

# **“Home Monitoring for elderly people”**

*Project report submitted in partial fulfillment of the requirement  
for the degree of*

## **BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING**

By

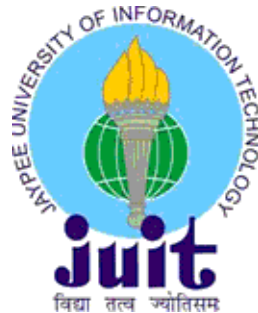
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May, 2019

## STUDENT'S DECLARATION

We hereby declare that the work presented in the Project report entitled “**Home Monitoring for elderly people**” submitted for partial fulfillment of the requirements for the degree of Bachelor of Technology in Electronics and Communication Engineering at **Jaypee University of Information Technology, Wagnaghat** is an authentic record of our work carried out under the supervision of **Dr. Nishant Jain**. This work has not been submitted elsewhere for the reward of any other degree/diploma. We are fully responsible for the contents of our project report.

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## CERTIFICATE

This is to certify that the work which is being presented in the project report titled “**Home Monitoring for elderly people**” in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Electronics and Communication Engineering submitted to the Department of Electronics and Communication Engineering, **Jaypee University of Information Technology, Waknaghat** is an authentic record of work carried out by **Arpit Rituraj (151093)**, **Akshit Sharma (151102)** and **Gouri Sharma(151103)** during a period from August 2018 to May 2019 under the supervision of **Dr. Nishant Jain** Department of Electronics and Communication Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement is correct to the best of our knowledge.

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## **Abstract**

Home monitoring system for elderly people focuses on the nuclear families and the elderly people living alone. The use of technology in monitoring the daily activities of the elderly people will help to keep an eye on the people without compromising with their privacy. The use of various types of sensors, microcontroller and GSM module creates the basic idea of our project and helps us to analyze the data which was collected during the implementation of the project. The basic idea is to check the daily cycle of the elderly person and then creating the time table of the person. If some abnormal activities are detected then an emergency message is sent to the care taker via GSM module and a buzzer also starts ringing. This buzzer keeps ringing until an external person (in our case neighbor) enters the house and stops it manually. We have also kept emergency switches in the system that may be installed in the desired places and may be used by the person when he may face some difficulty. The use of GSM (Global System for Mobile) gives a correspondence among patient and caretaker.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 AGING PROBLEM**

Elderly or overage person are vital and growing segments in the world population. The measurements demonstrate that the level of more established individuals is constantly becoming because of numerous reasons, specifically, the declining the birth rates and the decrease of ladies fruitfulness. The worldwide populace matured sixty years or over numbered ninety six million out of 2018, which is more than twice as huge as in 1980 when there were thirty-eight million more seasoned people around the world. The quantity of more seasoned people is required to twofold again by 2050, when it is anticipated to achieve about 2.1 billion. The more established populace of the creating areas is developing a lot quicker than in the created districts. Thusly, the creating area is home to a developing offer of the world's more established population. In 1980, the creating districts were home to fifty six percent of people matured sixty years or more. In 2017, more than 66% of the world's more seasoned people lived in the creating districts. Somewhere in the range of 2018 and 2050, the quantity of people matured sixty years over in the creating districts are required to build more than two fold from six hundred fifty two million to 1.7 billion, though the more created areas are anticipated to see a 38 percent expansion in the quantity of more seasoned people over that period, from 310 million people matured sixty years or over in 2018 to 427 million of every 2050. Projections demonstrate that in 2050, 79 percent of total populace matured 60 or over will live in the creating locales.

Over the coming decades , the quantity of more seasoned people are required to become quickest in Africa, where the populace matured sixty or over is anticipated to build more than triple somewhere in the range of 2018 and 2050, from sixty-nine to 226 million. Africa is trailed by Latin American and Caribbean, whereas the more seasoned populace is anticipated to expand more than twofold somewhere in the range of 2018 and 2050, from seventy six to 198 million.

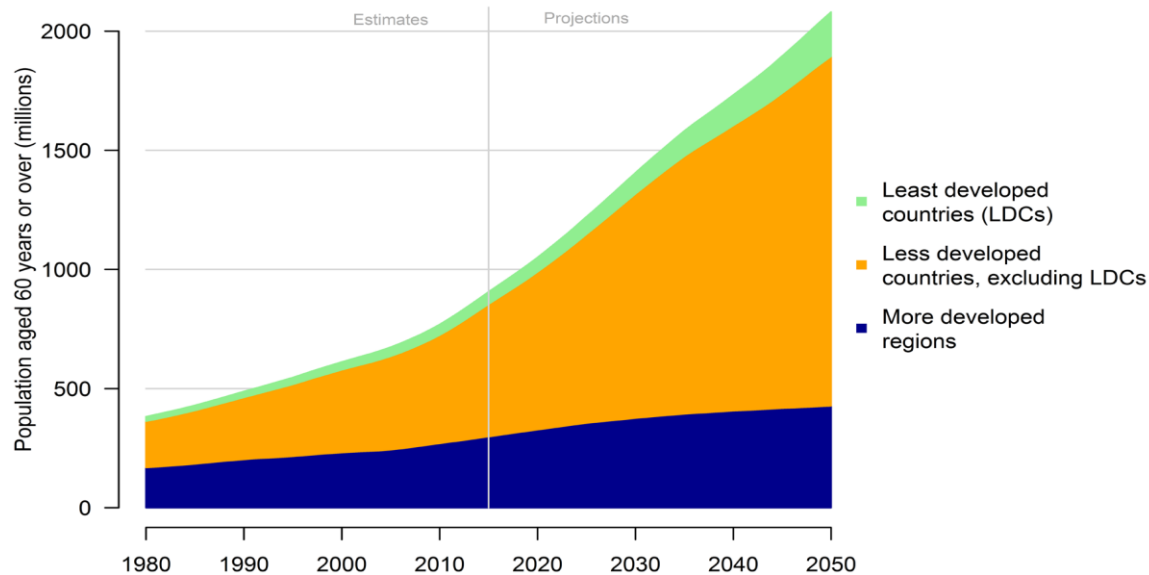


Figure 1.1: Number of persons aged 60 years or over by development group from 1980 to 2050[1]

Asia additionally is required to encounter a twofold increment in the quantity of more established people, with the populace matured sixty or over anticipated to increment from 549 million of every 2018 to almost 1.3 billion out of 2050. The six noteworthy geographic districts, the more established populace is relied upon to become most gradually in Europe, with an anticipated increment of 35 percent somewhere in the range of 2018 and 2050. Also, the present public activity style, current prescription and the simple access to restorative consideration have expanded future.

An Assembled Countries report assessed that the future was sixty five i.e. 65 years in 1950 and seventy eight i.e. 78 years in 2010 and it will keep on ascending to eighty three i.e. 83 years in 2045. On the other hand, it was accounted for that 35% of individual's age of 65 or above in 2011 had some sort of incapacity. Some might be expected help to fulfill significant individual basic needs. Delicate more established grown-up lean towards living freely and self-overseeing in their own home which advance the sentiments of competency lessen the weakness to melancholy. Truth be told, from monetary perspective, the average cost for basic items at home with observing gadgets and canny apparatuses is more affordable and more advantageous than going to therapeutic focus and being regulated by attendants. As individuals age, regularly, their requirement for medicinal help develops, which may result in successive and impromptu

therapeutic consideration or in-facility social insurance administrations. So as to get long haul medicinal services administration, some older individuals need to remain in long haul care focuses, which are costly just as of constrained limit. However, the ongoing development towards the IOT technology can play a pivotal role for the development of old medicinal services frameworks. In a brilliant home, different key physiological indications of the old can be estimated and checked utilizing straightforward, minimal effort sensors from a remote social insurance administration focus over a verified correspondence stage, in this manner offering a financially savvy answer for long haul wellbeing observing. This will likewise enable the old to lead an autonomous life in their home while guaranteeing most extreme solace, wellbeing and security.

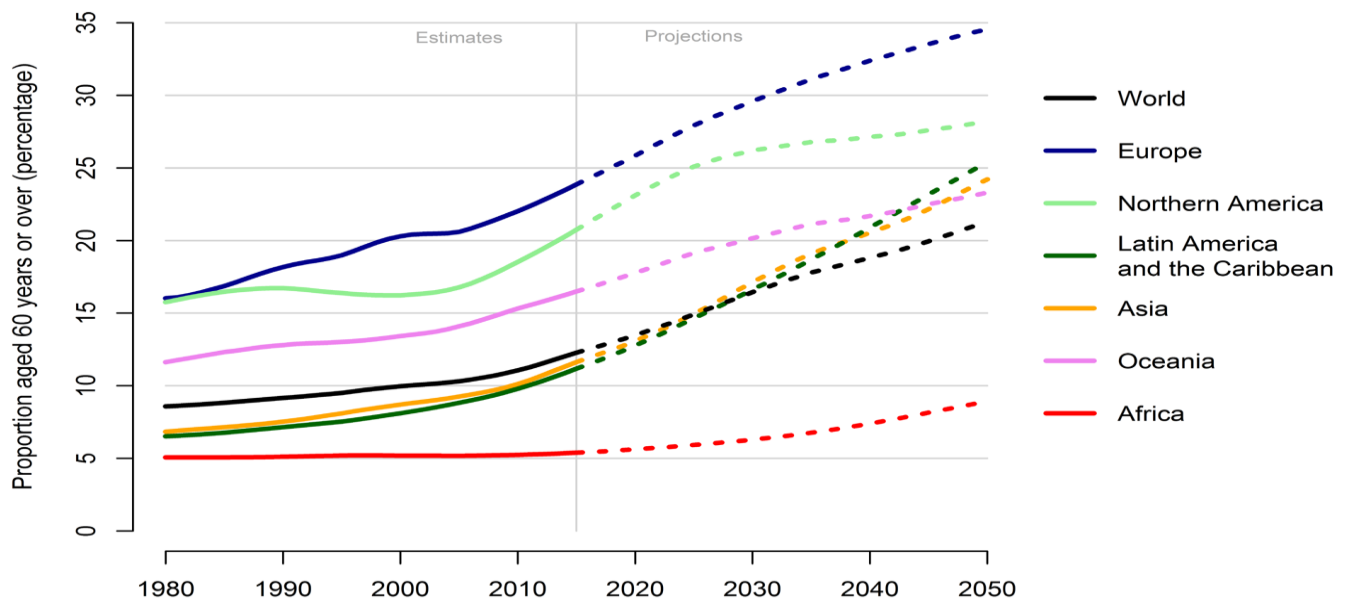


Figure1.2: Percentage of population aged 60 years or over by region, from 1980 to 2050[1]

The smart homes can benefit from artificial intelligence (AI), which can accumulate and examine data with respect to the tenant's exercises and wellbeing status, distinguish and report any inconsistencies. The computer based intelligence framework incorporates a database that stores inhabitant's social and physiological examples and restorative accounts. If there should be an

occurrence of a medicinal crisis, this framework can raise an alert. Thus, allowing the caretaker to have immediate and appropriate medical attention.

The desired goal of personal wellness system is to provide care for elderly people in the right time by activity recognition and Wellness determination. To deal with these issues such as monitoring the daily activities, performance tracking of normal behaviors and well-being of the elderly living alone the system which is noninvasive, flexible, low of cost and safe to use is designed and developed. An initial change in regular daily activities can be identified by the home monitoring systems and trigger messages to the appropriate care taker about the changes in the functional abilities of the elderly person [1].

## **1.2 HOME AUTOMATION**

Keen homes or Smart home, home automation, insightful homes, domestic's purpose and others are home automation, generally proportional words that delineate, according to the Smart Home Automation of Netherlands, the "blend of development and organization through home frameworks organization for a prevalent nature of living". The UK department of trade and industry characterizes the savvy house as "an abode joining a correspondences arrange that associates the key electrical appliances and benefits and it's also enables them to be remotely controlled, observed or got to". The smart home framework is certainly not another science wording yet it is still far from individual's vision. Truth be told, most of home machines are by one way or another automation yet the coordination of these innovations, the between company of computerized different apparatus in a moderate plan and the simplicity of distribution due to long communication provides peace to mind as well as convenience to the person. These systems are possible, use of low control, utilization, secure, effective, successful versatile and flexible, cost-saving described by omnipresent access, finally supported by easy to-use normal Interface. The universal interface (UI) for control of the system uses tablet, personal computer (PC), web interface, and divider mounted terminals and a cell phone application that may be similarly to available off-website page by the use of internet. While there are many fighting shippers, there are not a lot of worldwide available industry models and the smart home space is strongly separated. Makers every now and again envision self-governing executions by maintenance documentation and by indictment. The home automation showcase was of the rate

5.77 billion US dollar of out of 2013, foreseen to accomplish a market scenario of estimation of around 12.81 billion US dollar continuously till 2020[2].

### **1.2.1 HISTORY**

Earlier home computerization started with work sparing machines. Independent gas or electric controlled home devices wound up reasonable amid the 19<sup>th</sup> century with the starting of electric power scattering and incited the starting of garments washers in 1904(19<sup>th</sup> Century), water warmers in 1889(Early 19<sup>th</sup> century), coolers, pieces of clothing dryers, dishwashers and sewing machines.

In late 19<sup>th</sup> century (approx. 1975), primary broadly useful home mechanization organize innovation was created named as X10 home automation. It is a correspondence convention for electronic machines or gadgets. It basically utilizes the power in form of electricity to transmit in wiring for flagging and controlling whose sign must include radio recurrence blasts of advanced information and maintain the most of the generally accessible. By the late 19<sup>th</sup> century (approx.1978), X10 home automation items incorporated a channel of 16 direction comfort, a light module and a machine module. Not long after the introduction of the fist X10 timer and divider switch module.

By the year 2012, according to ABI research, in the United State, around half a million i.e. 1.5 million home automation system were installed. As the research by ABI, even more of forty five i.e. 45 million of smart home devices would be in the houses of U.S by the end of 2018[2].

### **1.2.2 GENERATION OF HOME AUTOMATION**

There is 3 generation of home automation given by Li et al.:

1. **1<sup>st</sup> Generation:** In this generation, wireless technologies with proxy servers. E.g.:- Zigbee Automation.
2. **2<sup>nd</sup> Generation:** In this generation, electrical devices can be control by AI (artificial intelligence). E.g.:- Amazon Echo.
3. **3<sup>rd</sup> Generation:** In this generation, a robot who can interact with humans. E.g.:- Robot Rovio, Roomba.



Figure1.3: Zigbee automation[2]



Figure1.4 : Amazon Echo[2]



Figure1.5 : Robot Rovie[2]

### 1.2.3 CRITICISM AND CONTROVERSIES

Home automations suffers from platform fragmentation and lack of technical standards a situation where the variety of home automation devices, in terms of both hardware variations and contrasts in the product running on them, makes the errand of creating applications that work reliably between various conflicting innovation environments hard. Clients may waver to wager their IOT future on exclusive programming or equipment gadgets those utilization restrictive conventions that may blur or end up hard modifying and interconnecting. The nature of home automation devices can also be a problem for security, since patches to bugs found in the core operating system often do not reach users of older and lower-price devices. One set of researchers said that the failure of vendors to support older devices with patches and updates leaves more than 87% of active devices vulnerable [2].

### **1.3 Controlled Appliance**

Smart homes include various territories of hardware, engineering, figuring, and interchanges. A shrewd home accomplishes a total and absolute control of boundless number of machines. It directions the On/Off request of residential gadgets, for example, ice chest, TV, washing, cooking, and cleaning machines, just as electrical gadgets as engines, siphons so as to water the houseplants utilizing moistness and soil dampness. It administers the natural framework, for example, HVAC (Heating, Ventilation and Air Conditioning), and fans. It likewise aces the lights plan as trading, decreasing lights and making temperament for different events. It can control windows blinds and shades to help trademark lighting. Moreover, it engages various components of security by realizing gas, smoke, and fire sensors related with alerts, and by using interference markers and customized development identifiers outside homes that different pets from intruders. It uses glass breaking markers, perception and camera frameworks just as checking home structure frameworks for distinguishing vibrations and seismic tremors utilizing 3D accelerometer sensors. Besides, the home theater and the fervor system secure abnormal state of similarity and give the customers to give the authorization for visitors using video door phone and fulfills standard visitor section decision. Additionally, the home amphitheater endorses the scattering of the most cherished sound and video, the telecom of music in any bit of the structure and the affirmation of video correspondence between different rooms. Finally, shrewd homes are of incredible enthusiasm since they are water and power sparing frameworks, since their capacity utilization could be overseen utilizing keen meters, temperature auto control and battery regulating levels. Circulatory strain, skin temperature, advice medicine periods and specialist's gatherings and alarms clinic if there should arise an occurrence of crisis [3].

### **1.4 SMART HOME TECHNOLOGIES**

SMART home technology use devices connected to the Internet of things to automate and monitor in-home systems. It stands for Self-Monitoring Analysis and Reporting technology. The innovation was initially created by IBM and was alluded to as Predictive disappointment investigation. The main contemporary SMART home innovation items ended up accessible to customers among 1999 and the mid-2000s. Keen home innovation enables clients to control and screen their associated home gadgets from SMART home applications, cell phones, or other organized gadgets. Clients can remotely control associated home frameworks whether they are



home or away. This considers increasingly effective vitality and electric use just as guaranteeing your house is secure. Savvy home innovation adds to wellbeing and prosperity improvement by pleasing individuals with exceptional requirements, particularly more established individuals. Shrewd home innovation is currently being utilized to make SMART urban areas. A Smart city capacities like a SMART home, where systems are monitored to more efficiently run the cities and save money.

Numerous different advancements have been proposed in the writing and rely upon the manner in which the control the signal is spread from the end-to-end client remote control to achieve the objective apparatuses through ace control board sheets. The primary innovation is the Power-line Carrier framework where the control coded signals engender through the family existing electrical power wiring. While the electrical cable transmits AC sign of recurrence 50 Hz, 60 Hz, the direction signals are utilized in the scope of 24 kHz - 500 kHz. The significant downsides are the spread issues and the electronic obstruction where uproarious sign can be deciphered in a wrong way. The second innovation seeks after the home apparatuses utilizing landline phone framework (simple telephone utility). The methodology is straightforward: when a dial-up association is set up and kept up for restricted time term, digits are dialed up for different controls. Every mix of numbers is related to a particular machine or hardware. This instrument does not require web association. Its downside dwells in the unattainable capacity to examine the status of machines. Be that as it may, the advanced telephone administration regularly known as VoIP (voice over IP) conveys the computerized flag over a broadband association as DSL (computerized endorser line) and link modem. This innovation holds the transmission of voice for voice control just as messages and IM (texts). Without a doubt, the got message is examined, treated and the memory helper catchphrases are progressed in order to execute the directions. The infrared light, which is imperceptible to the human eye, is for the most part utilized in home remote controls to issue unidirectional directions from a separation. The infrared heartbeats created by the remote control handset ought to be sped up to the gadget through a short and direct viewable pathway. This methodology is constrained for the situation when the transmitter furthermore, the authority are arranged in short range evacuate or organized in a comparative site. Curiously, the Bluetooth advancement achieves the data exchange over short partitions yet the telecom of this remote sign does not require that the controller and the device are going up against each other. The extent of Bluetooth endless supply of radio used in the use. In all

honesty, the most routinely modernly used radio is of class 2 of power 2.5 mw that enables an extent of 10 m. The Bluetooth major inclinations over the distinctive remote modalities are that PC, mobile phone, android, and I-contraptions are supporting it. Also, the execution of the Bluetooth module at the control central board gives a sensitive access and allows the control of apparatuses. The SMS (Short Message Service) control requires commonly versatile correspondence frameworks. The proposed machines are constrained by a fundamental control board that has the capability to identify the specified number from which the SMS is sent, and therefore classify the mobile numbers that have the need to access to the mechanized framework. The GSM model is an equipment circuit required by a SIM card that gets the content back rubs. More often than not, the message is decoded, transmitted to the preparing unit dependent on microcontroller that, thusly, actuates the transfers so as to flip the present conditions of the machines switches.

The Web strategy requires a Web server PC associated with microcontroller or PLC .The tasks are done from a far separation through TCP/IP association. The framework can be aced from handheld gadgets or cell phones with android applications. The incredible favorable circumstances of comparable methodology are the defenselessness to perceive and to know about the condition of the apparatuses yet the web association ought to be always kept up. An elective approach to recognize home control through web is by sending electronic mail. The correct arrangement of Microsoft Outlook determines a particular preparing of the email content words and acts as per the present catchphrases in the email. Tragically, the Web savvy framework could be an objective for dangers and infections which open it to security breaks. The home framework dependent on Wi-Fi innovation involves a web server PC given by Wi-Fi card. The equipment control is interfaced with Wi-Fi module that does full correspondence between the PC server and the equipment parts up to separation scope of 20 m. The directions are sent to the PC server through the web from other PC or application programming introduced on PDAs. Regardless of the upsides of the Wi-Fi innovations concerning the range and the security, the web association ought to dependably be held[3].

#### **1.4.1 VULNERABILITIES**

Smart home technology frameworks were overused in order to carry out the directed refusal of administration assaults (DDoS) in the month of October and in the year of 2016. These numbers

of gadgets or devices which are associated to the IOT (Internet of Things) have inborn dangers to breakdown of security. Programmers focused on unbound gadgets that incorporates smart home innovation and contaminated them with malevolent code to shape a botnet and do the attack. An examination evaluates that in any event 15 percent (15%) of home switches are unbound with powerless or default (own generated) passwords. There are more than 13 billion interconnected computerized and electronic gadgets over the world. The October 2016 DDoS assault demonstrated that a little level of helpless gadgets can have an overwhelming effect[3].

#### **1.4.2 USES**

Uses related to smart home technology devices can be ranged are given below:

- Water Detector (Use to detect the presence of water).
- Smart Door Lock.
- Lighting.
- Refrigerator.
- Using monitors for Home Energy.
- Laundry Machine.
- Thermostats.
- Carbon Monoxide (CO)/Smoke detector.
- Use for security of home.
- Use for monitoring purposes.
- Some Domestic Robot.
- Wireless Speaker Systems.

Starting at year 2015, a very famous well-known bit of smart home innovation is found in the country, namely United State was remote speaker frameworks with about 17 percent of individuals having at least one. Savvy indoor regulators were the second most predominant bit of smart home innovation with 11 percent of individuals utilizing the gadgets or device. A customer report of 2012 say that given information from the NAHB (National Association of Home Builders) searched for which smart home gadgets or devices property holders needed the most and the results are that best five were remote security frameworks (half), programmable indoor regulators (47%), surveillance camera (40%), lighting control

frameworks and remote home sound frameworks (39%), home theater and multi-zone HVAC frameworks (37%) [3].

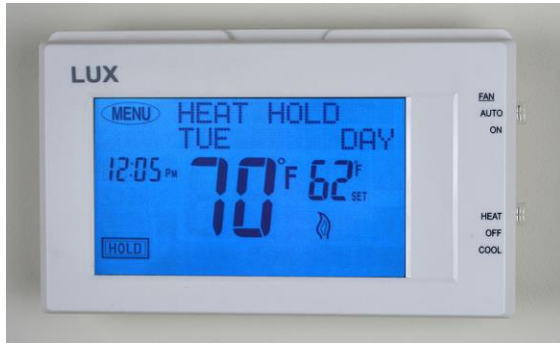


Figure 1.6 Programmable thermostat [3]



Figure 1.7 wireless speaker systems[3]

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 GENERAL**

Firstly the overall goal of this chapter is to establish the significance of the past studies conducted across the world. The bulk of the chapter was on critically evaluating the different methodologies used in this field so as to identify the appropriate approach for investigating the research.

#### **2.2 SUMMARY OF LITERATURE REVIEW**

Shewale et.al.[4] proposed that provided information about home automation using Zigbee. This segment contains home types of gear and lights which are checked with the assistance of vitality estimation and correspondence unit. Vitality estimation and correspondence unit is introduced in each light and outlets for estimation of vitality and power utilization of home types of gear and lights. Vitality estimation and correspondence unit sends the deliberate esteem after some particular time spam towards the home server with the assistance of ZigBee.

As we utilized sustainable power source to spare the vitality cost in this framework, two things are significant and for example vitality utilization and vitality age. Vitality utilization depends on ZigBee. In the vitality utilization, it gauges the vitality utilization of home types of gear dependent on ZigBee and home server gets this gathered information from ZigBee. Vitality age depends on PLC. Vitality age too have sustainable power source portal. PLC is utilized for observing the sun powered board. The REG gathers the status of sun based board and sends this gathered information to the home server. Sustainable power source portal (REG) is considered for both the things for example ZigBee based vitality utilization and PLC based vitality age. Subsequently by taking both utilization and age, the home server streamlines home vitality use.

Isa et.al.[5] proposed that this paper presents a security framework, with GSM portable correspondence support, for shrewd home robotization. The proposed framework is contrasted and related reconciliations in the documented. Future headings of this examination could embrace extra security and wellbeing schemes. This work is expected to propose an adaptable and proficient way, for the plan and the execution of such a security framework. In the meantime, the proposed framework is meant to fulfill the expanded requirements for keen home mechanization,

at an extraordinary way. The framework's usage cost is simultaneously low enough, in regards to dispensed assets. The proposed framework underpins correspondence modules with the proprietor, conceivable end clients, just as with focal security workplaces through the accessible GSM correspondence arrange.

Bacelli et.al.[6] proposed that Our methodology depends on structure interlocking courses of action made out of shallow level lace molded pieces that pursue a cross-field characterized superficially. We give a novel formalism to consequently plan a cut to-cut interlocking framework. This formalism gives enough degrees of opportunity to pursue complex cross-fields and, subsequently, to proficiently rough the worldwide structure that portrays the information shape. We additionally overhauled the customary cut interlocking component that is utilized to associate pieces so as to inexact nonexclusive 3D surfaces with more noteworthy adaptability. Also, we guarantee an adequate level of physical stability of the final structure and provide the sequence of manual operations required for the assembly procedure.

Raghavan et.al.[7] proposed that This paper displays a cloud based minimal effort home automation framework executed utilizing the Digilent chipKIT Uno32 and Arduino Uno. This is a proof of idea for a home that can be observed and controlled remotely from anyplace on the planet by means of the Internet. An "associated" home like this can make life increasingly advantageous and furthermore more secure. The remote checking part of this undertaking exhibits the capacity of having the option to realize what is new with various frameworks at home which can be utilized for control and security. For instance, we can screen the temperature for encompassing control, the condition of certain sensors for interloper recognition and the condition of various gadgets like fans or lights at home. It is additionally exhibited utilizing a couple of engines, how one can control various frameworks at home utilizing the cloud administration by means of the Internet. So a virtual "switch" accessible in the cloud UI can be flipped to turn on/off a fan or open/close a carport entryway at home. This venture has an enormous degree and can be coordinated with numerous different frameworks like keen electronic apparatuses at home. This paper depicts the undertaking actualizing the fundamental system to accomplish such an associated home. It gives a rundown of equipment and programming in the present usage of the venture, future upgrades and extension.

Anusha et.al.[8] proposed that In the paper ease, secure, universally open, auto configurable, remotely controlled answer for mechanization of homes has been presented. The methodology talked about in the paper has accomplished the objective to control home machines remotely utilizing the SMS-based framework fulfilling client needs and necessities. The broad abilities of this framework are what make it so fascinating. From the comfort of a basic android versatile, a client is ready to control and screen for all intents and purposes any electrical gadget in a family. By interfacing every one of the apparatuses with the framework through electrical cable correspondence or remote to the framework, all electrical family machines can be constrained by communicating something specific from an android portable.

# CHAPTER 3

## METHODOLOGY

### 3.1 COMPONENT USED

- i. Atmega16
- ii. Electronic push Button switch
- iii. Magnetic door switch
- iv. LCD
- v. GSM

### 3.2 ATMEGA16

#### 3.2.1 Introduction

- i. By Using CMOS technology, a low power consumption microcontroller is formed with 40 pins.
- ii. CMOS (Complementary Metal-Oxide Semiconductor) is a cutting edge innovation which is mostly utilized for creating most of the integrated circuits. It's comes with low power.
- iii. In 1996, microcontroller family AVR is developed by Atmel. It is a controller (8-bit) dependent on RISC (Reduced Instruction Set Computing) architecture.
- iv. It is a single chip PC that accompanies ROM, CPU, EEPROM, RAM and ADC.
- v. It has worked in register that are utilized to create an association among CPU (Control processing Unit) and outer peripherals gadgets. CPU (Control processing Unit) has no immediate association with outside gadgets. It can give output by writing registers and take input by reading registers.
- vi. All timers in Atmega16 can be utilized as counters when they are streamlined to check the outside signal. While it has 8-bit timers (two) and 16-bit timer (one).
- vii. A large portion of the fundamental outermost is necessary to programmed capacities that joined in these gadgets like ADC (Analog to digital convertor), Universal Synchronous/Asynchronous Receiver/Transmitter (USART), SPI (Serial peripheral interface), which make it reasonable when contrasted with a microchip that requires outer fringe to perform different capacities.



- viii. It accompanies static RAM of 1KB which is an unstable memory that stores data for brief timeframe and very relies upon the steady supply of power. Whereas flash memory of 16KB otherwise called as ROM, is likewise joined gadget which is non-unpredictable in this universe and can easily store data for significant time and can't afford to lose any data when supply of power has been detached.
- ix. Maximum frequency at which Atmega16 work is 16MHz in which one machine cycle is required for execution of instructions [9].



Figure 3.1 Atmega16 [9]

### 3.2.2 Architecture

Figure demonstrates the design of Atmega16 that depends on Architecture by Harvard and accompanies separate buses and memory. Guidelines are put away in the program memory.

- **CPU**

Central Processing Unit that is, CPU resembles a mind of Controller which provides help in performing various guidelines. It can deal with interferes, perform counts and manageable outermost with assistance of registers. Atmega accompanies with buses which has count of two, known as data and instruction buses. The Central Processing Unit (CPU) for the most part comprises of the program counter, broadly useful stack pointer, registers, guidance registers and a guidance decoder.

- **ROM**

The Controller is put away in the ROM, otherwise called stable programmable memory of Flash. The memory of flash accompanies a goals of at any rate 10,000 compose/delete cycles. Memory (flash) is chiefly partitioned into sections of two that is, Booth flash and application flash Section.

- **RAM**

Random Access Memory that is, RAM is utilized for putting away data briefly and accompanies 8-bit registers. This is much the same as a standard PC RAM which has been utilized to provide information at the runtime.

- **EEPROM**

Electronically Erasable Programmable Read Only Memory that is, EEPROM is stable memory utilized as quite a while capacity. It's been no inclusion in processing the principle code use in program. It has utilized for putting away the arrangement of the framework and gadget framework which keeps on working even when reset in called in the application processor. Electronically Erasable read Only Memory (EEPROM) accompanies a restricted review cycle to 1 lakh (100000) while boundless for read cycle. While utilizing EEPROM (Electronically Erasable read Only Memory), compose least guidelines according to necessity, so you will get the advantage from these memory available in EEPROM for a more extended time.

- **ANALOG AND DIGITAL I/O MODULE**

Digital I/O modules are utilized to provide a communication which is Digital, b/w the outside gadgets and controller. While simple modules (I/O) are utilized for exchanging data which is analog in nature. In Analog I/O modules classified as Analog Comparators and ADC.

- **TIMER/COUNTER**

Timer or counter is utilized for figuring the inner signal inside the controller and atmega16 accompanies 8-bit clocks (two) and 16-bit clock (one). All of these clock works as a counter when they have been updated for outside signal.

- **SERIAL COMMUNICATION**

Atmeha16 accompanies USART and SPI units that have been utilized for creating sequential correspondence with some external devices

- **WATCHDOG TIMER**

This clock is an astounding expansion in these controllers which has been utilized to produce reset of timer and the interrupt. It accompanies 128 kHz unmistakable CLK(Clock) source[9].

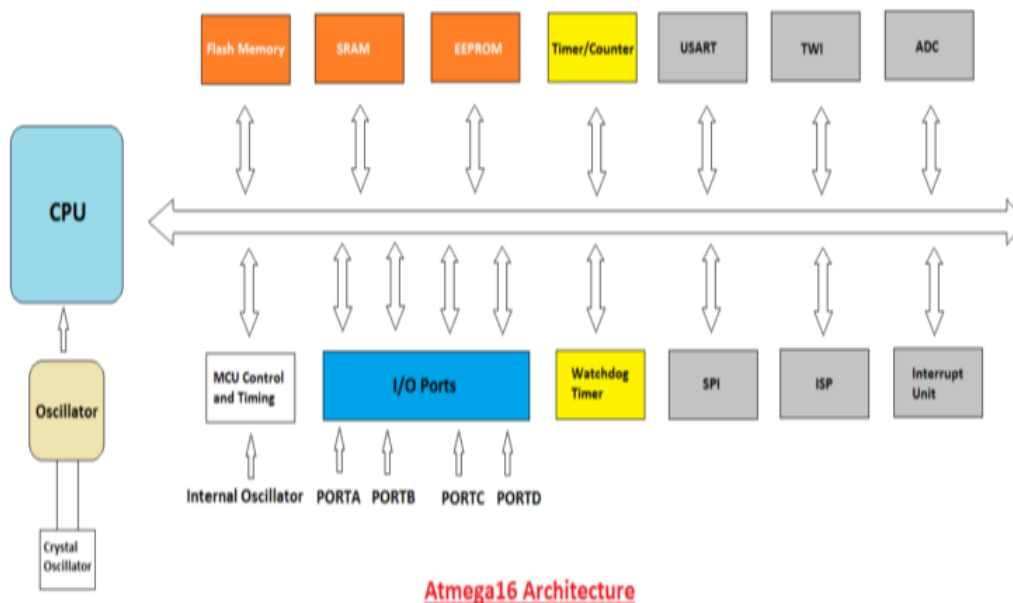


Figure 3.2 Architecture of Atmega16 [9]

### 3.2.3 ATMEGA16 PIN DIAGRAM

Figure demonstrates the pin diagram of this AVR microcontroller. It is favored over different microcontroller on the grounds that it accompanies a lot quicker capacity to process out directive and comprise of altered RISC (Reduced Instruction Set Computer) processor and it has been worked in glimmer which accompanies highlights of a boot loader[9].

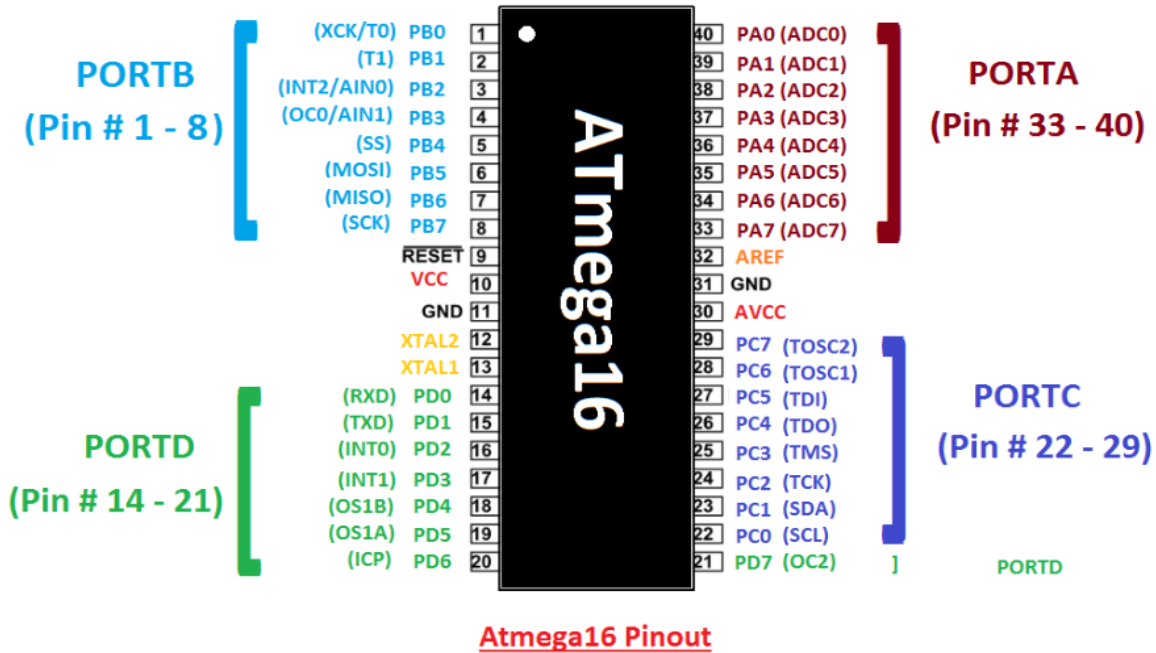


Figure 3.3 Pinout diagram of Atmega16 [9]

- PIN DESCRIPTION**

It accompanies 40 pins whose each stick is utilized to play out a particular undertaking. Tit has all out 32 pins (I/O) and ports(4). Every port comprises of 8 pins (I/O).

PORT NAME	NO. OF PINS	PIN NO.
PORTA	8	33 – 40
PORTB	8	1 – 8
PORTC	8	22 – 29
PORTD	8	14 – 21

Given below are the significant important function related to pins.

- **PORTA:** Pins number (30 to 40) falls under the category of PORTA. It's behaves like simple contributions to analog to digital convertor. Of the many cases, without A/D (Analog to digital) converter, PORTA is utilized as a bidirectional of 8-bit Input and output port. It accompanies with resistor.

Port Pin	Pin No	Description
PA7	33	ADC7 (ADC input channel 7)
PA6	34	ADC6 (ADC input channel 6)
PA5	35	ADC5 (ADC input channel 5)
PA4	36	ADC4 (ADC input channel 4)
PA3	37	ADC3 (ADC input channel 3)
PA2	38	ADC2 (ADC input channel 2)
PA1	39	ADC1 (ADC input channel 1)
PA0	40	ADC0 (ADC input channel 0)

### **PORTA # 33 - 40**

Figure 3.4 Description for pin number from 33 to 40 [9]

- **PORTB:** Pins number (1 to 8) has a place with PORTB. These are input/output bidirectional pins. These port additionally comprises with resistors.

Port Pin	Pin No	Description
PB7	8	SCK (SPI Bus Serial Clock)
PB6	7	MISO (SPI Bus Master Input/Slave Output)
PB5	6	MOSI (SPI Bus Master Output/Slave Input)
PB4	5	SS (SPI Slave Select Input)
PB3	4	OC0 (Timer/Counter0 Output Compare Match Output)
PB2	3	INT2 (External Interrupt 2 Input)
PB1	2	T1 (Timer/Counter1 External Counter Input)
PB0	1	T0 (Timer/Counter0 External Counter Input)

### **PORTB # 1 - 8**

Figure 3.5 Description for pin number from 1 to 8 [9]

- **PORTC:** It's an Input/output bi-directional port that comprises of 8 numbers of pins and pins (22 to 29) have a place with this port. Like different ports, it accompanies with resistors.

Port Pin	Pin No	Description
PC7	29	TOSC2 (Timer Oscillator Pin 2)
PC6	28	TOSC1 (Timer Oscillator Pin 1)
PC5	27	TDI (JTAG Test Data In)
PC4	26	TDO (JTAG Test Data Out)
PC3	25	TMS (JTAG Test Mode Select)
PC2	24	TCK (JTAG Test Clock)
PC1	23	SDA(Two-wire Serial Bus Data Input/Output Line)
PC0	22	SCL (Two-wire Serial Bus Clock Line)

### **PORTC # 22 - 29**

Figure 3.6 Description for pin number from 22 to 29 [9]

- **PORTD:** Pin number (14 to 21) has a place with these ports. It's a bi-directional port where every pin has been utilized either as input or as output pin. In any case, there has an extra highlights related to these port like PWM, timer and interrupts.

Port Pin	Pin No	Description
PD7	21	OC2 (Timer/Counter2 Output Compare Match Output)
PD6	20	ICP1 (Timer/Counter1 Input Capture Pin)
PD5	19	OC1A (Timer/Counter1 Output Compare A Match Output)
PD4	18	OC1B (Timer/Counter1 Output Compare B Match Output)
PD3	17	INT1 (External Interrupt 1 Input)
PD2	16	INT0 (External Interrupt 0 Input)
PD1	15	TXD (USART Output Pin)
PD0	14	RXD (USART Input Pin)

### **PORTD # 14 - 21**

Figure 3.7 Description for pin number from 14 to 21 [9]

- **RESET:** Pin number 9 is a functioning as active low reset pin. The long pulse will create reset while short pulse is probably not going to create reset.
- **GND:** Pin number 11 is a ground or earth pin.
- **VCC:** Pin number 10 is a power source for pin for these controllers. In a running condition i.e. power supply of 5 V is required for these controllers
- **AREF:** Pin number 32 is a simple connecting pin predominantly utilized for analog to digital converter.
- **AVCC:** Pin number 30 is an AVCC which is a source of voltage for porta and ADC. It's associated to a channel which is low pass in nature through Vcc within the sight of ADC. Nonetheless, without ADC, AVCC is extenal associated with Vcc.
- **PIN 12 and 13:** An oscillator which is crystal in nature is associated with this number of pins. Microcontroller works at an internal frequency of 1MHz [9].

### 3.2.4 APPLICATIONS

Controller's AVR accompany wide scope of uses where computerization has required. Given below are the fundamental uses of Atmega16.

- For Home Automation purpose.
- Use as control device for pressure and temperature.
- Use for security systems.
- Use for automobiles.
- Use project related to arduino.
- Use for manufacturing of Embedded systems.
- Manufactured the equipment for medical purpose.

### 3.3 Electronic push Button switch

#### 3.3.1 INTRODUCTION

Pushbutton switches are two-position devices prompted with a catch that is crushed and released. Most pushbutton switches have an inside spring instrument reestablishing the catch to its "out," or "unpressed," position, for fleeting action. Some pushbutton switches will bolt on the other hand on or off with each push of the catch. Other pushbutton switches will stay in their "in," or "pressed," position until the catch is pulled haul out. These last sort of pushbutton switches typically have a mushroom-formed catch for straightforward push-pull action[9].



Figure 3.8 Electronic Push Button Switch [9]

#### 3.3.2 WORKING

A Push Button is a sort of switch takes a shot at a straightforward component called "Push-to-make". At first, it stays in off state or typically open state yet when it is squeezed, it enables the current to go through it or we can say it makes the circuit when squeezed[9].



# Pushbutton switch

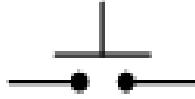


Figure 3.9 Push button diagram [9]

## 3.3.3 APPLICATION

- The design of the push button is such that it can accommodate a human finger to control the system easily. For machinery with complicated operations and various buttons, there are donations for separate colors of the push button. This enables users to identify what function the switch is bound to perform.
- For our daily applications, there are scarce guidelines for the color of the button, since only a few of them are common across multiple industries. For example, the red button frequently functions as the power button, while yellow indicates a pause.
- For industrial applications like machinery, the color meanings are more firmly defined in international standards [9].

## 3.4 MAGNETIC DOOR SWITCH

### 3.4.1 INTRODUCTION

It is an electrical switch that switches when an attractive field influences it. They are helpful in circumstances where moving components can't reach the switch, for example, in unstable situations. They are likewise ready to work in water [9].

### 3.4.2 FEATURE

- Size: 24mmX14mmX6mm
- Compact Size
- Suitable for Photocopiers, washing machines
- Contact Rating 10W 200 VDC, 0.5 A



Figure 3.10 magnetic door switch [9]

### 3.4.3 APPLICATION

- Liquid Level Control
- Flow Measurement
- Security Door Switch
- Washing Machines
- Sensing Rotations
- Distance Measurement

## 3.5 LCD (liquid crystal display)

### 3.5.1 INTRODUCTION

- LCD is the presentation module which can show the two letters in order and numeric qualities and some uncommon images. We will talk about the speck lattice LCD which is little in size. As a result of its little text dimension, LCD generally utilized for portability or handhold electronic items or in wherever the presentation perusing separation is small.

LCD(Light Emitting Diode) accessible in various sizes columns and each line contain 16 columns. LCD(Light Emitting Diode) with this size can show a limit of 32 characters. Single Colum can show a solitary character. Fig.



Figure 3.11 Light Emitting Diode [9]

### 3.5.2 PIN DESCRIPTION

Pin illustration as shown in figure below:



Figure 3.12 Pin Diagram [9]

- **PIN 1:** VSS. Pin is associated with ground.
- **PIN 2:** VDD. Is connected with +v 5volt path of the power supply.

- **PIN 3:** Complexity Control Pin. To shift the differentiation of the LCD we need to alter the voltage on this stick for that we can associate the variable resistor on this stick which goes about as voltage jumper.
- **PIN 4:** RS. This is the Register select stick. It is used to make determination b/w Command & Data Register. In the event that RS stick is 0(low) it chooses the Command register. On the off chance that RS stick is 1(high) it chooses the information register. There are two registers in the LCD for example Order register and Data Register. Direction register dependably holds the directions. The Command which we need to execute in LCD must load in the Command register. Prior to the showcase, we should execute some order to instate the LCD. There are some different directions which are discretionary and can be utilized by necessity. Information register dependably holds the information which we need to show on the LCD screen. Now this data must be in ASCII code.
- **PIN 5:** WR/RD. pin has a double capacity. Rationale 0(low) on this stick chooses the LCD in the Write mode. Rationale 1(high) on this stick chooses the LCD in Reading mode.
- **PIN 6: Enable** In the wake of sending the Command or Data we need to give an empower signal on this pin as high to low.
- **PIN 7 : D0**
- **PIN 8: D1**
- **PIN 9: D2**
- **PIN 10:D3**
- **PIN 11: D4**
- **PIN 12:D5**
- **PIN 13: D6**
- **PIN 14: D7**
- **PIN 15:** Back light (LED) Light Emitting Diode anode. This particular pin must be connected to +5 via register.
- **PIN 16:** Back light (LED) Light Emitting Diode cathode. This particular pin must be connected to ground path of power supply.

## 3.6 Global System for Mobile Communications (GSM)

### 3.6.1 INTRODUCTION

Global System for Mobile Communication (GSM) is a wide area remote exchanges system that uses automated radio transmission to give voice, data, and media correspondence organizations. A GSM system sorts out the correspondence between a phones (versatile stations), base stations (cell goals), and trading structures. Each GSM radio channel is 200 kHz wide channels that are also segregated into housings that hold 8 plan opportunities. GSM was at first named Groupe Special Mobile. The GSM system consolidates phones (flexible stations), radio towers (base stations), and interconnecting trading structures. The GSM structure allows up to 8 to 16 voice customers to share each radio channel and there may be a couple of radio channels for each radio transmission site (cell site).

Figure demonstrates a review of a GSM radio framework. This chart demonstrates that the GSM framework incorporates versatile specialized gadgets that convey through base stations (BS) and a portable exchanging focus (MSC) to associate with other cell phones, open phones, or to the Internet. This graph demonstrates that the MSC interfaces with databases of clients. This precedent demonstrates that the GSM framework cell phones can incorporate cell phones or information specialized gadgets, for example, PCs [10].

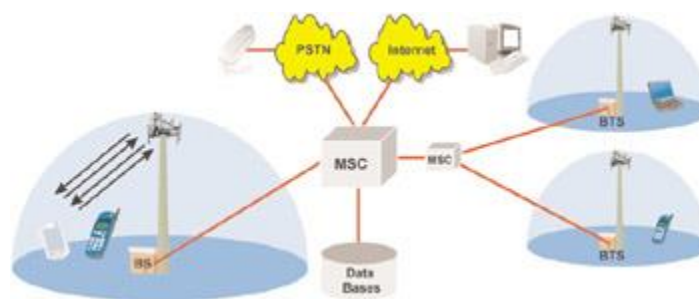


Figure 3.13: Global System for Mobile Communications (GSM) [10]

The GSM determination was at first made to give a solitary industry standard to European cell frameworks. In 1982, the improvement of the GSM detail started and the main business GSM

framework started activity in 1991. In 2004, there were more than 1.046 billion GSM supporters in 205 nations.

### 3.6.2 Architecture and Working

Given below flowchart or figure (GSM architecture):

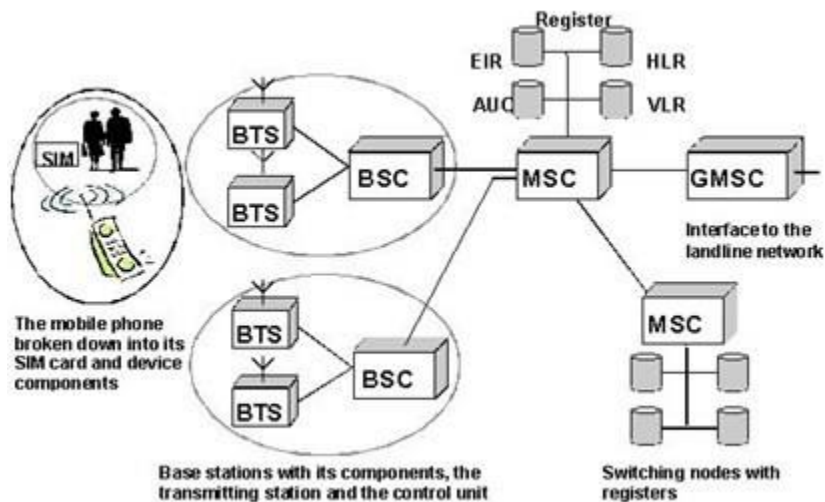


Figure 3.14: GSM Architecture Diagram [10]

Followings are the main components of GSM architecture:-

- **MOBILE STATION (MS)**

Mobile Station (MS) give provide permission for GSM arranges. It's principle part of GSM architecture. It's has been accompany with two segments.

1. Subscriber Identity Module (SIM)
2. Mobile Equipment (ME)

- **SUBSCRIBER IDENTITY MODULE (SIM)**

It's a principle part of GSM design because number subtleties of meaning of system like principle Ki, calculations A3, A5 and A8. An expression of request or a pin is securing close. Its can move of the phone with the goal that is called by phone and its has important data to initiate the phone.

- **MOBILE EQUIPMENT (ME)**

There are number of portable gear being utilized for this engineering. These can be dispositive convenient, mounted on vehicle, held in the hand. Each gadget has the sound just recognized from an IMEI. These cell phones are in charge of voice and information transmission at the same time. It works at power level 0.8 – 20 W.

- **BASE STATION CONTROL (BSC)**

The controller of fundamental station controls the assets by low low sulfur content using radio. He appoints to the recurrence and the areas of time for all the of thousandth in his division. He additionally coordinates the establishment of call, usefulness of adjustment. He gives to the conveyance to every 1000th and the correspondence Cam and the Low Sulfur Content. BSc likewise gives the administration of the assets by radio. It's allocates & its discharges to frequencies and segments of time for all the 1000<sup>th</sup> in his division. One takes control frequencies between cells once more.

- **BASE TRANSCEIVER STATION (BTS)**

The Station of accepting transmitter brings down code, computes multiplex, tweaks & acquaints the sign of RF with the radio wire. It's create the technique for the recurrence hop, speaks with the mobile station and BSC. It's comprises of the units of getting transmitter(TRx).The Low Sulfur Content gives the protection by radio of GSM in a cell. It's infers the radio that it transmits and that gets gear and the treatment of the sign partner in GSM engineering.

- **VISITOR LOCATION REGISTER (VLR)**

A visitor location register (VLR) circle, like a HLR, that is utilized by the nets you outfit to the profiles of taken of fleetingness for the clients (those are out of their focal field). This information of VLR is low on the sought information client of a HLR.

- **BASE STATION SUBSYSTEM (BSS)**

With air interface Base Station Subsystem (BSS) gives MS and Network Station Subsystem (NSS). Base Station Subsystem (BSS) comprises with following components.

1. One TRAU (Transcoding Rate and Adaptation Unit)
2. One or more BTS

### 3. One BSC

- **HOME LOCATION REGISTER (HLR)**

It's contains given client as given of record, the inclinations client, account position gadgets have undersigned with to the client, the present circumstance of the client, and so on the information preserved in HLR for the few kinds of nets are comparable yet they contrast in certain subtleties

- **MAIN SWITCHING CENTER (MSC)**

The focal point of primary replacement is the core of the net. The correspondence between the GSM and different nets controls. Draft the capacity of arrangement of call and the compensation, the development of call, the data of invoicing and the accumulation of base. It is additionally assumes significant job in GSM engineering.

- **GATEWAY MSC**

The Gateway MSC with an interface to other system like Public Switched Telephone (PSTN) is known as passage fundamental exchanging focus.

- **EQUIPMENT IDENTITY REGISTER (EIR)**

Global System for Mobile (GSM) MS conceivable to work any substantial GSM SIM. An open door exists for underground market and stolen hardware. To battle these issues EIR is present and track such hardware.

- **AUTHENTICATION CENTER (AUC)**

Authentication center (AUC) takes care of not for looter or hoodlum amid air interface. Its keeps the verification keys and allowed the security triplets. It's a typically connected with the HLR.

### 3.6.3 APPLICATION

- **ACCESS CONTROL DEVICES:** Now get to control gadgets can speak with servers and security staff through SMS informing. Complete log of exchange is accessible at the head-office Server immediately with no wiring included and gadget can in a split second



ready security work force on their cell phone if there should arise an occurrence of any issue.

- **TRANSACTION TERMINALS:** EDC machines, POS terminals can utilize SMS informing to affirm exchanges from focal servers. The primary advantage is that focal server can be anyplace on the planet. Today you need neighborhood servers in each city with different phone lines. You spare gigantic framework costs just according to exchange cost.
- **SUPPLY CHAIN MANAGEMENT:** Today SCM require gigantic IT framework with rented lines, organizing gadgets, server farm, workstations and still you have enormous personal times and surprising expenses. You can do this at a small amount of the expense with GSM M2M innovation. A focal server in your mind office with GSM ability is the appropriate response, you can get moment exchange information from all your branch workplaces, distribution centers and business partners with nil personal time and ease [10].



Figure 3.15: GSM

### 3.7 METHOD

S.No.	DAY	No. of Times	Hours
1	MONDAY	3	(60+30+30)MINUTS =2HOURS
2	TUESDAY	4	(30+30+10+20)MINUTS =1HOUR 30MINUTS
3	WEDNESDAY	2	(30+15)MINUTS =45 MINUTS
4	THURSDAY	4	(20+15+60+10)MINUTS =1HOUR 45MINUTS
5	FRIDAY	3	(30+15+15)MINUTS =1 HOUR
6	SATURDAY	2	(30+20)MINUTS =50 MINUTS
7	SUNDAY	3	(60+30+20)MINUTS =1HOUR 50 MINUTS

Table 3.1: Data from Chair Switch

$$\begin{aligned}\text{Mean of the week} &= \text{Sum of the hours} / \text{No. of Days} \\ &= 2+1.5+0.75+1.75+1+0.84+1.84 / 7 \\ &= 1.38 \text{ (Approx.)} \\ &= 1.45 \\ &= 1\text{HOUR } 45 \text{ MINUTS}\end{aligned}$$

We have the data of the week and by analyzing it we came to the solution that we can take the average time of a person to sit on the chair is 1 hour and 45 minutes and if the person is sitting on the chair for more than this time then the warning message may go to the care taker and also the buzzer will ring.

Now the main question that arises is that will there be any false alarm or will there be failure of the system?

We have decided to give a reset button in the chair also. The function of this false button will be that if there is any false alarm the person may push this button to stop the alarm and the false emergency message may not go to the guardian.

The significance of using the chair in our project was that we can use it in real time and the data was getting stored in the EPROM of the microcontroller. We can use the data whenever we want and also pause/play the system whenever we needed. The work of a week gave us a surety that it is a feasible idea and the message of emergency was working properly. The clock of 1 hour 45 minutes is the mean of the data that was collected with one week of patience.

We chose to use the home monitoring system rather than the simple cameras because it hindered the privacy of the person living in the home. Also by using the GSM technique we can display the emergency alarm to the guardian.

A reset button will be present near the entrance of the house which can only be switched off manually. So the neighbor or a passersby can hear the alarm and he may help the person in need.

Once all the things are done and the data is collected manually the data is feuded in the system manually and it will work till the system is kept on. The data shall not be erased automatically as the data is been stored in the EPROM and can only be edited with the help of the burner through the help of the program. We used 4 emergency switches which will be installed in different places like in the chair in bathroom and near the bed. This switch will directly send the emergency message to the nearby care taker. In this way the elderly person can directly send the message to the nearby person and by this quick action cane be taken by the care taker.

We have used the bed switch. This switch will be kept on for the time the person will be on the bed. For example the person sleeps for eight hours in bed and at some time there is the casualty and the person does not get up in eight hours or for the set time then there will be an emergency alarm. Now the question arises that if the person decides to sleep during the day. At this the real time clock comes in picture. It says that there will be a demo for a week in which the real time will be captured and then it will be working on that time. Whole of the data will be captured in EPROM of the microcontroller. This will create a real time.

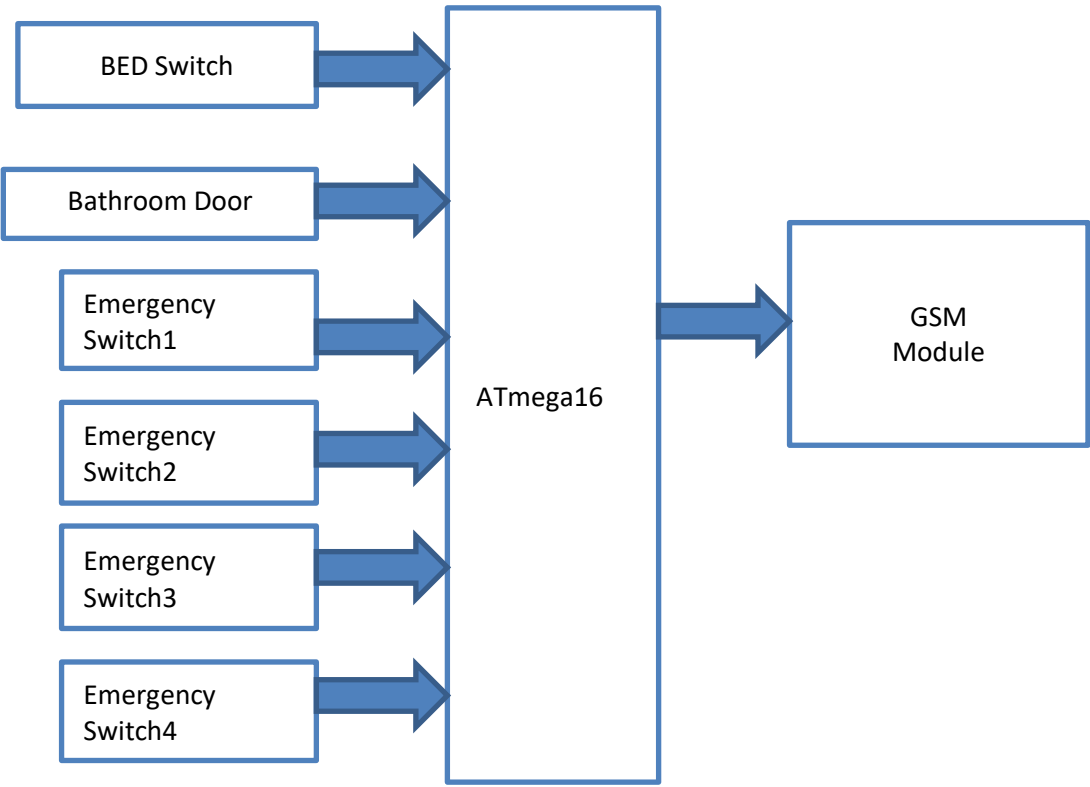


Figure 3.16: System description

- **Atmega16:** All the devices will be connecting with ATmega16 which control the whole functioning according to software.
- **Bed Switch:** This is the Push to On switch that placed on the bed of elder person. When elder person placed on the bed the switch turned on the timer of microcontroller that

counts down the sleeping time of elder person on the bed. If it got more than usual time a message /call send to other person using GSM module.

- **Bathroom Door switch:** This is the Push to On switch that placed on the Bathroom door. When door of bathroom closed, the switch turned on the timer of microcontroller that counts down the bathing time of elder person on the bed. If it got more than usual time a message /call send to other person using GSM module.
- **Emergency Switches:** The multiple emergency switches placed in hall or in house. Whenever elder person not feel good he /she can press the switch that send the emergency message to other person
- **GSM Module:** The GSM module connected with ATmega16 used to send the messages.

## **Chapter 4**

### **Result**

We start with four emergency switches, one chair switch, one bed switch and one bathroom switch. Made the board of switches with soldering and installed it with the microcontroller. We used LED to give the physical display of data and to help us know the process which is been done by the system. We then applied the switches in the microcontroller board. One is the display button and other is clear button. Display button shows how many times particular switch is pressed. For example if the person goes to the bathroom three times then it will display three and he sits on the chair two times then two shall be displayed on the screen. Now clear button comes into picture. This button clears the data which is stored in the microcontroller. As already discussed all the data is stored in the EPROM this clear button clears the data. A refresh button is also installed in the microcontroller board. This is used when the emergency alarm fires. This stops the system automatically and restarts the whole system.

A GSM module is used in the system. This helps to send an emergency alarm to the phone number which is applied in the system. An emergency message “EMERGENCY ALERT” is sent to the phone number when either of the emergency switch is pressed. A message “TIME OVER IN BATHROOM” when the bathroom door is on for more than three minutes. A message “TIME OVER ON CHAIR” when the switch of chair is pressed for three minutes. A message “TIME OVER ON BED ” when the switch of bed is pressed for three minutes.

In practical use we came to the solution that a person sits on the chair for one hour and forty-five minutes. This is the practical assumption and is verified by using the system for a week.

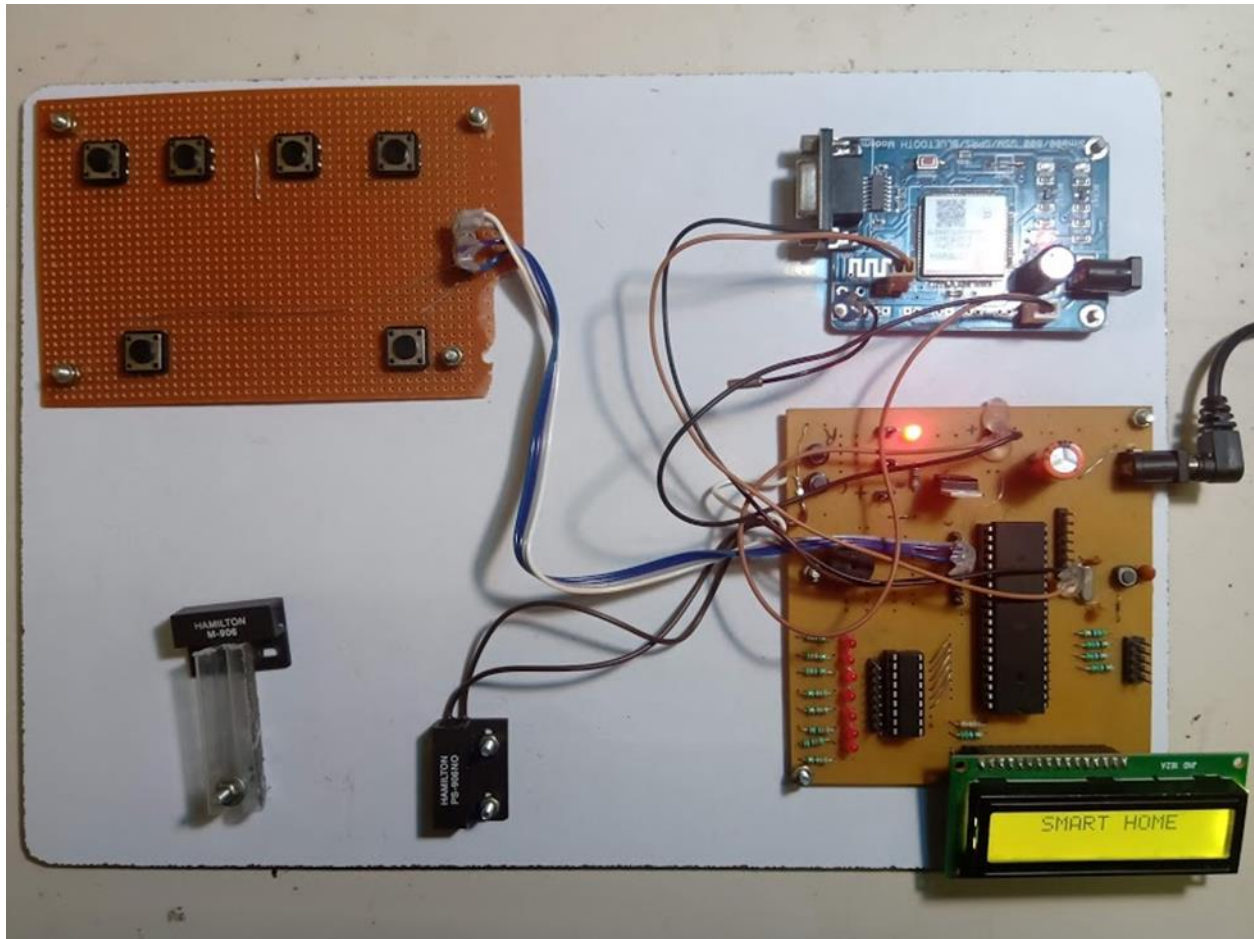


Figure 4.1: Photo of actual system

The basic structure of our project when we power it on. LED glows and start with the message “SMART HOME” been displayed on the screen. At this point all the components are on rest position. The sim in the GSM module is installed and the N/W LED on the GSM module starts glowing. This shows that the module is finding signal. When the signal is found this LED stops blinking. At this time we can start our project.

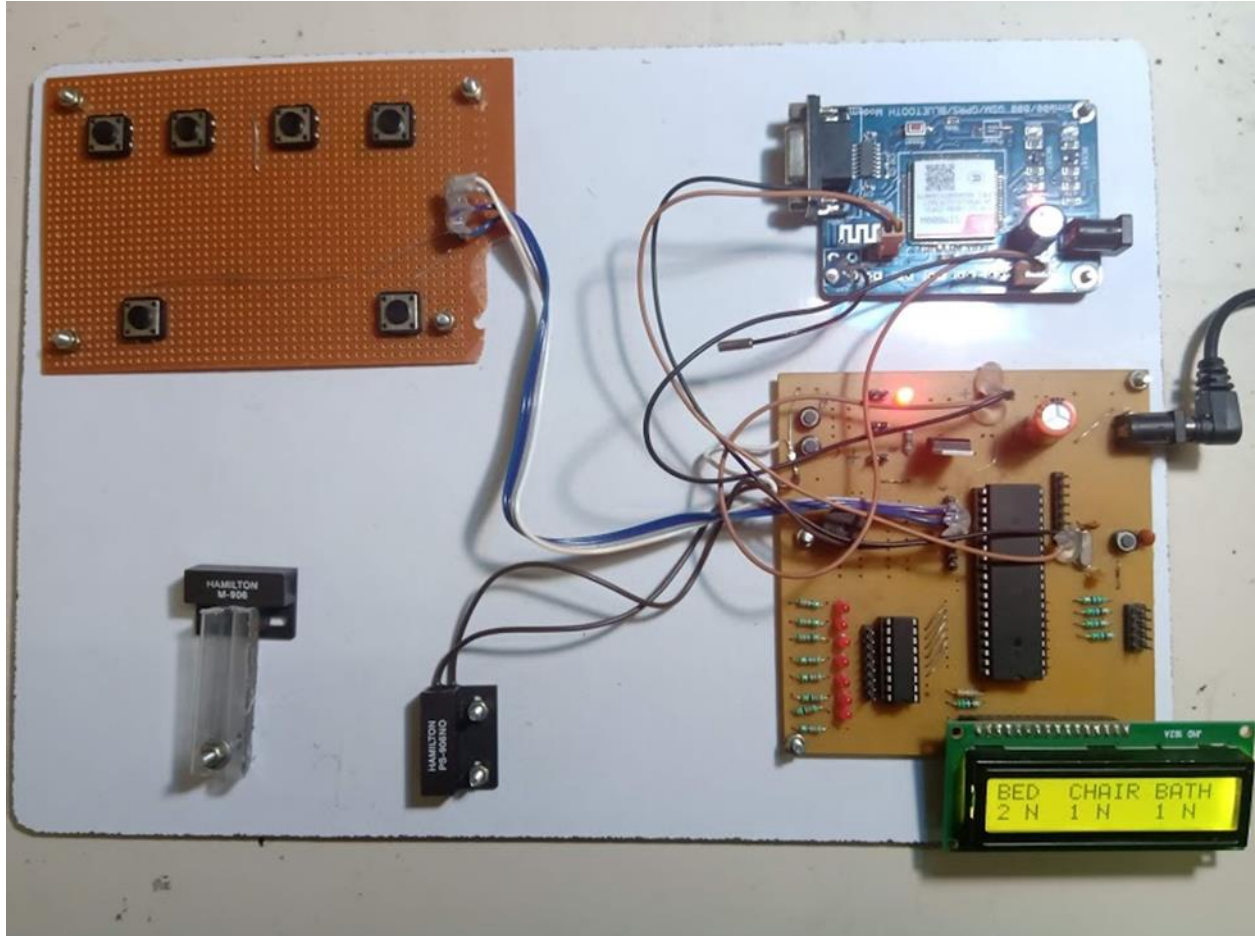


Figure 4.2: Showing the number of times person uses different facility

C and R switches are installed in the microcontroller board. When R button is pressed, LED shows the data of number of times the switch is been pressed. For example we can see in the picture that BED switch is pressed two times, Chair switch is pressed one time and BATH door is in function for one time. This finds the number of time particular task is been done. This data is stored in EPROM and can be deleted manually with the help of C switch.



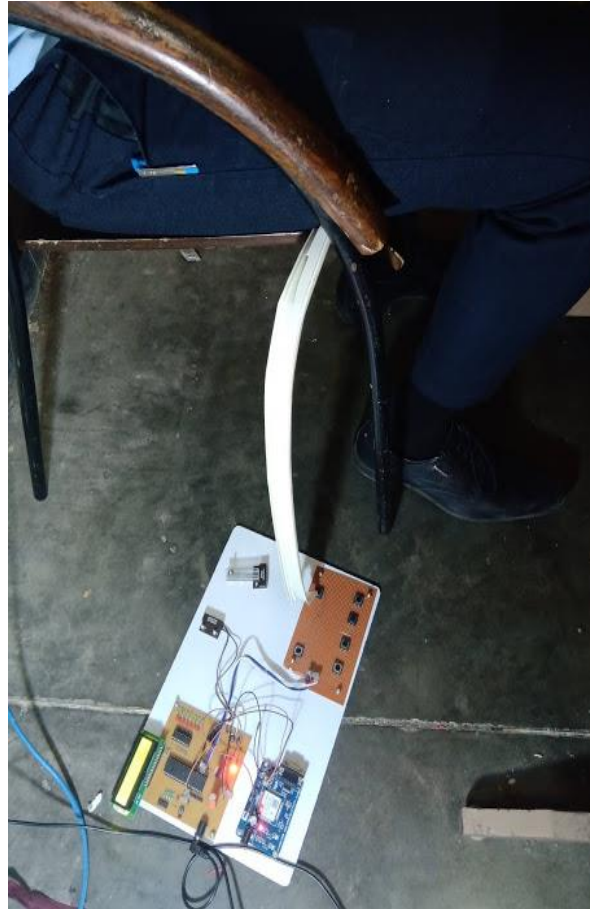


Figure 4.3: Collecting data using Chair switch

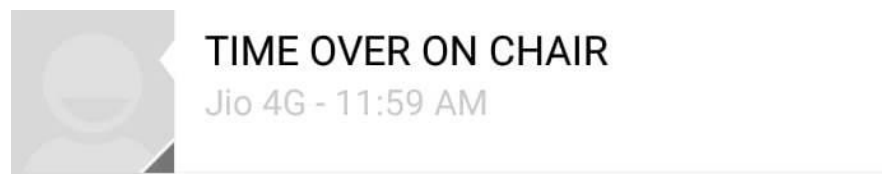


Figure 4.4: Message received on phone

This picture shows the practical use of the chair switch. When a person sits on the chair the chair switch gets activated. If a person sits on the chair for more than one hour forty-five minutes then the buzzer starts ringing. And the message “TIME OVER ON CHAIR” goes on the phone registered.

## **Chapter 5**

### **CONCLUSION & FUTURE WORK**

- **CONCLUSION**

The basic idea of home monitoring system is to analyze the time table of the elderly person and to schedule the day of the person in the same way. By having a brief idea of the day of an elderly person, the care-taker can have an idea of what the person is doing in the home. The privacy of the person is also not breached. By putting the emergency button in various places, a person can send direct message to the care taker within seconds. The clear button resets the whole system and can only be pressed manually. Home monitoring provides the luxury to keep an eye on the elderly person without being physically present at the place.

- **FUTURE WORK**

We can use different sensors like force and motion sensor to use the system in physical domain. The main disadvantage of our project is that it is feasible only for one elderly person i.e. if only one person is living in the house then only it will work efficiently. We can add multiple sensors and make a connection in different parts of the house. We have collected the data of chair. The installation of bed switch and bathroom gate is still to be done.

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