Microcontroller &GSM Based Home security system.



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Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhere else for the award of any degree.

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Certification

This is to certify that this project entitled **"Microcontroller & GSM Based home security system"** is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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ABSTRACT

Ensuring securitization is an important factor in the current world. It is not possible for a man to take care of his house, his belongings at all times. Through this project, we have shown how to ensure the safety of our homes from afar and receive notifications about any accidents or unwanted situation.

Microcontroller and GSM Based Home security system ensures the maximum security of a home. This security system that maintains several security to make secure position very cleverly. With this protection system, the homeowner receives a notification from home about any unusual situation.That why we came with the idea of Microcontroller& GSM Based Home security system.

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LIST OF ABBREVIATION

DC	Direct Current
LED	Light Emitting Diode
GND	Ground
CKT	Circuit
GSM	Global System for Mobile Communication
LDR	Liquid Crystal Display
SIM	Subscriber Identity Module
SMS	Short Massage Sent
PDA	personal digital assistant
I/O	Input / Output

CHAPTER I

INTRODUCTION

1.1 Introduction

It is not possible for a man to take care of his house, his belongings at all times. Microcontroller and GSM based home security system that maintains several security and make secure position very cleverly. It is very suitable for office, home, industry for high security. That's why we came with the idea of Microcontroller and GSM Based home security system.

This project has 4 basic modules along with a GSM modem. GSM module is used to send the SMS whenever there are changes in any of the four modules.

- First module of this project is laser light. It is detects if any person is entering inside the house area from anyside of boundary. This feature is helpful at night time or whenever we are out of our home.
- Second part of project is ultrasonic sensor to detects if any person is entering inside the sensor area.
- Third module is capacitive touch sensor uses serves the functionality of a door opening. As well as sending this data to a GSM modem through serial port. This module also turns on buzzer.
- The fourth module uses Limit switch to detect the door is sopened or close. If the door is open then buzzer is turned on and the GSM send a sms.

The microcontroller receives signals from these four modules and send SMS to the owner using GSM module. Through this project, we have shown how to ensure the safety of our homes.

1.2 Background Study

GSM can trace its origins as far back as 1975 when Henry Kieffer from the Swiss PTT suggested Europe needed to find new spectrum for mobile at 900 MHz – the vital raw material for radio.

Setting-up of GSM was the next significant milestone. Similar standards activity also started in USA and Japan. In those countries the standards responsibility for the radio and the linked network were split between different standards bodies. A similar split had existed inside CEPT. The critical decision in 1982 was to allow GSM to define everything it needed for itself. This secured a competitive edge for European mobile standards making.

1.3 Objectives

The main objective of this system is to introduce to GSM based home security system with microcontroller technology, Laser security, Ultrasonic sensor, Capacitive touch switch, Limit Switch. The supplementary objectives of this project are as follows:

For security and well management, time-saving, accurate identification is the demand of this time. So, use of GSM system, Microcontroller GSM Based home security is essential to tackle situation & make home and other area is secure.

AGSM Based home security system make all system more convenient than conventional system. It is fair to say that the purpose of our project is to create a system for automatically operating and utilizing all the necessary equipment of an home securitysystem.

1.4 Project Organization

In this report, Chapter one covers introduction, background, objectives. Chapter two represents theory, description of the microcontroller technology, Laser security, Ultrasonic sensor, Capacitive touch switch, Limit Switch and other components. Chapter three describes and working principle of the project. In chapter four we have discussed result and discussion, cost estimation, future modification, conclusion.

CHAPTER II

THEORY OF THE PROJECT

2.1 Introduction

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of Arduino Uno, microcontroller,GSM Module,Ultrasonic Sensor, Touch Sensor, Limit switch, Resistor, Transistor, Vero board, and other components. Here we can know that the total system overview of the projects. And we will also know that how the equipment are working with each other.

2.2 Theory

We've developed the system that can handleevery situation and every system perfectly. Our system has several automation system. Based on those circumstances our systemcan manage various sytem and situation in home such as laser security, Motion security, touch security, door security.

2.2.1 Arduino Uno

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs and turn it into an output. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software, based on Processing.

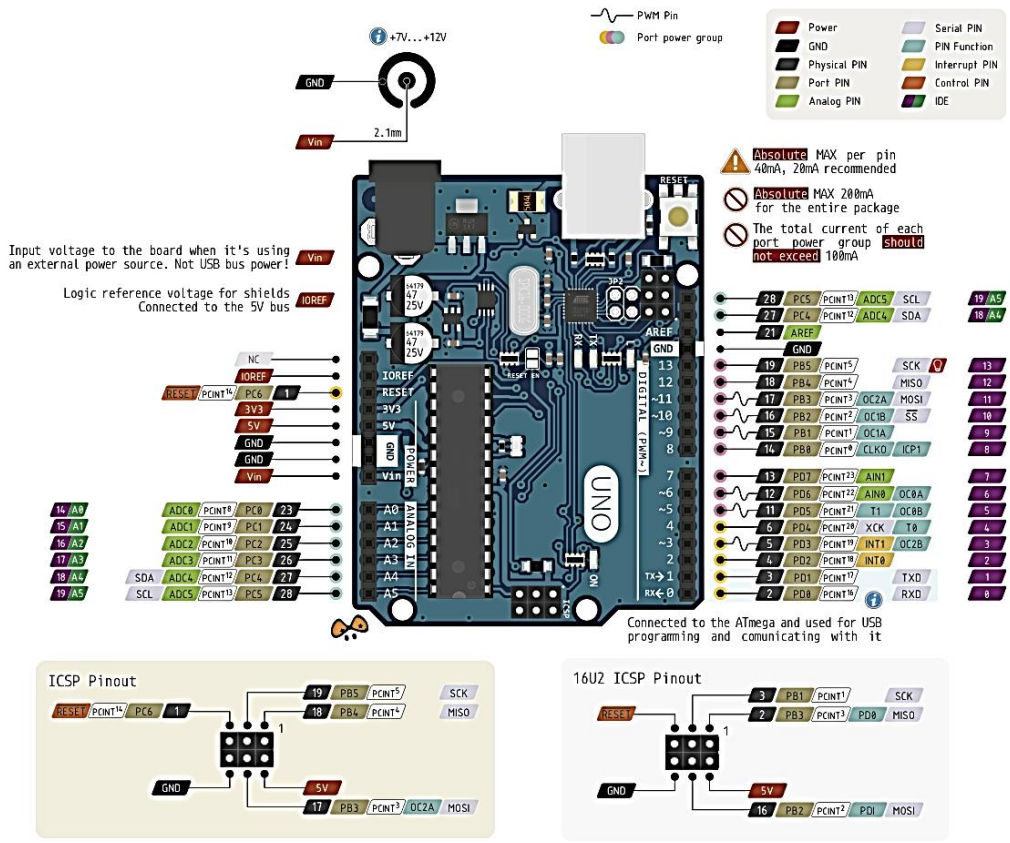


Fig: 2.2.1.1 Arduino UNO Pin Diagram

Technical specificationsof Arduino UNO:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6 (3,5,6,9,10,11)
Analog Input Pins	6 (A0,A1,A2,A3,A4,A5)
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz

Table 2.1: Technical specifications of Arduino UNO

2.2.2 GSM Module (SIM 900a)

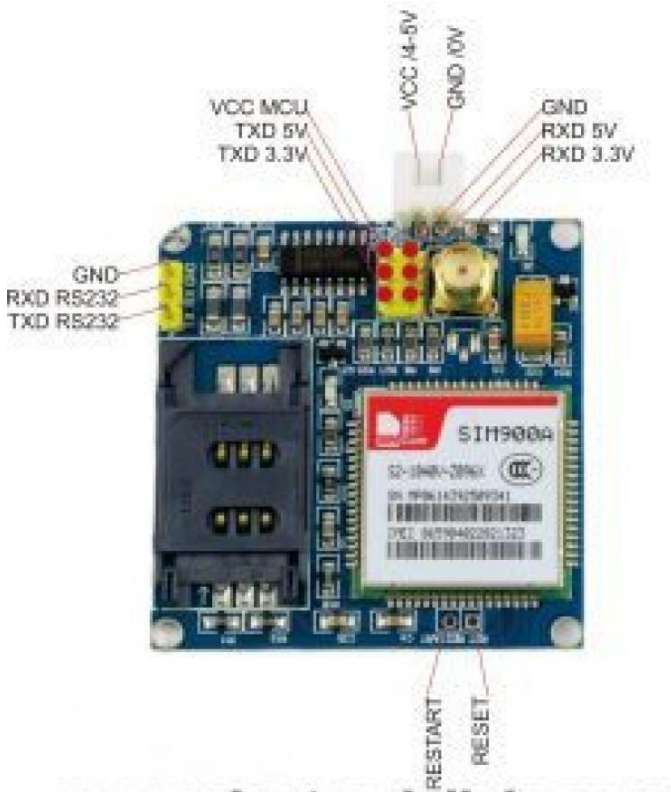


Table 2.2.2.1: GSM Module

GSM module is a specialized type of modem which accepts SIM card, and operates over a subscription to mobile operators. When the GSM module and computer are interconnected, there is communication over the mobile network. Though these GSM modems are most frequently used to provide mobile internet connectivity, most of them can also be used for sending and receiving SMS. This device can also receive and process GSM signals from virtually all GSM bands.

GSM module can be a dedicated modem device with serial, USB or Bluetooth connection, or mobile phone that provides GSM module capabilities. To perform the task, GSM module must support an "extended AT command set" for sending/receiving SMS messages. The GSM modem used for the work is configured using standard AT commands that can carry out operations of

conventional phone. The major usefulness of the module is its ability to interface with other circuit elements like the microprocessor hence making it possible to embed it with other systems.

SIM900A is an ultra compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single-chip processor integrating AMR926EJ-S core, allowing you to benefit from small dimensions and cost-effective solutions

The SIM900A is a readily available GSM/GPRS module,used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

SIM900A GSM MODULE Features

- Single supply voltage: 3.4V – 5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands:SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GSM class: Small MS
- GPRS connectivity:GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
- Operating Temperature: -30ºC to +80ºC
- Storage Temperature: -5ºC to +90ºC
- DATA GPRS: download transfer max is 85.6KBps, Upload transfer max 42.8KBps

- Supports CSD, USSD, SMS, FAX
- Supports MIC and Audio Input
- Features keypad interface
- Features display interface
- Features Real Time Clock
- Supports UART interface
- Supports single SIM card
- Firmware upgrade by debug port
- Communication by using AT commands

2.2.3 Laser Light

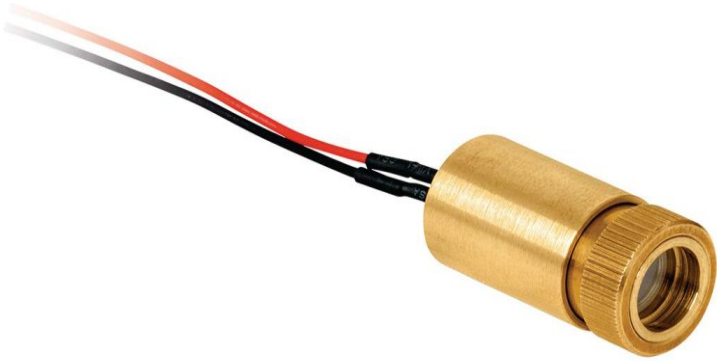


Fig:2.2.3.1: Laser Light

Laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation".

Specifications of Laser:

- Oparate in 5 V DC
- Auto power control IC inside
- Low current consumption of the APC circuit
- Surge current protection
- High quality glass lens for output beam
- Adjustable focus

2.2.4 Ultrasonic Sensor



Fig:2.2.4.1: Ultrasonic Sensor

The HC-SR04 ultrasonic sensor uses sonar to measure distance to an object. It offers excellent range accuracy and stable readings in an easy-to-use package. It operation is not affected by sunlight or black material like sharp range finders are (soft materials like cloth can be difficult to detect).VCC, trig (T), echo(R), GND. The basic operation principle is below, use IO port TRIG to trigger ranging. It needs 10 us high level signal at least module will send eight 40 kHz square wave automatically and will test if there is any signal returned. If there is signal returned, output will be high level signal via IO port ECHO. The duration

of the high level signal is the time from transmitter to receiving with the ultrasonic. Testing distance = duration of high level x sound velocity(340m/s) / 2 It can use the above calculation to find the distance between the obstacle and the ultrasonic module.

Features of Ultrasonic Sensor:-

- Working Voltage: 5V(DC)
- Static Current: Less than 2mA
- Output Signal: Electric frequency signal, high level 5V, low level 0V
- Sensor Angle: Not more than 15 degrees
- Detection Distance: 2 cm to 450 cm
- High Precision: Up to 2mm
- Input Trigger Signal: 10us TTL impulse
- Echo Signal: Output TTL PWL signal
- Note: The module has a blind spot of 2cm (very near)
- So obstacle held too closely will not be detected

2.2.5LDR

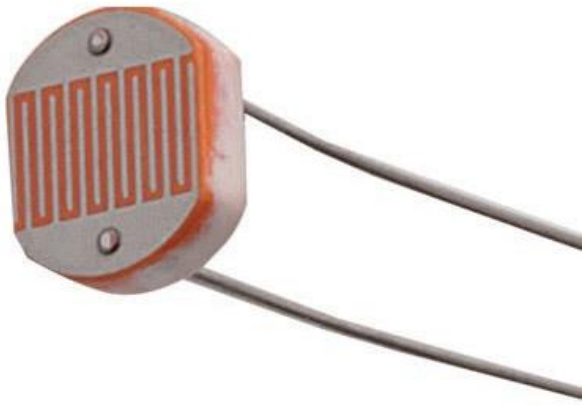


Fig:2.2.5.1: LDR

LDR 10 mm Photo Resistor.LDR or Light dependent resistor is a low cost sensor device which responds to visible light. As the intensity of the light falling over LDR increases, its resistance decreases while the resistance increases if light falling over LDR decreases.

Features of LDR:

- Oparate in 2 to 5 Volt
- Wide spectral response
- Use in fire alarms, smoke alarms, control street light
- Low cost.
- Ambient Temperature Range.
- Wide spectral response.

2.2.6Capacitive Touch Sensor

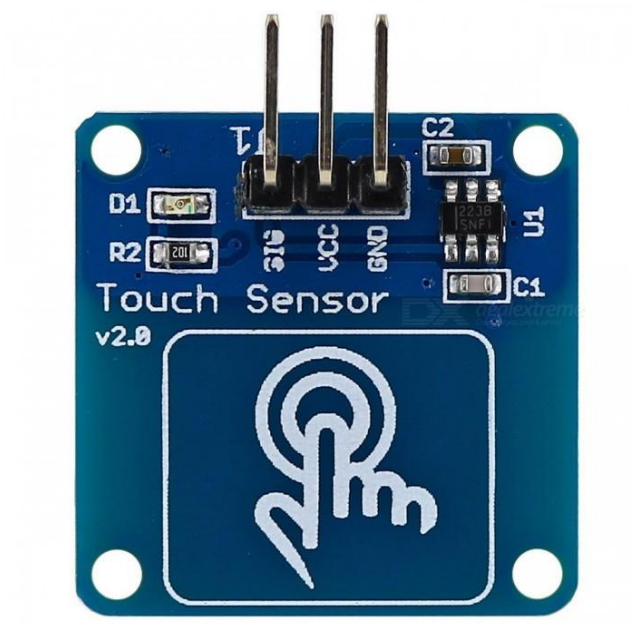


Fig:2.2.6.1: Capacitive Touch Sensor

The module is based on a touch-sensing IC (TTP223B) capacitive touch switch module. In the normal state, the module output low, low power consumption; when a finger touches the corresponding position, the module output high, if not touched for 12 seconds, switch to low-power mode.

Features of Capacitive Touch Sensor:

- Low power consumption
- Power supply for 2 ~ 5.5V DC
- Can replace the traditional touch of a button
- Four M2 screws positioning holes for easy installation

Specification of Capacitive Touch Sensor:

Item	Min	Typical	Max	Unit
Power supply voltage VCC	2.0	3	5.5	V
Output high VOH	-	0.8VCC	-	V
Output low VOL	-	-	0.3VCC	V
Output Pin Sink Current (@ VCC = 3V, VOL	-	8	-	mA
Output pin pull-up current (@ VCC = 3V,	-	4	-	mA
Response time (low power mode)	-	-	220	mS
Response time (touch mode)	-	-	60	mS
Size	24x24x7.2			mm
Weight	2			g

Table 2.2.6: Technical specifications of Capacitive Touch Switch

2.2.7Limit Switch



Fig: 2.2.7.1: Limit switch

a switch preventing the travel of an object in a mechanism past some predetermined point, mechanically operated by the motion of the object itself.

Specifications of Limit switch:

Brand Name	uxcell
Current Rating	15.0 amps
Material	Plastic , Metal
Measurement System	Imperial , Metric
Model Number	a11021800ux0130
Part Number	a11021800ux0130
Size	V-156-1C25
Switch Type	SPDT , Limit Switch
Terminal	Spdt

Table 2.2.7: Technical specifications of Limit Switch

2.2.8. Switch



Fig: 2.2.8.1: switch

a switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another.

Specification of switch:

ROHS Compliant	Yes
Switch Type	Standard Rocker
Power/Voltage	0-220v
Usage/Application	MICRO CIRCUIT SWITCH
Material/Body	Plastic
Working Temperature	0-100F

Table 2.2.8: Technical specifications of Switch

2.2.9 Resistor



Fig: 2.2.9.1: 1 M ohm Resistor

Resistor is an electrical component that reduces the electric current. The resistor's ability to reduce the current is called resistance and is measured in units of ohms (symbol: Ω). If we make an analogy to water flow through pipes, the resistor is a thin pipe that reduces the water flow.

Specification of 1 M ohm Resistor:

1M Ohm Metal Oxide Film Resistors, Lot of 5 Pieces.

Tolerance: 5%.

Rated Power: 5 Watts.

Max. Working Voltage: 700V.

Dielectric Withstanding voltage: 1000V.

Size: L 24+-1mm, D 8+-0.5mm, H 30+-3mm, d 0.75~0.8mm..

2.2.10 Transistor

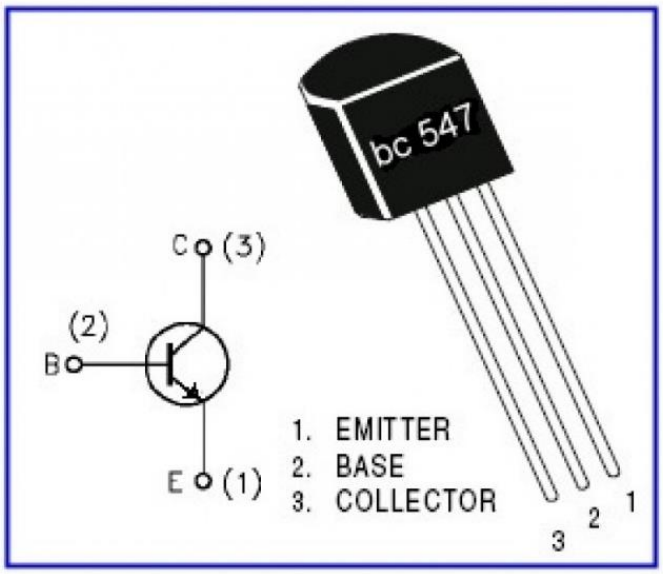


Fig: 2.2.10.1: BC 547 Transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

Specifications of BC-547 Transistor:

- BIPOLAR TRANSISTOR, NPN, 45V, TO-92
- Transistor Polarity: NPN
- Collector Emitter Voltage V(br)ceo: 45V
- Transition Frequency Typ ft: 300MHz
- Power Dissipation Pd: 625mW
- DC Collector Current: 100mA
- DC Current Gain hFE: 150

2.2.11 LED



Fig: 2.2.11.1: LED

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

Specification of LED:

- 1.8-2.2VDC forward drop
- Max current: 20mA
- Suggested using current: 16-18mA
- Luminous Intensity: 150-200mcd

2.2.12 Buzzer



Fig: 2.2.12.1: LED

Apply 3V to 5V to this piezo buzzer module and you'll be rewarded with a loud 2 KHz BEEEEEEEEEEEEEEEEP. Unlike a plain piezo, this buzzer does not need an AC signal. Inside is a piezo element plus the driver circuitry that makes it oscillate at 2 KHz. The piezo buzzer is 5V TTL logic compatible and Breadboard friendly pin spacing.

This buzzer is ideal when you need to fit a buzzer in a small place. It has its own built-in drive circuit. It offers low current consumption. Used in manufacturing applications such as laptops, alarms, pagers, etc.

Specifications of Buzzer:

- Operation Voltage: 3-5V DC
- Current: <25mA
- SPL: 85dBA/10cm
- Frequency: 2,300Hz
- Color: Black
- Operating Temperature: - 20° to +65°C
- Weight: 2.4 gram
- Size: 1.2cm diameter x 1cm tall (0.47" x 0.39")
- Pin Spacing: 7.6mm

2.2.13. 12V DC Power supply



Fig: 2.2.13.1: 12V DC Power Supply

2V DC 2 Amp power supply for use with high powered electronics device 2amp or more of 12 volt current. This power adaptor has sufficient amperage for use with power runs more than 150ft. be sure to check the power consumption (voltage and amperage) for your security equipment.

Specification of 12V DC Power supply:

- 12V DC Power Adapter
- Center Positive DC plug
- Fits a 2.1mm DC Plug
- 2 Amp output
- 2.1mm DC Plug, Center Positive
- Also compatible with other 12V DC devices
- Use in indoor area or within enclosure for outdoor use

2.2.14 Connecting wire



Fig: 2.2.14.1: Male-FemaleConnector

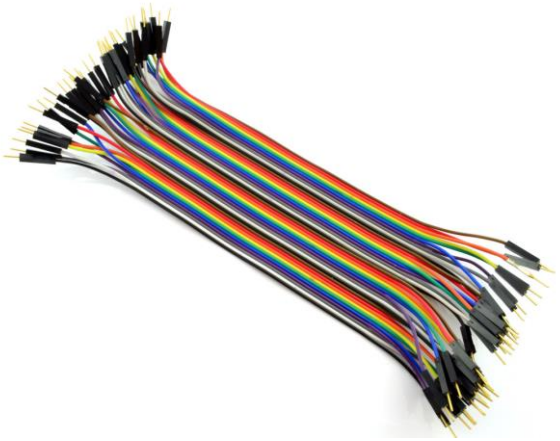


Fig: 2.2.14.2: Male-Male Connector

Set includes 40 PCs of multi-colored hook-up wires with a length of 20 cm. They are ended, on both sides, with male connector, type goldpin. Wires can be divided into single pieces. They are ideal for connecting the fields onthe breadboard &commissioning sets (e.g., Arduino, Bread Board). Cable length - 20 cm.

Specification of connecting cables

- Length: 20 cm
- Quantity: 40 pcs
- Type: matle-to-male
- Color: multi-color

2.2.15 Conclusion

In this chapter we have discussed the material, specification, use in this project also show the real image of the project and others. In the later part of this paper we discussed the result & discussion of the project to make the concept clear to anyone.

CHAPTER III

DESIGN& FABRICATION

3.1 Introduction

In this chapter fully cover with discuss design and fabrication of this project. Here we will discuss about developed block diagram and briefly describe about the circuit description and also learn about working principle. Total project flow chart is also available in this chapter.

3.2 Block Diagram

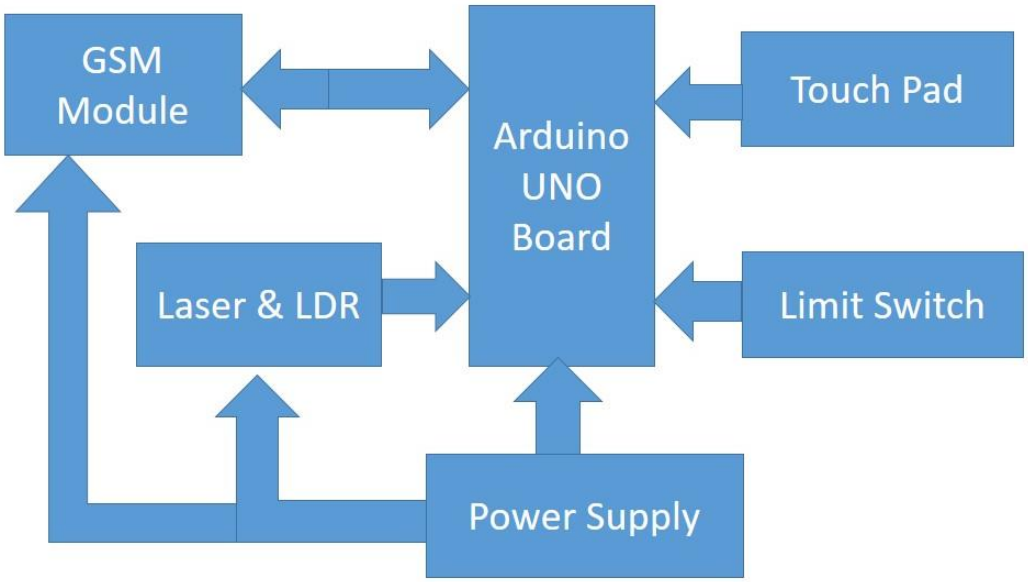


Fig: 3.2.1: Block Diagram of this project

Here's the block diagram of our Microcontroller & GSM based home security system. We can clearly describe the working process through this block diagram. Firstly we have two energy sources and DC power supply (12V) to supply low voltage dc and the voltage regulator of microcontroller convert this

12 V to 5 V and supply this 5 V to GSM Module, Arduino, Touch suitch, Limit Switch, Laser Light etc.

After supplying the voltage, all sensors & microcontrollers will be active.

The Laser lights detects any visible objects in the front and send a signal to Microcontroller.

The Ultrasonic Sensor detects any visible objects in the front and sends a signal to Microcontroller.

The Touch Sensor detects any Human touch in the door and send a signam to Microcontroller When anybody open the door then the limit switch send a signal to Microcontroller.

The microcontroller receives signals from a set of sensors and sends the message written to the program to the owner, with the help of a module, in terms of multiple sensors.

3.3 Circuit Description

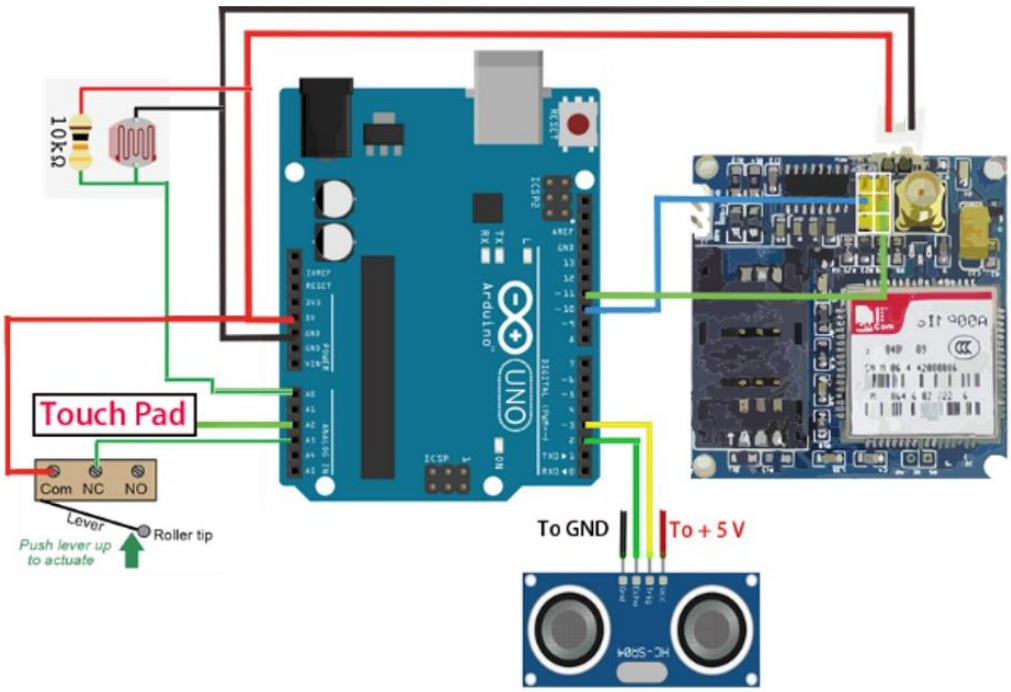


Fig: 3.3.1: Circuit Diagram of this project

In our circuit, we've used an Arduino as the controller, a GSM Module for send Massage, a Laser loght used to surround a area to detects any visible object in the area and sends a signal to the microcontroller, an ultrasonic sensor to control a selected area to detects any visible object to send a signal to the microcontroller. A touch sensor attach to door and detects any human touch and send a signal to the microcontroller. Limit switch also send massage to microcontroller whern the door is to be opened

3.4 Overview of GSM Technology

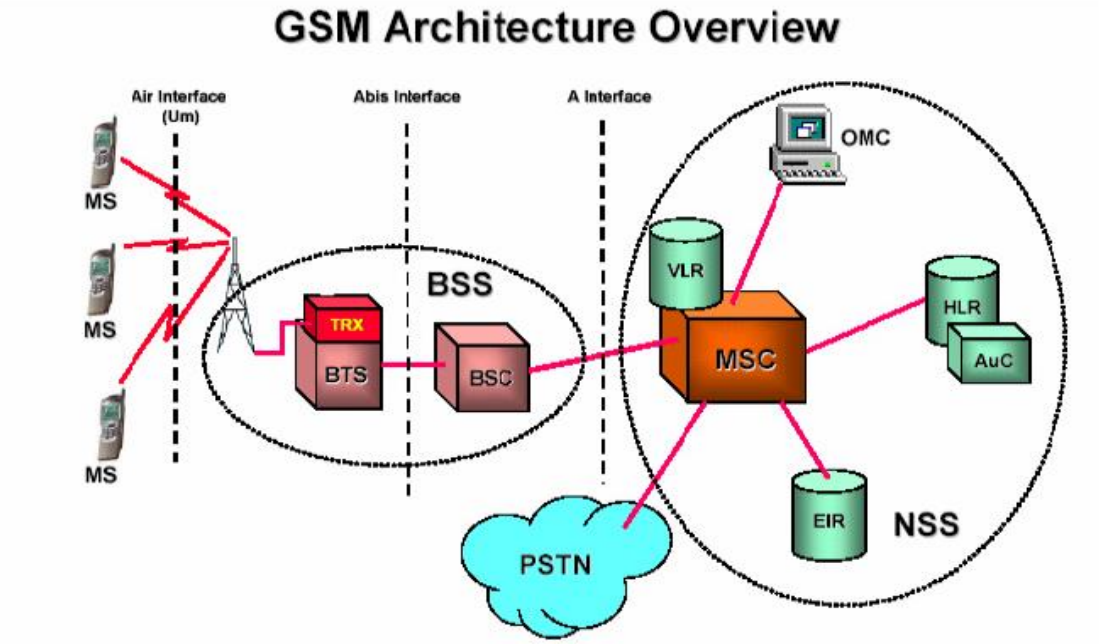


Fig: 3.4.1: Overview of project

A GSM system is a technology that is capable of sending and receiving messages through a SIM like mobile. GSM is a circuit-switched system that divides each 200 kHz channel into eight 25 kHz time-slots. GSM operates on the mobile communication bands 900 MHz and 1800 MHz in most parts of the world. GSM was developed using digital technology. It has an ability to carry 64 kbps to 120 Mbps of data rates.

3.5 Working Principle

The picture above is the actual demo project we've made. Now let's take a look at the step by step working process.

After powering up everything, all sensors, microcontrollers and GSM module will be active.

Laser rays emit from the laser light that the light turns around a certain area and falls on the LDR. As a result, the laser ray surrounds a certain area. The laser light that surrounds the area detects any visible object in the area and sends a signal to the microcontroller in this situation microcontroller send a massage to owner with the help of GSM Module.

After crossing the laser light area, there is anultrasonic sensor in a selected area. The ultrasonic sensor detects any visible object in the selected area and sends a signal to the microcontroller in this situation microcontroller send a massage to owner with the help of GSM Module.

After crossing the ultrasonic sensor area, the door has a touch sensor. When anybody try to open the door, basically touch the door then the touch sensor detects a object and sends a signal to the microcontroller in this situation microcontroller send a massage to owner with the help of GSM Module.

After open the door the limit switch goes to open circuit from close circuit in this situation microcontroller get a singal with the help of limit switch and send a massage to owner by GSM Module.

3.6 Image of the Project

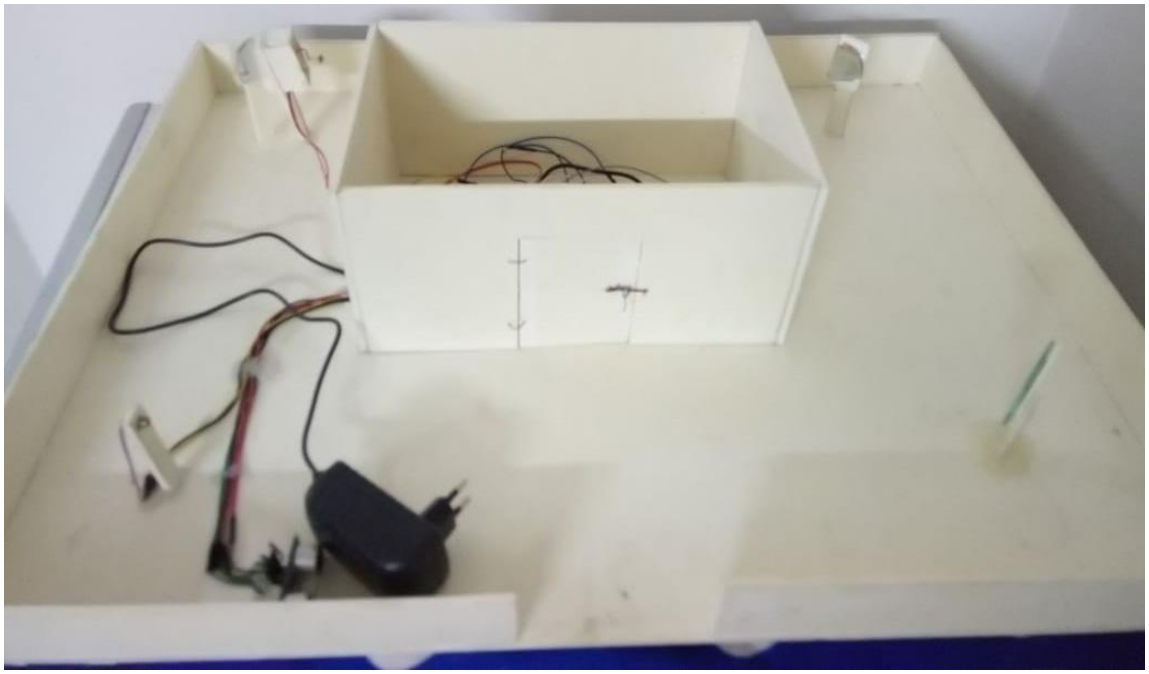


Fig: 3.6.1: Real image of the project

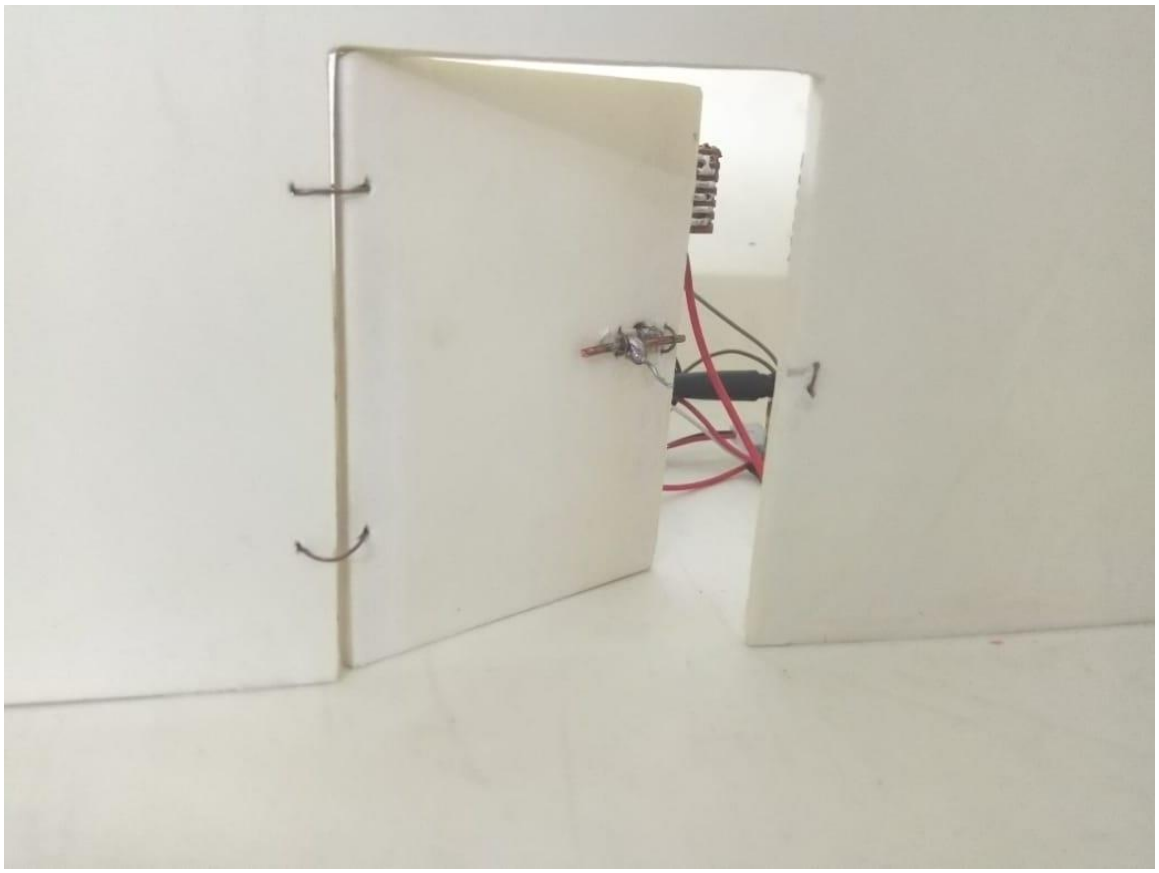


Fig: 3.6.2: Real image of the project

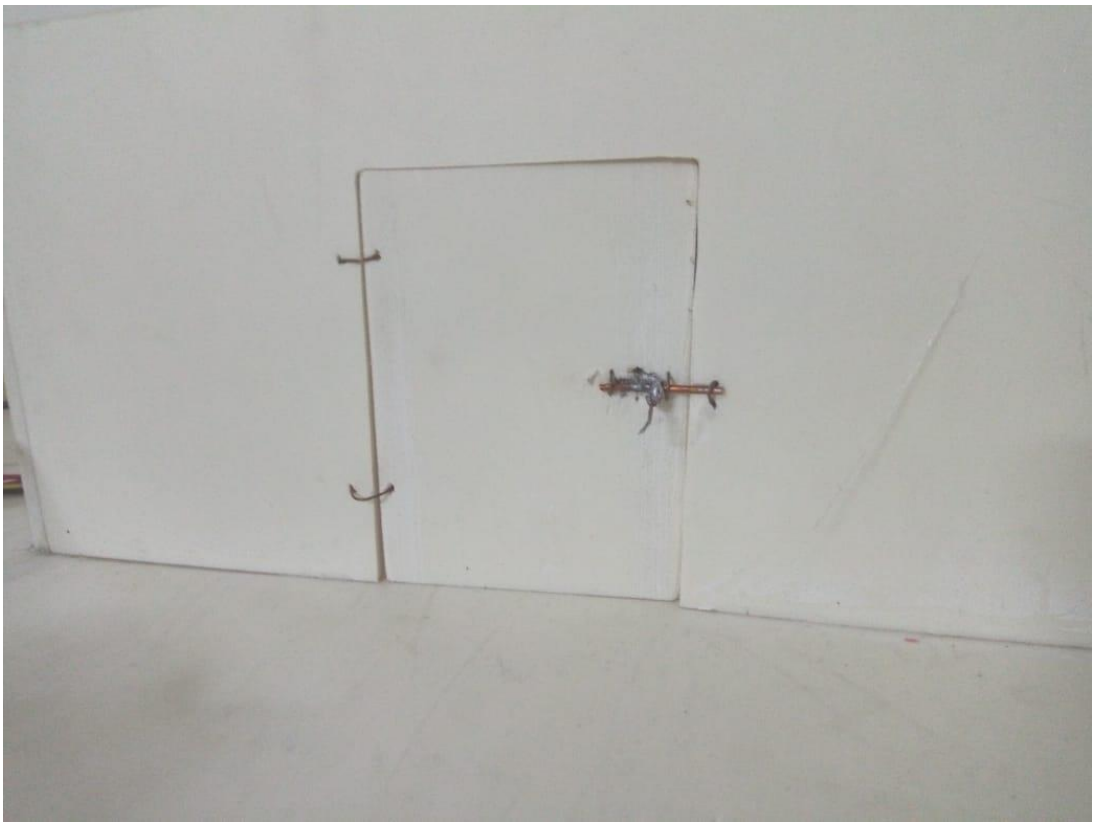


Fig: 3.6.3: Real image of the project

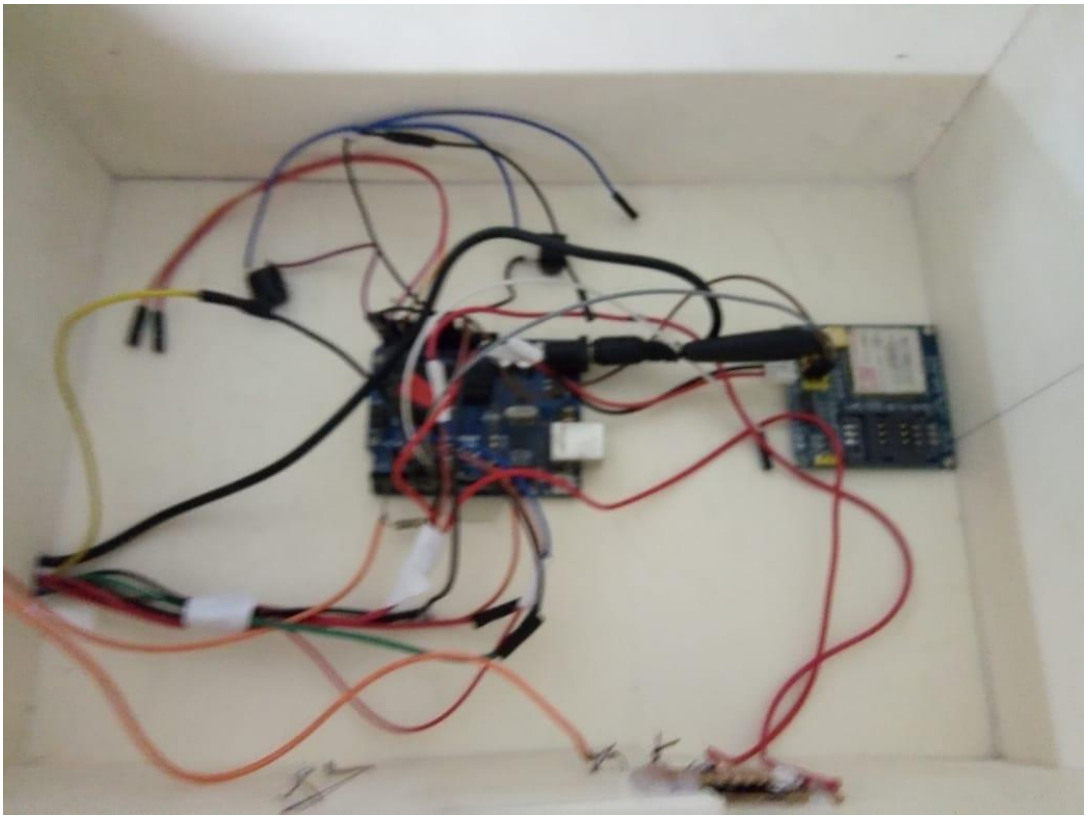


Fig: 3.6.4: Real image of the project

3.7 Flow Chart

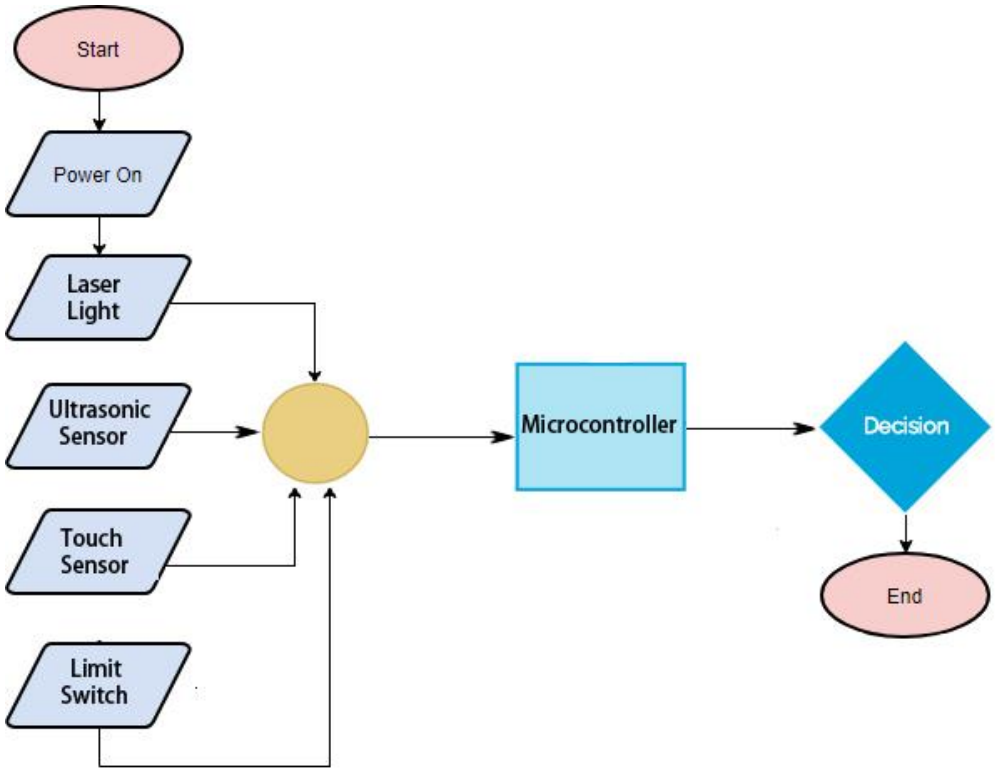


Fig: 3.7.1: Flow chart of the project

In this flowchart we can easily determine the working process of our system. Starting with Laser light, Ultrasonic sensor, Touch sensor, Limit switch, GSM & arduino.

Laser lights surround a specific area. The Laser lights detects any visible objects in the front and sends a message to owner with the help of Microcontroller & GSM Module.

Ultrasonic Sensor control a specific area. The Ultrasonic Sensor detects any visible objects in the front and sends a message to owner with the help of Microcontroller & GSM Module.

Touch Sensor control the door security. The Touch Sensor detects any Human touch in the door and sends a message to owner with the help of Microcontroller & GSM Module.

Limit Switch also control the door security. When anybody open the door then Microcontroller sends a message to owner with the help of & GSM Module.

3.8 Used Materials

1. Microcontroller (Arduino Uno) - 1 pcs
2. GSM Module - 1 pcs
3. Laser Light - 1 pcs
4. LDR - 1 pcs
5. Touch Sensor - 1 pcs
6. Limit Switch - 1 pcs
7. Switch - 1 pcs
8. Resistor(1k, 3.9K, 1M) - 3 pcs
9. Transistor (BC547) - 1 pcs
10. LED - 4 pcs
11. Buzzer - 4 pcs
12. DC Power Supply - 1 pcs
13. Connecting wire -As needed
14. Wires - As needed

3.9 Conclusion

In this chapter we have discussed the block diagram,circuit discription, working principle, flow chart also show the real image of the project and others. In the later part of this paper we discussed the result & discussion of the project to make the concept clear to anyone.

Chapter IV

RESULT & DISCUSSION

4.1 Introduction

This chapter contains the results obtained and discussion about the project. We have also covered discussions about advantages, disadvantages and limitation of current version of the protection system.

4.2 Result

Day by day, the number of untruthful people is gaining ground, resulting in theft and robbery of various places including home or office. And it is not possible for a human being to observe all of these places.

So, use ofMicrocontroller& GSM based home security system, a person should be sure to stay in the safety of his / her home from a distance and receive information from any distance in the event of an accident.

4.3 Advantags of Microcontroller & GSM based home security system.

- Security
- Accuracy
- Accessibility
- Trustable
- Efficient
- Save Money
- Save Time

- Minimize Man power
- Accurate Identification
- Convenient

4.4 Disadvantages of Microcontroller & GSM based home security system.

- Complexity.
- Environment and Usage Matters.
- Additional Hardware Integration.

4.5 Discussion

By implementing above systems there are various benefits.

- By biometric system, we can control all room, door, selected area and several place.
- Conservation of labor: Since the systems are automatic, they do not require continuous monitoring by labor.
- The design is low cost, small size, robust and highly versatile.
- This system use microcontroller which make it more convenient than conventional system.
- The main advantage is that the system's action can be changed according to the situation or demand.

4.6 Cost Estimation

SI	Particulars	Specification	Qty.	Unit Price	Total Price
1	Arduino Uno	ATMEGA328P	1	450	450
2	GSM Module	SIM900a	1	1800	1800
3	Laser Light		1	250	250
4	LDR		1	20	20
5	Touch Sensor		1	330	330
6	Limit Switch		1	120	120
7	Switch		1	10	10
8	Resistor	1 M ohm 1 W	1	5	5
9	Buzzer		4	15	60
10	LED		5	2	10
11	DC Power Supply	12V	1	150	150
12	PVC Sheet		1	1400	1400
				Total	**4,605**

Table:4.6: Cost Estimation

4.7 Applications

Microcontroller and GSM based home security system plays an important role in modern smart technologies. Following are the most common applications of Microcontroller and GSM based home security system.

- House.
- Office.
- Industry.
- Airport Security.
- Border Control
- Access Control.

4.8 Conclusion

Microcontroller and GSM based home security system that maintains several security and make secure position very cleverly.

Chapter V

CONCLUSION

5.1 Conclusion

Microcontroller and GSM based home security system that maintains several security and make secure position very cleverly.

This project is very usefull for office, home & industrial for high security. It mainly helps office &industries to keep their system & place in secure.

5.2 Future Modification

In future we can apply visual control system in this security system. The video transmitter can be attached to transmit video to the owner.

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