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IoT BASED MONITORING SYSTEM FOR REPETETIVE, RESTRICTED & STEREOTYPED BEHAVIOUR IN AUTISM

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Abstract - *This is an overview of stereotypic behavior in autistic spectrum disorder(ASD).This repetitive, nonfunctional, fixed pattern of behavior is associated with autism severity but it is not specific for ASD. There are a wide range of behaviors mentioned as stereotypes. It usually starts in early childhood and its severity is associated with outcomes and severity of autism in adolescence and adulthood. It is typically co-morbid with other psychological disorders , and is not precisely clear about its pathophysiology. management is most likely behavioral. Nonetheless, exciting new theories and findings arise from neurobiology and developmental psychology, which recognizes neural adaption, lack of environmental stimuli, anticipation and adaptive functions as essential factors for the initiation and persistence of Restricted and Repetetive Behaviours(RRBs). This project consists of accelerometer sensor, tilt sensor, heart beat sensor, PIC microcontroller, vibrator with help of driver relays and IoT module. The accelerometer and tilt sensor are used to detect the child activity continuously. The sensor values are fed to PIC(16F877A) microcontroller. If sensor value crosses the threshold value, the vibrator triggers the child and voice (music) will be play while in autistic spectrum disorder. The IoT is used to monitor the child activity continuously.*

Keywords – IoT monitoring, repetitive moments monitoring, autism monitoring

1. INTRODUCTION

AUTISM spectrum disorders (ASD), characterized by deficits in communication and social interaction together with restricted, repetitive, and stereotyped patterns of behavior, represent a range of neuro developmental disabilities. The growing of technologies such as ubiquitous computing and ambient intelligence are improving the quality of health care and medicine treatments. Today the concept of patient in-the-loop influences the development of new system health oriented, for this reason, new difficulties and challenges are coming out. 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 follows 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. A typical traid of symptoms is differentiated, not by a single symptom: impairments in social interaction; impairments in communication; and limited interests and repetitive behavior. [2]

Although ASD is a life-long disorder with no known cure, several studies have shown that children with ASD can learn how to act in social situations when they can repeatedly practice specific scenarios. However, traditional educational interventions for ASD are costly, inaccessible, and inefficient due to limited resources and weak motivations . In recent years, computer-based interventions have shown potential due to their low-cost, their appeal to children with ASD, and their relatively broader access. Many children with ASD exhibit a natural affinity for computer technologies that leads to a higher level of engagement and fewer disruptive behaviors in computer based interactions[3]. In particular, virtual reality (VR) technologies allow children with ASD to actively participate in interactive and immersive simulated situations. Several VR-based systems have been developed to teach important living skills, such as driving skills, and social skills, to children with ASD, and results suggest that children were able to appropriately understand, use, and react to virtual environments with the possibility of transferring theses skills to real life. [1]

In this paper, we are monitoring patient through the IoT and datas are stored in the cloud help of ESP 8266 – 12E NODE MCU. NodeMCU is an open source IoT platform. This includes firmware running on Espressif Systems' ESP8266 Wi-Fi SoC, and hardware based on the ESP-12 board. The word "NodeMCU" applies to the firmware and not the dev kits. The software uses the language for Lua scripting. It is based on the eLua project, which is based on the ESP8266 Espressif Non-OS SDK. It uses many open source projects, such as lua-cjson, and spiffs. [4]

2. EXISTING SYSTEM

The development of CVE technology for ASD intervention may lead to the creation of novel low-cost intervention environment. The illustrated, hand-in-hand, contact Enhancement CVE device helps two kids to play a series of immersive games in a virtual reality environment using basic hand gestures. Such games are designed to promote natural contact and inter-user cooperation. In existing system, they have presented a collaborative virtual environment (CVE)-based social interaction platform for ASD intervention. The results of a feasibility with 12 children with ASD and 12 typically developing peers show that the children with and without ASD have accepted this system well.

3. PROPOSED SYSTEM

We introduce a system based on 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 aim of this paper is to provide a lightweight approach for early detection of nocturnal epileptic seizures using data from 3-D accelerometer sensors, tilt sensor & heart rate . Datasets from patients suffering from heavy autism disorder were used for the development of automatic detection autism. In this system includes the tilt sensor, 2D accelerometer sensors, vibrator, PIC Microcontroller, IoT module, driver circuit with relay and heart beat sensor are used. An accelerometer is a tool that measures proper acceleration; proper acceleration is not the same as coordinate acceleration (rate of change of velocity). This is placed in wrist of patient hand. For example, a resting accelerometer on the Earth's surface

would measure acceleration due to Earth's gravity, straight upwards (by definition) to 9.81 m/s2. In comparison, free fall accelerometers (falling at a rate of around 9.81 m/s2 into the middle of the Earth) would test null. The basic tilt switch can easily be used to detect orientation. There's a pair of ball inside the can that make contact with the pins when the case is upright. Tilt the case over and the balls don't touch, so don't make a connection. There are numerous uses for these basic sensors, but keep in mind that you may need to use some hardcore code, as the sensor is not immune to small vibrations. The tilt sensor is placed in the neck of autism disorder affected patient. HEARTBEAT SENSOR uses the TCRT1000 reflective optical sensor for photoplethysmography. The use of TCRT100 simplifies the construction of the project part of the sensor, as both the infrared light emitter diode and the detector are arranged side by side in a leaded package, thus blocking the surrounding ambient light, which could otherwise affect the performance of the sensor. I also designed a printed circuit board for it, which carries both sensor and signal conditioning unit, and its output is a digital pulse that is synchronous to heart beat. The output pulse can be fed either to the ADC channel or to the digital input pin of a microcontroller for further processing and recovery of the heart rate in beats. These sensors output is given to PIC (16F877A) microcontroller which is a programmable IC. If the above sensor value is exceeds compared with predefined values, which is accrued in the development phase. The PIC controller is sends the signal to the vibrator to trigger the patient body with help of relay driver circuit. And then the voice board will ON to play some music, which is stored in the APR 9600 playback voice board to relaxes the patient from hypertension due to autism disorder.

4. BLOCK DIAGRAM AND WORKING

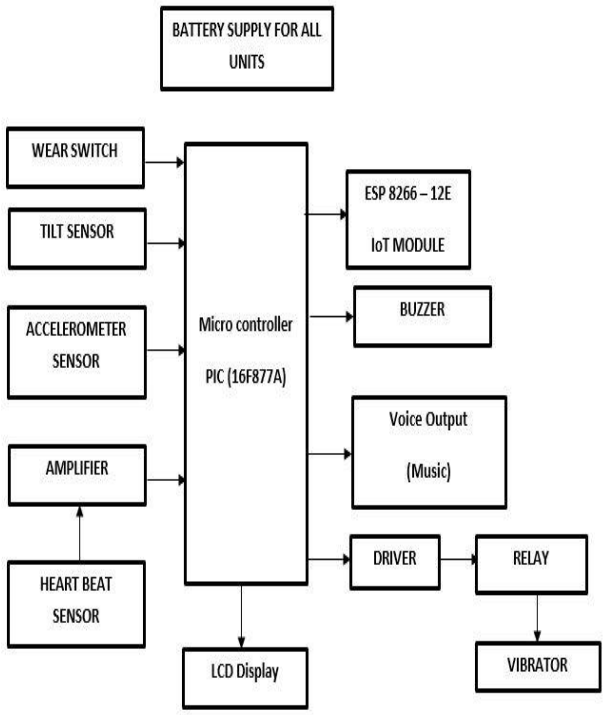

Fig1 : Block diagram of the system

5. TRIPLE AXIS ACCELEROMETER ADXL 335

An accelerometer is a device that measures the correct acceleration; the correct acceleration is not the same as the speed of the acceleration of the coordinates. For example, an accelerometer at rest on the Earth's surface will measure the acceleration due to Earth's gravity, straight upwards (by definition) g at a depth of 9.81 m/s^2.On the other hand, accelerometers in free fall (toward the Earth's center at a rate of about 9.81 m/s^2) will measure zero.

The acceleration measurement has a variety of uses. The sensor can be installed in a system that detects velocity, position, shock, vibration, or gravitational

acceleration for orientation determination(Doscher2005)

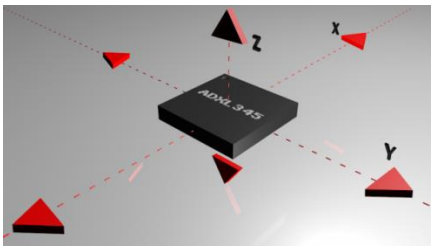

Fig 2 : Axes of measurement for a triple axis accelerometer

A system made up of two orthogonal sensors is capable of sensing pitch and roll. This is useful in capturing head movements. A third orthogonal sensor can be added to the network for orientation in three dimensional space. This is appropriate for the detection of angles of pens, etc. The sensing capabilities of this network can be enhanced by the addition of three orthogonal gyroscopes to six degrees of spatial measurement freedom. As a shock detector, an accelerometer is looking for changes in the acceleration. This jerk is sensed as an over damped vibration. Verplaetse described the bandwidths associated with light that reflected back from the fingertip is monitored by the phototransistor.

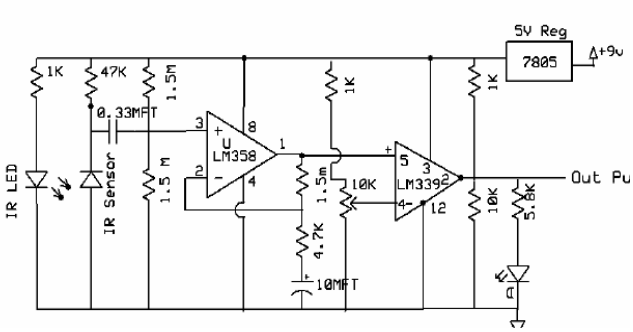

Fig 3 : External bias circuit for TCRT1000

A subject's finger is illuminated by an infrared light-emitting diode. Depending on the volume of tissue blood, more or less light is absorbed. As a result, the reflected light intensity varies with the pulsation of the different accelerometer implementations as an input device.

6. HEART RATE SENSOR

The sensor used during this project is TCRT1000, a reflective optical sensor with an infrared light emitter and a side by side phototransistor enclosed inside the lead pack. Pulling the Enable pin high will turn the IR LED emitter on and activate the sensor. The fingertip placed above the sensor acts as a reflector of the incident light. The amount of

7. MICROCONTROLLER

The PIC microcontroller PIC16f877a is very convenient to use, the coding or programming of this controller is also easier.It is a fundamental component in the proposed system. It performs various tasks from processing all sensor inputs to alerting the buzzer.

8. TILTSENSOR

blood with the heart beat. The plot for this time-based variation is a photoplethysmographic or PPG signal.

Here tilt sensor is used as accident detection sensor. The voltage v at the source is directly proportional to the power, pressure or strain. The output signal is then related to this mechanical force as if it had gone through the corresponding circuit. If any accident happens to the autism disordered people then it is detected by the tilt sensor and alerting the buzzer.

9. VIBRATOR

A vibrator is a mechanical vibration generating unit. Vibration is often caused by an electric motor with an imbalanced mass on its drive shaft. Here vibrator is use to

trigger the patient when they did a repetitive or restricted moments and it has driven through the relay driver.

10. IoT

Internet of Things (IoT) is a computing device that connects to the digital world with interrelating towards the mechanical machines. It is a wide range of network connectivity that gets the access towards in and around all the objects which can be accessed with local connectivity of network and also with the wide range of network possibilities.

11. HARDWARE SETUP

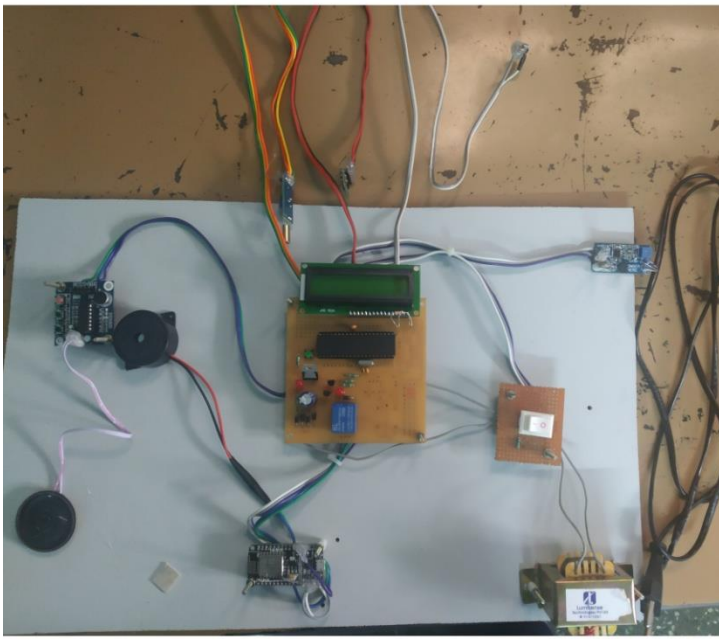

Fig 4 : Hardware layout of the project

12. CONCLUSION

Technology-assisted systems can provide a quantitative, individualized rehabilitation platform. Presently-available systems are designed to connect learning through aspects of one's own success, which limit individualization. System signals that were acquired with a satisfactory level of accuracy and thereby confirm the feasibility of an anxiety-sensitive system to be used as a social communication skill learning platform for children with autism. This paper presents the development and evaluation of the Autism spectrum disorders prevention system, which can provide a naturalistic social interaction platform for children with ASD and their peers, increase the opportunities for communication and cooperation within the collaborative games and collect quantitative data regarding collaborative and communicative performance of the participants. The feasibility study tested the acceptability of the system among children with ASD and obtained a preliminary assessment of the system.

13. REFERENCES

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