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A PATIENT SPECIFIC SINGLE SENSOR IOT BASED WEARABLE FALL PREDICTION AND DETECTION SYSTEM

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ABSTRACT:

The project aims in designing a system which helps in monitoring the heartbeat and fall detection of elderly people on IOT. Technology is being used every where in our daily life to fulfill our requirements.We are employing different sensors for different applications sometimes we may even use same sensors differently for different applications. We can not only increase the comfort of life but also increase health security with good ideas to make use of the technology. One of the ideal ways of using technology is to employ it to sense serious health problems so that efficient medical services can be provided to the patient in correct time. This idea to provide efficient health service to patients has given birth to the project heart beat monitoring system along with fall detection with display on PC. The modules in the project are: MEMS accelerometer which is capable of fall detection, heartbeat sensor which continuously gives the heartbeat, and PC to display the monitored parameters. Heart beat monitor and display system is a portable and a best replacement for the old model stethoscope which is less efficient. The heartbeat rate is calculated manually using stethoscope where the probability of error is high because the heart beat rate lies in the range of70 to 90 per minute, so this device can be considered as a very good alternative instead of a stethoscope. The functioning of this device is based on the truth that the blood circulates for every one heart beat which can be sensed by using a circuit formed by the combination of an LD Rand LED. Depending upon the rate of circulation of blood per second the heartbeat rate per minute is calculated. This device consists of a micro controller which takes the input from the heart beat sensor and calculates the heart rate of the patient. Also, the Micro controller gets the information from MEMS accelerometer about the tilt angle. Them microcontroller takes the responsibility to display the same on the PC which is interfaced to it through MAX 232 line driver.

I. INTRODUCTION

The rising populace of elderly people has increased the risk of accidental and unassisted fall events. Accidental falls are a major concern for the elder people being the main cause for hospitalization and the

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second leading cause of unintended injury-related demises among the elder people in the world. According to the U.S. Centre for Disease Control and Prevention, 25% of theAmericansaged65oraboveexperience a fall once each year.Every11 second an elderly person is treated in the hospital for a fall and,every19seconds an elderly person dies from a fall.These falls cause more than 27,000 deaths and more than 800,000 injuries annually and cost tens of thous and smillion dollars every year. Shows the number of reported fatal fall events and their expenses per age group for elder people(>65years)intheUSAonlyin2010.

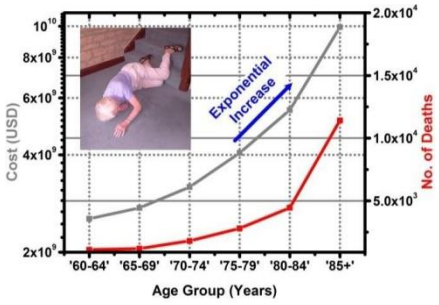

Fig:1. Distribution of fatal fall events and cost per age group.

The undesirable effects of fall events have led to wide attention in the fall risk assessments, detection, and prediction systems by health-care professionals. It is crucial for the health- care providers to determine circumstances and scenarios that led to a fall event and advise a mechanism to mitigate such falls In practice, most of the fall risk assessments are usually collected through patient's interviews and questionnaires, fall diaries, phone calls, and simple physical performance tests. Data collection through the formerly mentioned methods provides pertinent information, but these statistics cannot be treated always as the reliable medical record since elderly people often forget or fail to recall the precise circumstances of their fall event identifying the person as a high fall-risk patient is not sufficient to protect the patient. Therefore, accurate continuous monitoring.

With a decent ralized on -spot decision and recording mechanism is critical for the fall-prone patients and elderly people. Several research studies have proposed different methods to detect a fall event; however,very few ones predicted the fall event before it occurs. The study in presents an algorithm to classify elder women subjects as high or low fall risk patients. Proposes a fall prediction and detection algorithm based on a tri-axial accelerometer, predicting the fall event 200~400msecbefore the collision with a limited number of test cases. Falls can be detected by monitoring a person's surrounding using a fixed video camera with computer vision wearable cameras pressure sensors,smart tiles and acoustic sensors(Micro phone Array System), This

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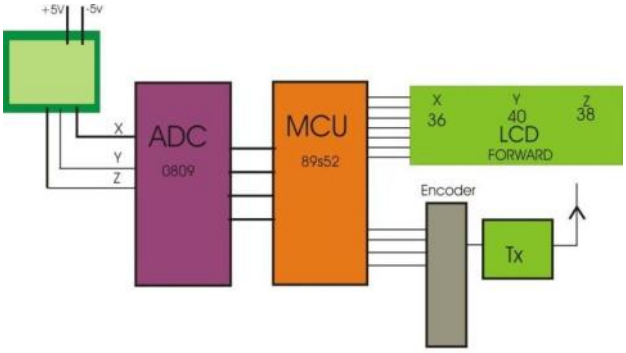
proposed system aim at design a system to sense and update elder one's health status over I

nearest of kin of falls and other related incidents of distress. It is also to provide the two parameters functionality such as heart rate, and fall detection to constantly monitor and relay the activities of the individual. The device mustn't be cumbersome, but rather wearable, so as to remove any social stigma related to the possession of such a device. It must have a high degree of reliability and differentiate activities of daily life from genuine falls. The main aim of this project is to develop a most secure access control system for dump people assistance system using MEMS based accelerometer.MEMS is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tiltand makes use of the accelerometer, that data given to Raspberry pi Microprocessor. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a micro controller not only accepts the data as inputs but also manipulates it,interfaces the data with various devices, controls the data and thus finally gives the result. The project MEMS fall detection using IOT using Raspberry pi Micro processor is exclusive projects recognize the face when it is detected.

II. LITERATURE SURVEY:



AUTOMATIONOFWHEELCHAIRUSINGMEMS: Wheel Chair is a mobility device designed for shifting patients,moving physically challenged people from one place to another with the help of attendee or by means of 228 self-propelling. The wheel chair is divided into two different types based on the power used form obility:

1. Manually powered wheelchairs.

2.Electric powered wheel chairs(automated).

Manual powered wheelchairs are driven by manual power which is again classified into foldable and non-foldable with or without commode design. Electrical powered wheel chairs runswith electric power and operation of chair depend upon the instruction given by the patient hand or head movement or any other mechanism. This project is based on the wireless technique with 3 D motion. In this project we use two circuits. One is transmitter and second is receiver circuit. In the transmitter circuit we use 3 Axis

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accelerometer base circuits and at the receiver end we use a small wheel chair with RF receiver circuit.

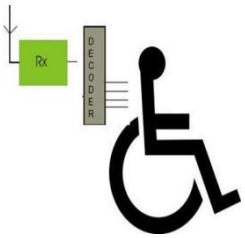

Fig3:Block diagram of Receiver

TRANSMITTER: In the transmitter circuit, as shown in fig.1, we measure the value of 3Axis accelerometer based on hand movement and converted it into digital with the help of ADC 0809. ADC converts the data from sensorandproceeds to themicrocontrollerforfurtherconversion.Microcontrol ler gets the hex data from the accelerometer and converted into ASCII code forLCD display. LCD display the X—Y—Z valuesand display thevalues on the LCD. Atthesame time microcontroller gets the data and compare inside with pre-defined variables. As wechange the position of hand, values are change automatically and change values are also shownontheLCD. We use the readings of accelerometer for wheelchair movements. We use one encoder circuit and one transmitter circuit with the microcontroller circuit for wireless transmission. We specify four variables for the wheelchair motion. As the position of the hand changes, data from the controller is also changes automatically. We get a four output from the controller. We use an HT12E encoder for serial communication. Data from the microcontroller is connected to the input pins of the encoder and transmits via the output pin of the encoder. Output from the encoder is connected to the RF transmitter module. RF transmitter module gets the signal from the encoder and transmits it via RF frequency 433MHz.

RECEIVER: In the receiver circuit, as shown in fig.2, there is an RF receiver, decoder circuit, and motor driving circuit. The receiver receives RF frequency transmitted from the transmitter and sends this signal to the HT12 D decoder circuit. Output from the decoder circuit sends commands to motor driver circuits. H-Bridge is used to drive the motors of the wheelchair. The direction of the chai movement is depended upon the received signal. Depending upon the movement of the hand or head wheel chair move sin four directions like-forward, backward, left, and right.Fromtheaboveexistingsystemwegotani deatodesignthefallpredictionanddetectionsy stem. Elderly-aged people are dependent they required proper caring. Time to time care is required. A person from a family/medical attendant is required to take care of the elder one. The patient may experience negligence from the caretaker.

III. Proposed methodology:

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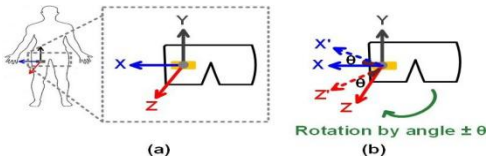

WERABLESENSINGPART: The system board is designed with anaccelerometer sensor, a RASPBERRY PI microcontroller, and a 16-bit ADC, powered by a 9V battery with an overall size of 6 cm× 3.5 cm ×2 cm. The sensor chosen is the MPU-6050 Tri-Axial accelerometer with an adjustable full-scale range of ±2g, ±4g,±8g, and ±16g, which can be attached comfortably to the patient's thigh without distressing the person's routine life activities. The upper thigh location is the preferred location for placing the sensor since it connects the bottom kinetic chain (legs and feet) to the parts responsible for keeping steadiness (core and head). In addition, elder people with chances of high fall risk show less harmonic acceleration ratios sequence in the pelvis and upper thigh. The ideal wearing position of the wearable sensor is on the subject's thigh. The tri-axial accelerometer sensor is mounted inside the wearable part where the Y-axis of the sensor is always in parallel with the human body Y-axis. However, both the X-axis and Z-axis of the sensor canbemisalignedfromthehumanbodyX-axis and Z-axis, θ forming two new axes X' and Z'. The rotation will lead the sensor to read acceleration in these different axes x and y.

1. FALLPREDICTIONANDDETECTIONSYS TEM:

The acquired acceleration data along each axis is processed through a median filter followed by a high pass filter (HPF) to mitigate the in-band noise. The HPF eliminates the gravity acceleration since the tri-axial accelerometer generates an output that is a combination of the desired dynamic acceleration and gravity acceleration. The system works in two parallel modes. A fast mode for fall prediction(FMFP)and also w mode for fall detection(SMFD). The FMFP operates on the incoming acceleration data at 256 S/sec while for SMFD the data are sub-sampled to 8 S/sec. This is because, for fall prediction, it is required to regularly check (every 100 msec) for potential fall events to take timely actions while for fall detection; it is required to look at a longer period to identify a fall event. If a large sampling rate is to be used for fall detection. In each operating mode, the feature extraction block extracts the selective features for the fall and forms a feature vector (FV). 4KB storage records the accelerometer data of a fall event for further examination by physicians. If any fall event is predicted, it will alarm the person to take precautionary actions if a fall event is detected.

RESULTS:

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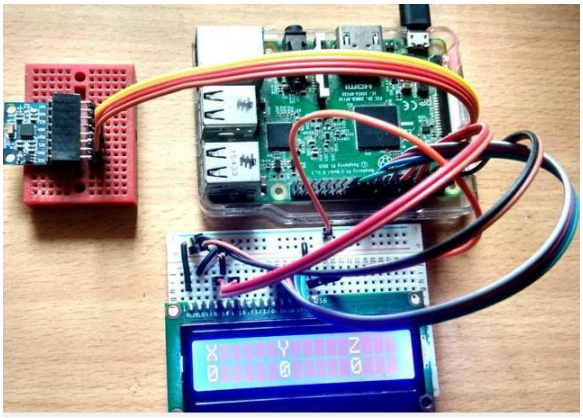

Fig4.1 before the patient falls down

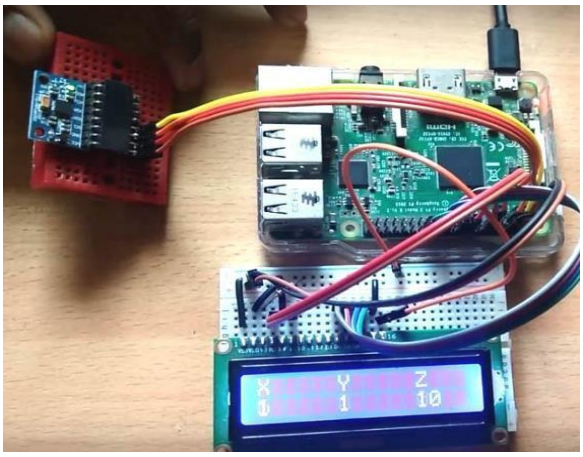

Fig4.2 when a patient falls down

IV. CONCLUSION:

Integrating features of all the hardware components used have been developed init. The presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

V. REFERENCES:

The sites which we reused while doing this project:

[1] www.wikipedia.com

[2]www.allaboutcircuits.com

[3]www.microchip.com

[4]www.howstuffworks.com

Books referred:

1. Rajkamal–Microcontrollers Architecture, Programming, Interfacing and System Design.
2. Mazidi and Mazidi– Embedded Systems.
3. PCB Design Tutorial– David. L. Jones.
4. ARDUINO Microcontroller Manual– Microchip.
5. Pyroelectric Sensor Module- Murata.
6. Embedded C–Michael. J.Pont.

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