

# Elderly Care Smart Home Automation Using Internet Of Things

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**Abstract**— According to the recent study, it has been observed that there is increased number of elderly and disabled people. Elderly people are not strong enough and hence they may face to different types of accidents. On the other hand, disabled people cannot perform some movements and activities.

WSN has become an efficient field for research as well as scientific and technological developments. WSN system comprise of large number of tiny devices equipped with a few sensors, along with some processing circuits and a wireless transceiver.

This paper provides elderly care smart home automation using WSN in which arduino controller is used as sensor node to detect the activity of elderly and disabled people using PIR, LPG, temperature and humidity sensor. Raspberry Pi acts as master node system which collects the data of different arduino sensor node using RF protocol. All the activity collected in the form of data is stored to the ThingSpeak cloud platform for further analysis.

**Keywords**— ARDUINO UNO, RASPBERRY PI, HVAC, DHT-11, MQ6.

## I. INTRODUCTION

The increased population of Elderly and disabled people increases the responsibility of caring them when they are alone at their home. Operating the devices of home is a difficult and cumbersome task for elderly and disabled people, even they sometime forgets to make washroom light OFF after use. Forgetting to OFF LPG gas regulator can also create breathing related problem in case of leakage.

To overcome these problems and to help elderly and disabled people, Smart home automation system using raspberry pi and arduino is given in this paper. The problem statement is resolved using the concept of wireless sensor network (WSN) where arduino controller is used as primary sensor node to sense the activity using PIR, LPG, temperature and humidity sensor. RF transmitter is used to transmit the data from primary node to master node where Raspberry Pi is acting heart of the system. RF receiver interfaced with Raspberry Pi receives all the data sensed by primary node and also save all these data on cloud using ThingSpeak.

In the second section literature review on elderly care and smart home automation is discussed. The block system for overall method is discussed in third section. All the results and working flow with conclusion is discussed in further sections.

## II. LITERATURE REVIEW

Literature review became useful to understand the profound knowledge of problems and for proper problem formulation.

This includes the review and suggestion that gave ideas for implementation of this project.

### Smart Home using Arduino:

Rasika S. Ransing has provided "Smart Home for Elderly Care Based on Wireless Sensor Network" in which Zig-bee technique is used with ARDUINO UNO controller to determine the health and wellness of the elderly people based on their daily activities. Temperature sensor, Contact sensor and LPG sensor, issued to be deployed for fire detection, gas leakage detection and determination of whether any door was closed or open. Lab VIEW is also used for a graphical user interface. In case of any emergency, a warning message has generated, and played through a loudspeaker for the user to take notice of the same and an SMS were sent to the caregiver used GSM modem to take preventive action.

### Elderly Care using PIC microcontroller:

Ana Lui a S. Ferreira, Hi uan and Moises V. Ribeiro in 2012, described "Robust and Reduced-Rank UWB Receiver for Green and Smart Home Communication based on Power Line" in which fault detection system is provided. It consists of an inertial unit that includes a tri-axial accelerometer and a gyroscope. Sensors such as heartbeat sensor, pressure sensor and temperature sensors these sensor data was then processes and sent to the PIC microcontroller. The PIC compares the data to the pre-existing Monitoring the health condition and send SMS via X-bee module threshold value to determine if an event has occurred or not

### Elderly Care Smart Home using GSM:

In I.R. Gnanavel et. Al. Sensors like temperature sensor, motion detector sensor and pressure sensor were deployed in order to monitor the health of elder people. An inertial unit that included Arduino was also used for fault detection and controlling. In case of any problems or emergency an SMS was sent to the caregiver and the nearby hospitals used a GSM modem to take action for helping the person.

In the further research Ms. Jayshri V. Ekshinge, Dr. Santosh S. Sonavane has explained the system which consists of two parts, the wireless sensor network and the security monitoring and management system. In the monitoring and management subsystem, the data was first processed and then analyzed, and ultimately were displayed in the form of graphs, and report forms, etc. The wireless network of this system was established by used the ZigBee technology. ZigBee is a wireless network technology with the advantages of low power, short-range, high capacity and high reliability. Sensors like temperature sensor, LPG sensor and Contact sensor were proposed to be deployed for fire detection, gas leakage detection and determination of whether any door was closed or open respectively. LabVIEW is used as a graphical user interface.

### Elderly Care Smart Home using IOT:

Resul Das was first who gave review of existing approaches and IoT solutions specifically proposed and designed for the elderly and disabled. IoT technology has started to support the elderly and disabled in many areas of their life and work and the IoT helps improve quality of life for the elderly and disabled, the amount of data collected by the IoT has increased tremendously and surpassed the expectations. These make it necessary to investigate approaches and solutions in order to efficiently utilized large amounts of data, especially in health care applications.

Ana Luiza S. Ferreira in investigate the use of ultra wide band receivers for low bit-rate data communication transceivers for smart home applications Liu in presents the designed and implementation of a smart home system based on ZigBee and GSM/GPRS network. The author explains not only the design of the home network but also how the smart home functions were remotely monitored and controlled.

### III. SYSTEM IMPLEMENTATION

The overall system is implemented using the concept of WSN. It consists of primary node using arduino and master node using raspberry pi as shown in figure.

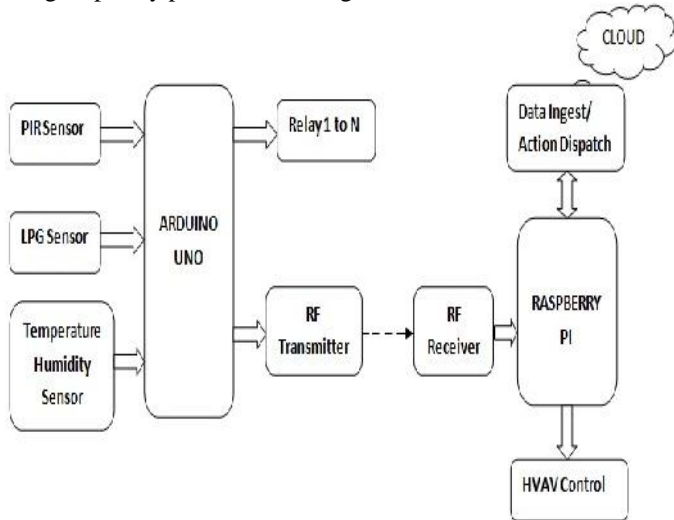


Fig. 1 Proposed Scheme Implementation using IoT

The above system consists of transmitter section as primary node and receiver section as Master node.

### Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet) with 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environment.

### Temperature and Humidity sensor

DHT 11 is an effective digital sensor having ability to detect both temperature and humidity. The number of DHT 11 used depends upon the number of primary nodes to be implanted.

### LPG GAS SENSOR

MQ-6 is easy to install and a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG leakage and concentrations in the air. When the sensor detects gas molecules leaked in the atmosphere in range 100 ppm to 1000 ppm, its output turns high.

### PIR Sensor

PIR sensor is used to sense motion of human being when he/she comes in the sensors range. It is small, inexpensive, low-power, easy to use and provides digital output if certain activity is detected.

### RF Modem:

RF modem is used for applications which need two way wireless data transmission. The communication protocol is self controlled and completely transparent to user interface. Here, RF transmitter is interfaced with arduino controller and RF receiver is interfaced with Raspberry Pi.

### Raspberry PI 3

The Raspberry Pi is a series of small credit-card-size single-board computer. In this system Pi 3 model is used because of inbuilt Bluetooth and wi-fi protocol. Raspberry Pi 3 collects the data from primary node and sends it to cloud for further analysis. It also control the HVAC system whenever needed.

### Cloud Computing

Cloud computing get its name from the internet. Cloud computing technology helps to reduced operational and capital costs providing scalability, elasticity and storage resources. Cloud computing stores data away into large data centres. The development of many data intensive applications has been done in this computing environment. It also helps users to access services anytime and anywhere. Due to the flexibility and transparency in cloud computing more data intensive applications are developed. Networking plays an important role in cloud computing.

### IV. RESULT AND DISCUSSION

The experimental setup consists of:

- i. Power Supply
- ii. WSN Sensor
- iii. Arduino 328 board
- iv. Real time alerts (LCD and LEDs alerts)
- v. Cloud Interface

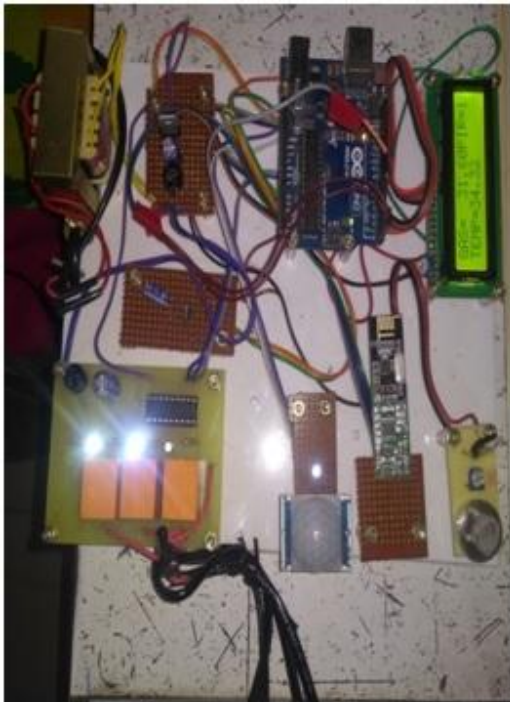


Fig. 2 Transmitter Section as Primary Node



Fig. 3 Receiver Section as Master Node

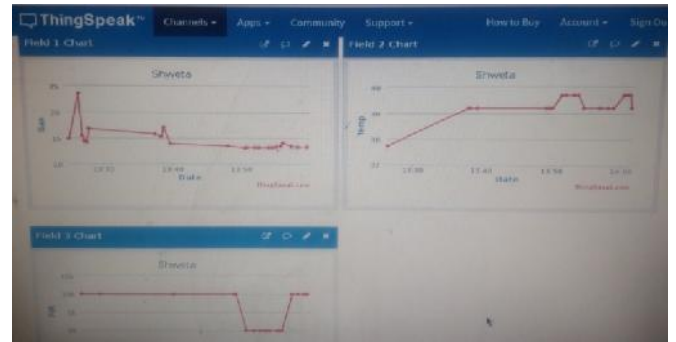


Fig. 4 Cloud Interface showing readings of all sensors

**i. Selection of Sensor 1/ Sensor 2/Sensor 3 for creating data base**

The selection of the user is made in ThingSpeak to obtain and save the data individually for each user and not to mix the database of different users. The data obtained from different sensors and corresponding health prediction can be used to create to database for each user differently.

**ii. Gas Reading Vs Date**

The graph of temperature Vs. time can also be selected which displays and update in real time to enable continuous monitoring of changes in values of temperature. Also the different graphs and can be obtained from data record created in matlab to monitor the changes in others factors with change in temperature. change in output voltage then change in LMP when.

**iii. Temperature Reading Vs Date**

The graph of temperature Vs. time can also be selected which displays and update in real time to enable continuous monitoring of changes in values of temperature. Also the different graphs and can be obtained from data record created in matlab to monitor the changes in others factors with change in temperature. change in output voltage then change in LMP when.

**iv. PIR Reading Vs Date**

The graph of temperature Vs. time can also be selected which displays and update in real time to enable continuous monitoring of changes in values of temperature. Also the different graphs and can be obtained from data record created in matlab to monitor the changes in others factors with change in temperature. change in output voltage then change in LMP when.

Table I. Sensor data collection.

Sr. No.	Reading Data	Sensor Data
1	28.00	Temp. limit safe
2	35.00	Temp. limit safe
3	45.00	Temp. limit exceeds
4	12.00	Gas limit safe
5	15.00	Gas limit safe
6	20.00	Gas Limit exceeds
7	00000	No motion detected
8	10000	Motion detected

#### V.CONCLUSION

The smart home monitoring system helps the elderly persons to live safely and independent at home in. The design methodology is a wireless sensor network based smart home for monitoring the elderly and to propose an optimal solution to circumvent the impediments. The smart home is based on a few smart and intelligent sensors, which are developed, fabricated and configured around a wireless network. The system generates early warning data to care giver, when an unforeseen abnormal condition occurs. So caregiver can take necessary action. It also analyzes the gathered data to determine sensor activity and behavior of elderly person.

The developed monitoring system uses Arduino Uno controller based transmitter model recognizes the activities of daily living and life style of elderly person living alone. At the same time receiver section consisting of Raspberry Pi 3 model senses the activity sent by transmitter and takes required action. This system uses RF protocol with low power consumption and fast response. Even though the monitoring system uses a limited number of sensors, it determines the daily behavior of the person. The cloud based application Things-Speak creates a graphical platform for the user to observe the overall activity continuously at any time and from anywhere. Thus, elderly care smart home monitoring system provides low cost, safe and wide range visualization of elderly person activity using Internet of Things.

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