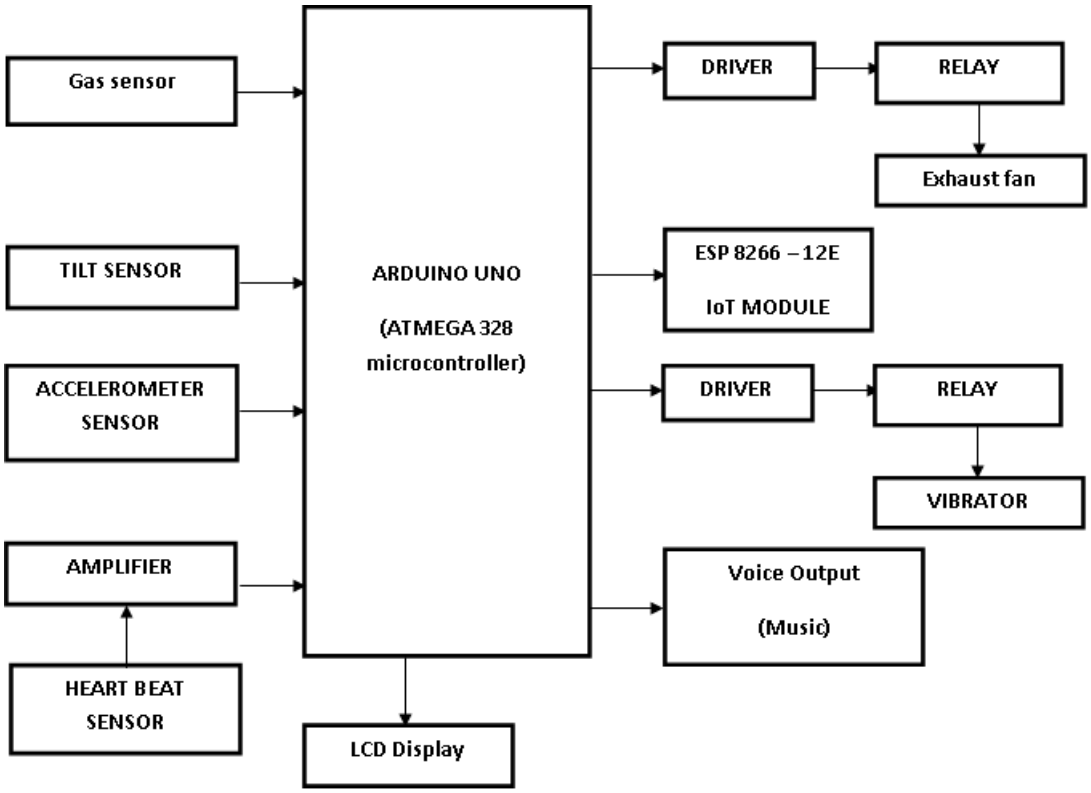

Figure 1:Schematic of Proposed system

In this project three different work has been done for three different problems that has been encountered by the ASD affected patients in their life.

1) Detection of Epilepsy :

The Autism and epilepsy are interconnected with each other for some extent there is a high amount of chance for ASD affected patient to affected by epilepsy and the patients with epilepsy also have a high chance to get affected by Autism. So in this project the epilepsy is identified using three sensors, the Heart rate sensor, the tilt sensor and the accelerometer sensor. If the heart beat value is abnormal , the tilt sensor and the accelerometer reaches its threshold value then the epilepsy is confirmed after the detection of epilepsy the data and alert message is sent to the close people or to the hospitals using IOT.

2) Alerting during repetitive behavior:

The Stereotypical behavior for the ASD patients can be monitor with the help of the accelerometer sensor. If the value reaches the threshold level then music will be played and a vibrator will be turned on to make their brain active and to stop the repetitive movement made by them.

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3) Detection of gas:

It is seen that most of the ASD affected patients will have smell sense disability to avoid the accident due to this we added a gas sensor which on reaching the threshold value alerts the ASD patients by the buzzer sound and also sends the message to the close people using IOT and also these Gas accidents most probably takes place in the house so a IOT controlled exhaust fan is Implemented which turns on when the gas sensor reaches the threshold value.

The open source Iot platform called cayenne in used for creating a application for communicating with the arduino to see the data that are obtained from the user. With the cayenne application the notification is sent via application and E-mail.

IV.EXPERIMENTAL RESULTS WITH FIGURES

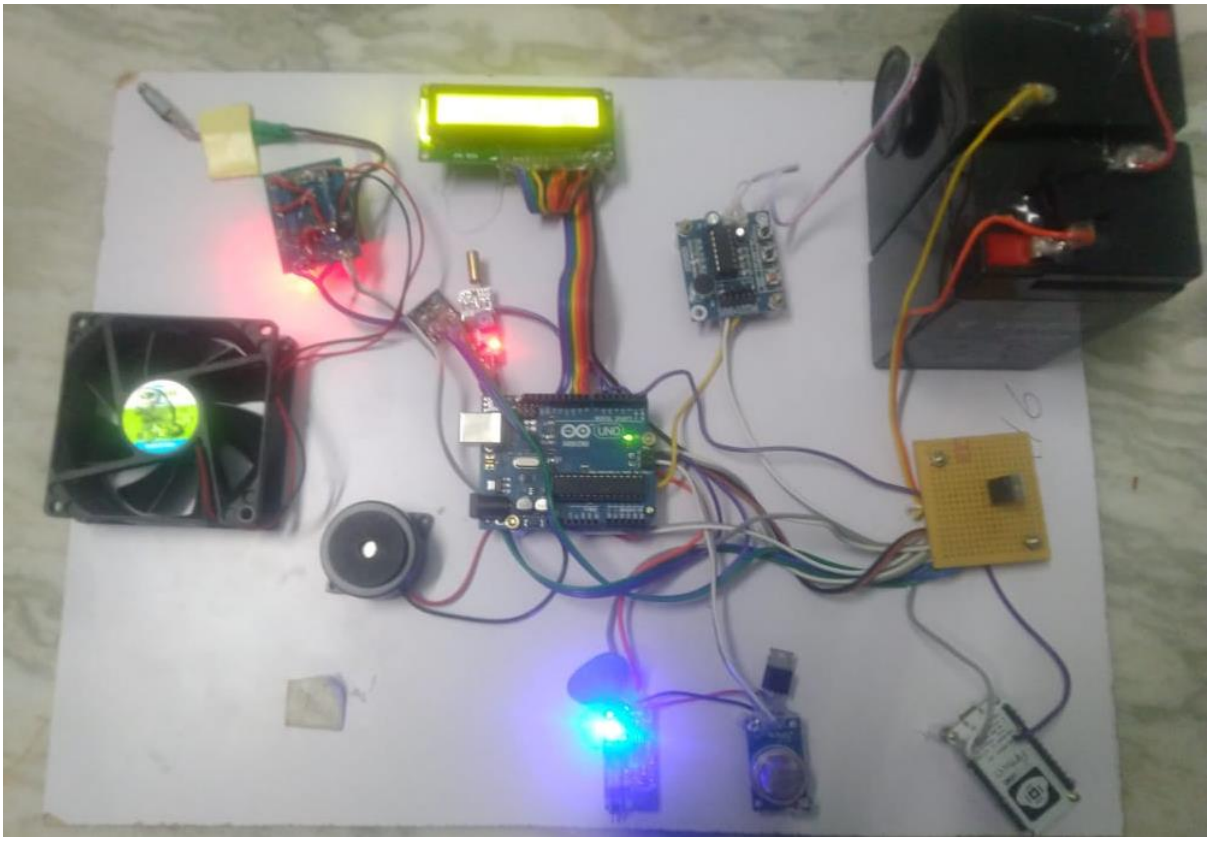

Figure 2: Experimental setup

This paper suggests a better and efficient way to support patients who are all affected by Autism Spectrum Disorder to live their life on their own by detecting the epilepsy and monitoring their stereotypical behavior. The data is stored in the IOT Cloud and used whenever it is required. Along with the IOT data communication the lcd display is used to show the data.

Figure 3: LCD Display

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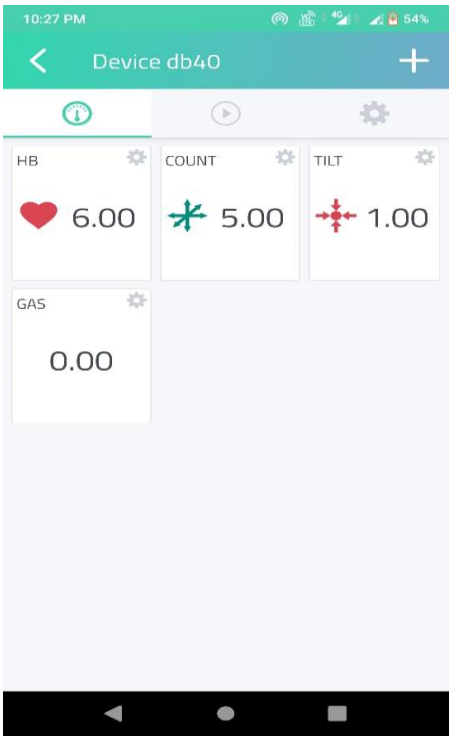

Figure 4: Mobile application created in cayenne

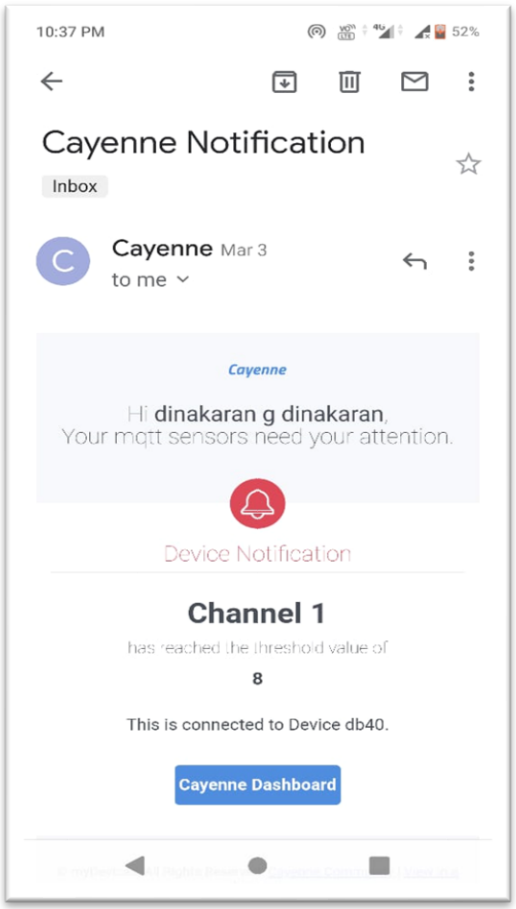

Figure 5: Mail Alert

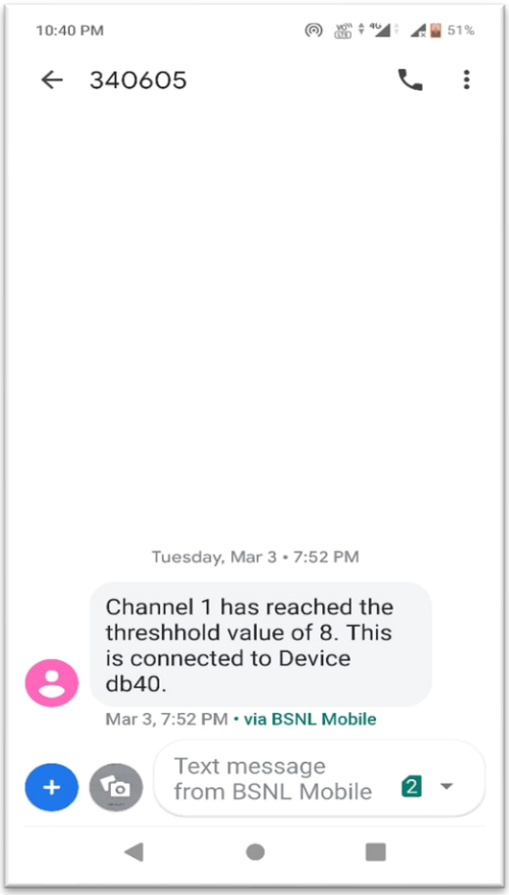

Figure 6:SMS Alert

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V.CONCLUSION

This paper suggests an idea to improve the happy living by own for the patients affected by the autism spectrum disorder. This paper mainly focuses on the three main problems which are encountered by the ASD patients. The system is also connected to the IOT based Application which gives live feed of data to the application. During the epilepsy and the detection of Gas leakage the alert notification is sent through SMS and E-mail.

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