Seizure Fall Detection And Location Tracking

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Abstract- *The paper reports an Internet of Thing (IoT) based fall detection and tracking system for individual experiences Seizure. The proposed system can be mounted on the person's body to detect fall using accelerometer and track their exact location using GPS. When fall is detected by accelerometer then the proposed system checks with the blood pressure of the person using sphygmomanometer. If blood pressure is increased after the fall, then the proposed system mounted on person's body gives alert sound to the surround people with the use of buzzer, then the caretaker will be given an alert call followed with the SMS of the exact location with the use of SIM900 GSM Module and GPS.The proposed system comprise of tiny wearable physiological equipment's, sensors, transmission modules. Hence, with the use of the proposed equipment, it is possible to implement a low cost mechanism to protect the valuable human life.*

Keywords- Seizure, location tracking, fall detection, GPS.

I. INTRODUCTION

A seizure is a sudden, uncontrolled electrical disturbance in the brain. It can cause changes in person's behaviour, movements or feelings, and in levels of consciousness. There are many types of seizures, which range in severity. Seizure types vary by where and how they begin in the brain. Most seizures last from 30 seconds to two minutes. A seizure that lasts longer than five minutes is a medical emergency. Seizures can happen after a stroke, a closed head injury, and an infection such as meningitis or another illness. Many times, though, the cause of a seizure is unknown. Most seizure disorders can be controlled with medication, but management of seizures can still have a significant impact on person's daily life.

Seizure signs and symptoms may include: temporary confusion, a staring spell, uncontrollable jerking movements of the arms and legs, loss of consciousness or awareness, cognitive or emotional symptoms, such as fear. Doctors generally classify seizures as either focal or generalized, based on how and where abnormal brain activity begins.

Cause of this seizure is Nerve cells (neurons) in the brain create, send and receive electrical impulses, which allow the brain's nerve cells to communicate. Anything that disrupts these communication pathways can lead to a seizure. The most common cause of seizures is epilepsy. But not every person who has a seizure has epilepsy.

Complications of having a seizure at certain times can lead to circumstances that are dangerous for person. The proposed system is developed looking at the risk of seizure and how a seizure person can overcome the risk. A fall is defined as an event which results in a person coming to rest inadvertently on the ground or floor or other lower level but**fall** during a seizure, can injure the person head or break a bone. Hence, the proposed system is developed to detect the seizure fall in a person.

The proposed system is based on IoT concept. The proposed system will be helpful in detecting the seizure fall in a person. Accelerometer sense the fall and sphygmomanometer checks with the blood pressure of the person, if blood pressure seems to be increased after the fallthen the proposed system alert the surround people through the sound generated by buzzer so one can help individual who fall during seizure, immediate after the buzzer sound an alert call fallowed with SMS which contains the URL of the exact location of the seizure person is sent to the caretaker with the use of GPS and SIM900 GSM Module.

In Section 2 of the paper discuss the existing technology in the area of fall detection and location tracking system. Section 3 discuss the operation of the proposed system and the paper is concluded in the section 4 along with the future research direction.

II.THE LIETERATURE REVIEW

[1] The paper deals with the early detection of nocturnal epileptic seizures through analysis of inertial data and muscle contractions the author uses an overlapping sliding window to derive the variance of data acquired by the MPU 9250 motion tracking device and single channel surface ElectroMyoGram (sEMG). Author's proposed approach was to improve the performance of existing detection systems based on data analysis from Accelerometer. The MPU 9250 is 9-axis motion tracking and used to detect motor seizures, and it contains a 3-axis Accelerometer, Gyroscope and Magnetometer. There

experimental results on a real dataset from an epileptic patient show that there proposed approach is able to increase detection accuracy and reduce the low false alarm rate.

[2] The main aim of this paper was to design an Automated Detection of Convulsive Seizures Using a Wearable Accelerometer Device. The paper aim to develop a wireless remote monitoring system based on a single wrist-worn accelerometer device, which is sensitive to multiple types of convulsive seizures and is capable of detecting seizures with short duration. The paper results shows the potential to build an ambulatory monitoring convulsive seizure detection system. A wearable accelerometer based seizure detection system would aid in continuous assessment of convulsive seizures in a timely and non-invasive manner.

[3] The target of the paper is to develop a Real-Time Epileptic Seizure Detection during Sleep using Passive Infrared (PIR) Sensors. The author investigated the use of Passive InfraRed (PIR) sensors to sense human body motion caused by epileptic seizures during sleep, which makes the body shake and causes the PIR sensor to generate an oscillatory output signal. This signal can be distinguished from that of ordinary motions during sleep using analysis with machine learning algorithms. Supervised Hidden Markov model algorithm (HMM), 1-D, and 2-D Convolutional Neural Network (ConvNet) are used to classify the data set of the PIR sensor output into occurrence of epileptic seizures, ordinary motions, or absence of motion. All simulated seizures were successfully detected, with errors occurring only in distinguishing between ordinary motion and no motion.

[4] This paper presents a patient-specific (PS) fall prediction and detection prototype system that utilizes a single tri-axial accelerometer attached to the patient's thigh to distinguish between activities of daily living (ADL) and fall events. There proposed system consists of two modes of operation: 1) fast mode for fall predication (FMFP) predicting a fall event before occurring, 2) slow mode for fall detection (SMFD) with a 1-sec latency for detecting a fall event. The nonlinear Support Vector Machine Classifier (NLSVM)-based FMFP algorithm extracts 7 discriminating features for the pre-fall case to identify a fall risk event and alarm the patient.

III. THE PROPOSED SYSTEM

The proposed system not only aim to detect the fall even to track the exact location of the seizure person. The fall detection and tracking of seizure person is done with sensors fig. 1 shows the block diagram of the seizure fall detection and tracking system with arduino.

We set-up hardware requirement according to the proposed system that need to be mounted on person's body. Accelerometer, sphygmomanometer, arduino board, buzzer, GPS and SIM900 GSM Module are the sensors used in the system.
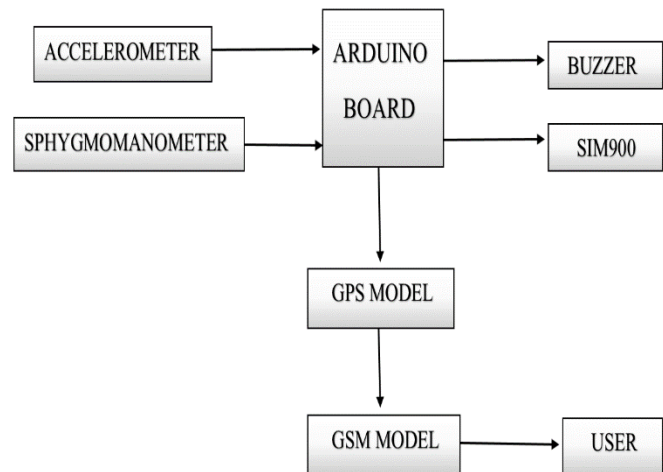

Fig.1 Block Diagram of Seizure Fall Detection and Tracking System

Accelerometer sensor detects the seizure fall but doesn't trigger the buzzer to alert the surround people since the fall can be even normal, hence once the fall is detect it triggers with arduino programmed with sphygmomanometer to sense the blood pressure rate in case pressure increase's with fall then the buzzer is triggered. SIM900 GSM Module is used to establish communication and alert caretaker through call and SMS. GPS is used to determine real time position and orientation of the seizure person. Data originating from sensors and GPS receiver is processed and collected using Arduino processor.

A. Flow of the Proposed System

The proposed system flow is explained and show in Fig. 2

1. Detecting the fall of a person through accelerometer.
2. Checking the fall type is normal or seizure fall through sphygmomanometer.
3. Sphygmomanometer checks for increasing in blood pressure
   - if yes then its seizure fall
   - if no then its normal fall
4. If its seizure fall then the buzzer is triggered and alert the surround people through beep sound.
5. Immediate after the sound with use of GPS and SIM900 GSM Module we alert the caretaker with call fallowed

with SMS which contains the exact location of the seizure person.
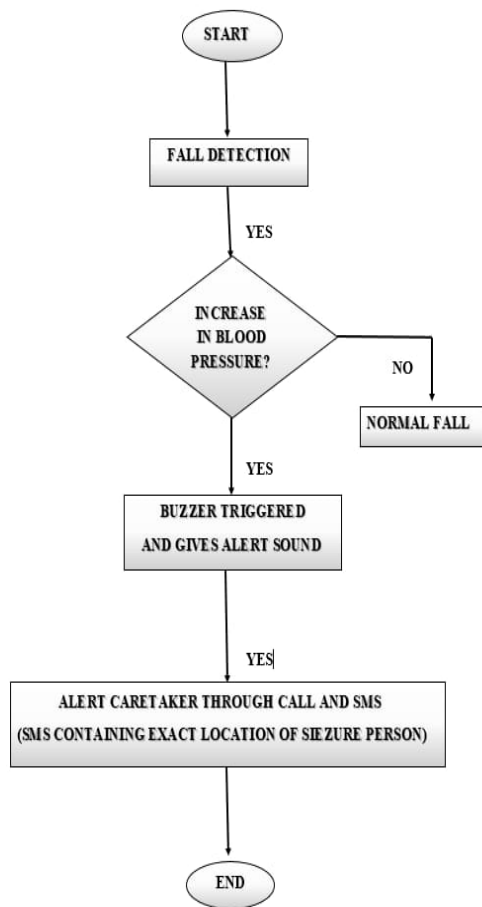

Fig. 2 Flow of Seizure Fall Detection and Tracking system

B. Hardware Description

- Accelerometer sensor

An accelerometer is a device that measures the vibration, or acceleration of motion of a structure.It is used for detecting the fall in a seizure person.

- Sphygmomanometer sensor

A sphygmomanometer is a device used to measure blood pressure, after the fall we check the blood pressure through this sensor once there is a fall with increase in blood pressure we alert.

- GPS

GPSStands for "Global Positioning System"GPS is a satellite navigation system used to determine the ground position of an object with use of GPS we can alter the caretaker with exact location of the person's fall.

- SIM900 GSM Module

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). We use GSM for establish communication and alert caretaker through call and SMS.

- Buzzer

A buzzer or beeper is an audio signalling device which gives alert sound as programmed we connect buzzer with arduino and program for the alert sound.

IV. CONCLUSION

The paper reports an IoT based system for seizure fall detection and tracking of the person. Aurdino board is used which is a low cost solution for the possessing purpose. Biomedical sensors measures blood pressure and detecting fall in a seizure person. This technology can be helpful to provide the accurate location of person fallen due to seizure. Thus we can conclude that this system will act as a lifeguard to the person experiencing seizure.

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