

Caring System for Elder People

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Abstract

Every year, more number of elder people those 65 and older fall. More than 95% of hip fractures in elderly are caused by falling. The elder people who fall and are unable to get up on their own, the period of time spent immobile often affects their health outcome. The principle behind this work is to determine the occurrence of the fall of the elder people using MEMS accelerometer and alert message is send to the caregivers via GSM. The ultimate aim of this project is to attain reliability and accuracy by reducing false alarm. The work also aims at protecting the elder people during fall which is done by opening the airbag. For comfort of elderly, this project senses the light intensity in the room & switch on the light using RF module. The controlling process is done by using Arduino.

Keyword- MEMS Acclerometer, GSM, RFmodule, Airbag

I. INTRODUCTION

Most of the people are working in the busy & mechanical world. They don't have enough time for caring their elder father and mother at every moment. Though many people really want to take care of elderly, it is not possible for them to do it satisfactorily. For these reasons, the number of orphanages are increasing day by day.

One of the most common problems faced by elderly is fall. Each year more than 250000 elder people are hospitalized for Hip fractures. Loneliness of elder people create the fear of fall .According to the psychological report, fear of elder citizen about falling leads to avoidance of physical activities , depression , decreased social contact and lower quality of life. When the physical activity is less, muscle becomes weaker and the chances of falling are increased.

Muscle cell breakdown starts within 30-60 minutes after fall due to compression. So immediate treatment will reduce the long-time hospitalization of elderly. With the advent of miniature technology we can reduce this problem of occurrence of fall. During fall it give sound alarm to the neighborhoods & message alarm to the caregivers & doctors about their falling.

II. METHODOLOGY

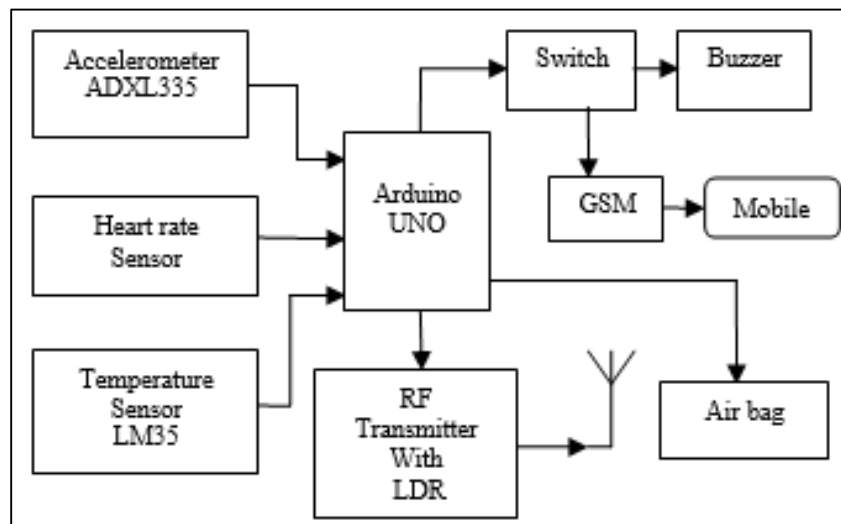


Fig. 1.1: Module designed for elder people

Accelerometer ADXL335 is used to detect the fall of elder citizen. When the fall is detected, it switch on the alarm. On hearing the alarm sound the neighbors can know about the fall. After the fall, if the elderly is able to get up on their own then he/she can press the switch. Then the alert message is not sent to doctors. So false alarm is much reduced.

The module shown in Fig 1.1 is designed to be present on the waist of elder people.

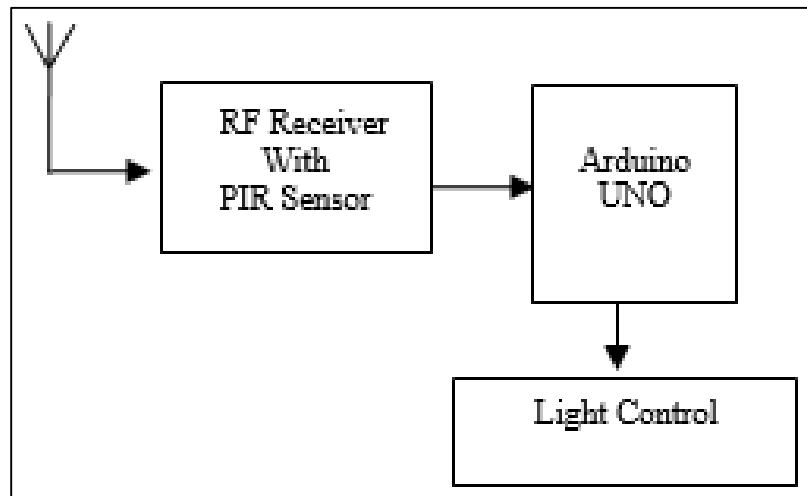
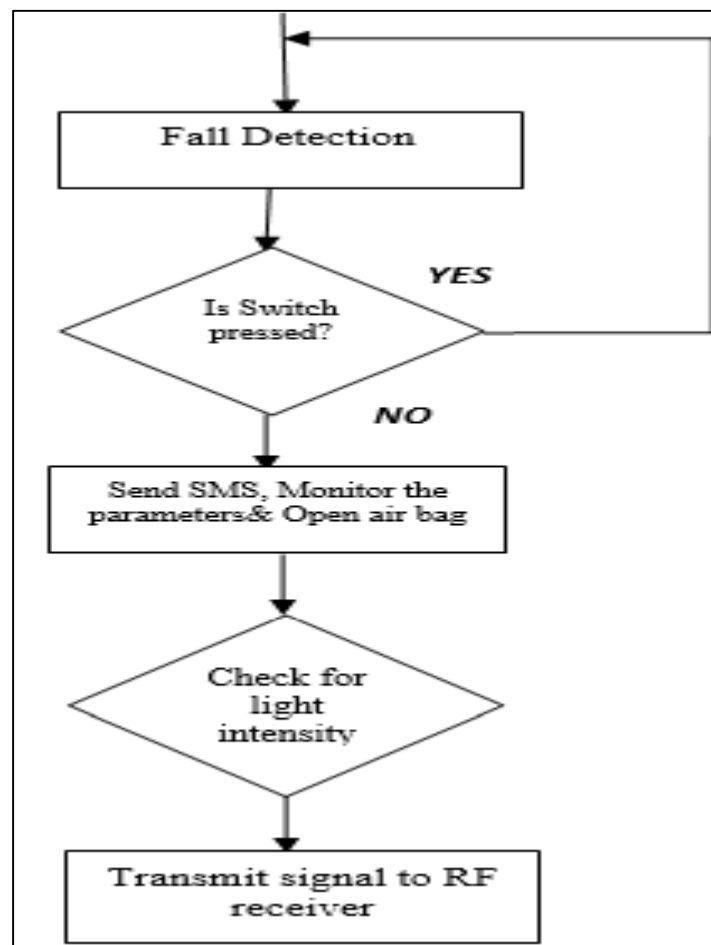


Fig. 1.2: Module fitted for the light control

The module shown in Fig 1. 2 is used for the light control in elder's room. Once RF receiver receives the information and gives the signal to the arduino. It analysis the signal from PIR sensor for the presence of human in the room. If the fall person present in the room, it switch on the light in that room.

A. Flow Chart



B. Accelerometer ADXL335

ADXL335 is a small, thin 3-axis accelerometer with voltage outputs. The range of ADXL335 is $\pm 3g$.

E. ARDUINO UNO

ARDUINO UNO is a microcontroller based kit for interacting the number of sensors & actuators. It contains number of analog & digital pins for this provision. For programming, Arduino provides Integrated Development Environment which supports c and c++ programming language. It contains Flash memory of 32KB, SRAM of 2KB & EEPROM of 1KB. It provides the UART Serial Communication with the use of digital pins 0&1. It provides I2C communication through pins A4&A5. It supports SPI communication through pins 11,12,13. Programming contains setup() and loop() functions. Setup () function for making board to be power on. Loop () function for running the code until the power is off.

F. GSM



Fig. 1.5: GSM/GPRS SIM900A MODEM

GSM/GPRS SIM 900A MODEM is used. GSM is a wireless modem. In a dialup modem we require the line connection. Wireless modem uses a wireless carrier. GSM is a circuit switching device. GPRS is a packet switching device. GPRS has a high transmission rate compared to GSM. It requires a SIM card for communication. It will transmit 30 SMS messages per minute. GSM/GPRS modem requires a 12V supply. It works on AT commands. It works on frequencies 900/1800 MHz. The fall of elderly is detected using ADXL335 and the alert message is sent to doctors through GSM along with temperature and heart rate values at the time of fall.

G. Light Dependent Resistor

LDR senses light intensity of room after elder people fell. The resistance decreases with increase of light intensity. In the dark room, it has resistance as high as several megohms. In the presence of light it has resistance as low as few hundred ohms. The output voltage measured at Arduino is varying with light intensity. For high intensity, output voltage is greater than 150mV

H. Passive Infrared Sensor

PIR sensor is used to measure infrared light radiating from object. It senses the movement of human, animals or objects within the range. It has a sealed metal to provide better immunity against temperature, humidity & noise. It is small & inexpensive. PIR sensor is used to detect motion of elder citizens. PIR sensor is used to find whether the elderly fall in that room. The range covered by the sensor is 10m. Presence of human will give active High signal.

I. RF Module

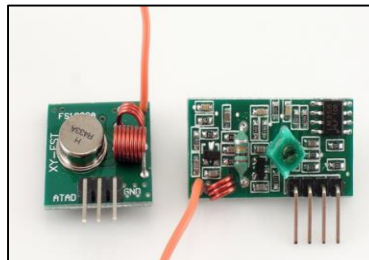


Fig. 1.6: RF module

RF module contains RF transmitter and receiver. It transmits the signal at the frequency of 433MHz which covers the range of 500ft. RF Transmitter along with HT12E encoder is used. The characteristics of the HT12E

Encoders are Operating voltage: 2.4V~12V, Low power and high noise immunity. The 2¹² encoders are mainly used for remote control system applications. They are capable of encoding information consisting of N address bits and 12N data bits. Each address/data input can be set to either of the two logic states. The programmed addresses/data are transmitted along with the header bits via an RF transmission medium. Transmission is enabled by applying the low signal to the TE pin. RF transmitter is connected with the Arduino. If fall is detected & light intensity is in low condition, RF transmitter transmits the signal to the receiver. RF receiver is connected with Arduino & light section. Once the signal is received at RF receiver, it checks for the presence of human using PIR sensor & switches on the light.

J. Air Bag



Fig. 1.7: Air bag

When the fall is detected, signal is given to open the solenoid valve which in turn opens the airbag by the CO_2 gas. CO_2 gas is created by a chemical reaction between baking soda and vinegar. The chemical substances used here are not harmful and reusable. So the design of the chemical substance is cost-efficient.

There are two airbags used. One is for protecting the elder person's hip & the other is a neck air bag for preventing the head from serious injuries.

III. RESULTS AND DISCUSSIONS

- The module designed for the elder people to wear on the waist is shown in Fig 2.1. It has an accelerometer to detect the fall and GSM to send a message.
- It has sensors to sense heart rate and temperature.
- RF transmitter to sense the presence of light.

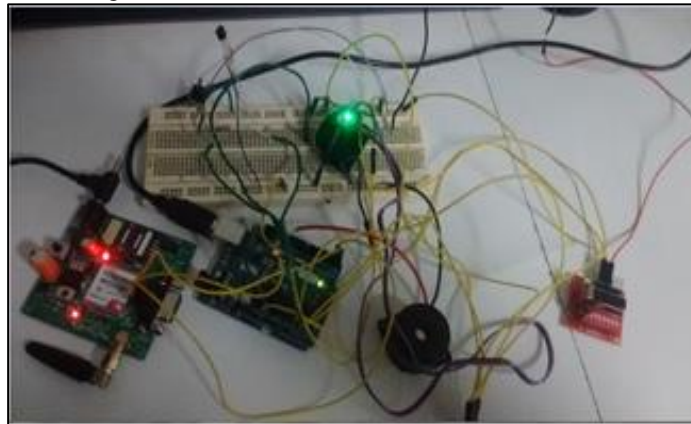


Fig. 2.1: Module designed for elder people

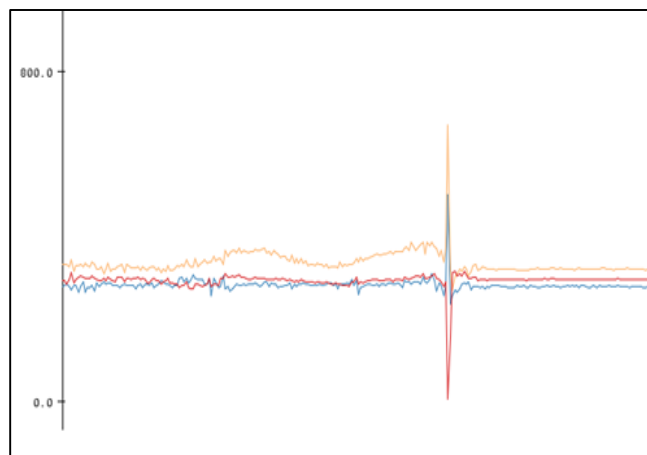


Fig. 2.2: Acceleration change during fall

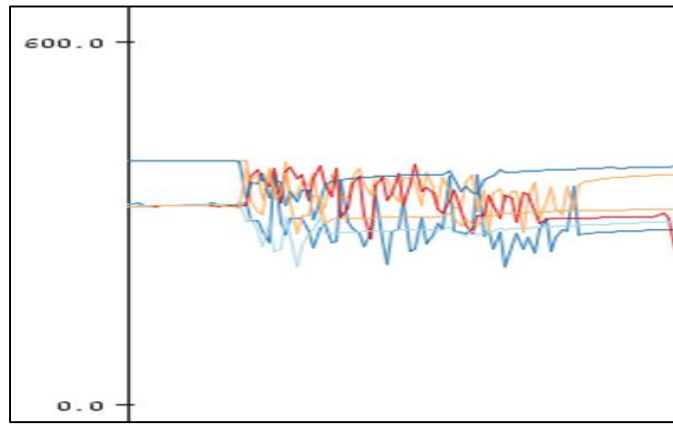


Fig. 2.3: Acceleration while walking

- The peak acceleration change during falling is represented using graph in Fig 2.2.
- The acceleration change during walking is represented using graph in Fig 2.3
- The message displayed during the occurrence of fall is shown in Fig 2.4
- Accelerometer with arduino detects the fall occurrence.
- After fall, Elder people health is monitored by measuring the heart rate & temperature using sensors.



Fig. 2.4: Message received at the doctor

- The module for light control is fitted with lights in all the rooms of home is shown in Fig2.5.
- It has RF Receiver receives the data from transmitter on the human body
- PIR sensor sense the presence of human in that room
- Based on RF receiver &PIR sensor values, light is switched on the room

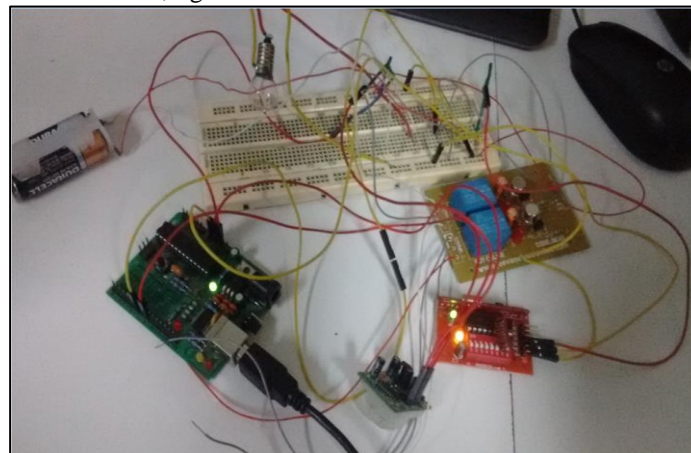


Fig. 2.51: Module designed at light control

During fall, if the light is in the on mode, then there is no need for switch on the light. This scenario is shown in the figure2.51

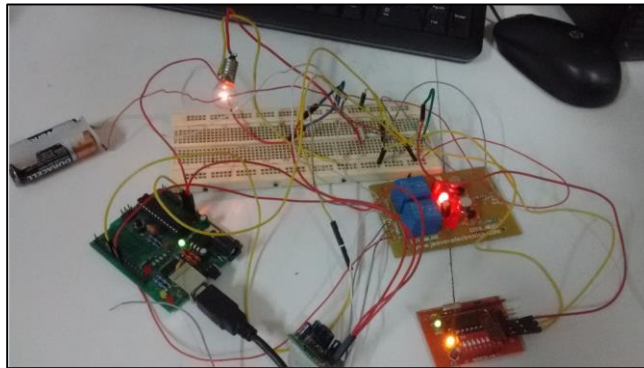


Fig. 2.52: Module designed at light control

During fall, if the light is in the off mode, then the light should be switched on .This scenario is shown in the figure2.52

IV. CONCLUSION AND FUTURE WORK

Pressure monitoring of elder people can be included. The fall prevention can be done with more efficiency. If the blood pressure of elderly is dropped down, then the airbag is opened automatically.

Fall detection for elderly is implemented based on wireless sensor system. Though there are many fall detection algorithms existed previously, this proposed idea takes quick remedy which helps the elderly to attain long healthy life.

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