Automatic Shutter Control and Security System Using GSM

SONARGAON UNIVERSITY (SU)

Supervised By

Md Rais Uddin Mollah
Assistant Co-ordinator
Department of EEE
Sonargaon University (SU)

Submitted By

Md Mohsin Khan	ID:EEE 1901016041
Saimon Miah	ID: EEE 1901016020
Md Imran Hossain	ID: EEE 1901016222
Md Rokib Molla	ID: EEE 1901016017
Rema	ID: EEE 1901016022

Department of Electrical & Electronic Engineering (EEE)
Sonargaon University (SU)
147/I, Panthapath,
Dhaka-1215, Bangladesh

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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.

.....	….....
Md Mohsin Khan	Saimon Miah
.....	….....
Md Imran Hossain	Md Rokib Molla
.....	
Rema	

Under Supervision of

.....

MD Rais Uddin Mollah

Asst. Co-ordinator

Department of Electrical and Electronics Engineering

Sonargaon University (SU)

Certification

This is to certify that this project entitled ***"Automatic Shutter Control and Security System Using GSM"*** 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.

Supervisor

.....

MD Rais Uddin Mollah

Asst. Co-ordinator

Department of Electrical Electronic Engineering (EEE)

Sonargaon University (SU)

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Abstract

The purpose of designing this project is to protect our shop from thief. Not only out country but also whole world shop rebury is a big problem. Every year lots of shop shutter broken by thief in over the world. This reason we think about it and make a solution. Here we make some protection system and alarm system for shop security. System automatically send SMS to our phone when shutter open and send SMS then shutter closed and send SMS if motion detected inside shop when security alarm system on. And also send SMS when fire detected inside the shop. We also can open and closed from anywhere in world using our cellphone.

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Chapter-1

1.1 Introduction

Shutter Security System is a typically designed tailor made safety device for the total protection of unauthorized entry into your shops, warehouse etc. by breaking open the shutter, even by few inches.

An unauthorized entry into the bungalows, banks and warehouses by breaking open the shutter is the most common modus operandi noticed in the case of theft, loot, robbery and riots. Till now we had no direct solution for this and we had to depend entirely on the security guard, as we all know due to its centralized nature & dependence on individuals such security systems has never been so effective, protection of shops, warehouse etc. has always been a point of great worry for the owners.

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1.2 Objective

The main objective of this projects are given bellow.

- Made Security system for shop.
- Generate security alarm when shutter open.
- Generate security alarm when shutter close.
- Generate security alarm when thief detected inside shop.
- Generate security alarm when fire detected inside shop.
- Open shutter using GSM.
- Close shutter using GSM.
- Get all notification via GSM.

1.2 Methodology

- First the requirements of the project was carefully analyzed to design the shutter security system.
- The methodology of this project design can be divided into two sections; hardware and software implementations.
- Information's were collected from references books and websites to find out the possible improvement.
- Required components have been purchased from local market.

CHAPTER 02

LITERATURE REVIEW

2.1 Literature Review

Shutter automation or smart shutter can be described as introduction of technology within the shop environment to provide convenience, comfort, security and energy efficiency to its occupants [1].

There are many other projects done on Shutter automation in different countries. They are all different from each other in designs; features, devices, elements and algorithm. They were designed according to specific needs and availability of components in the respective areas. Some of them are cheap; some of them are very expensive. Availability of both hardware and software is necessary to work. After a long searching, we have found a lot of articles. Searching for security purpose articles, we also found some projects done for garage security. These are mainly done in western countries. Many projects are done only for security purpose with Arduino. Again, the projects are done only for controlling shitter security appliances using Arduino.

There are few projects on Fingerprint recognition module for strong shutter security issues. One of the projects used biometric method for next generation E-passport. The e-passport, as it is sometimes called, represents a bold initiative in the deployment of two new technologies: Radio-Frequency Identification (RFID) and biometrics. [2].

Furthermore, there are projects done on fingerprint recognition module describing the methods how to identify the fingerprints. A wide variety of systems requires reliable personal recognition schemes to either confirm or determine the identity of an individual requesting their services. The purpose of such schemes is to ensure that the rendered services are accessed only by a legitimate user and no one else. Those papers didn't mention about how to use it for shop security using any kind of microcontrollers [3].

Face recognition is another excellent and smart way that serves security purpose. We have found projects for door security using face recognition using Raspberry Pi. We avoided this part for the security purpose because error occurs more in face recognition than fingerprint recognition. Fingerprint has high accuracy. They didn't explicitly

mention about the security purpose or Raspberry Pi. They have only mentioned about the techniques of recognition. Different people have described the procedure of recognition in different ways. Basically all of them have tried to minimize errors for computer to recognize face [4].

Three researchers of Malaysia proposed a web-based indoor air quality system with GSM and Arduino. The system consists of gas sensor, temperature and humidity sensor, particle dust sensor and wireless sensor network (WSN) node as a wireless transmitter. A desktop computer acts as the base station [5].

Annan Zhu, Peijie Lin and Shuying Cheng of Fuzhou University of China described the remote control system of shop appliances using android phone through GSM network (2012 International Conference on Control Engineering and Communication Technology).They focused on the design of Android terminal, the communication between ARM and GSM module. Minimizing the difficulty in supplying the appropriate low-voltage DC for MCU and wireless module by a single live wire was also one of the tasks. Here we have found only the controlling of appliances using android, nothing more than that [9].

An article of Singapore by the authors Thomas Gonnot, Won-Jae Yi, Ehsan Monsef and Jafar Saniie showed a protocol standard for shop security automation system called shutter security Protocol (SSP). Wi-Fi, Bluetooth 4.2, ZigBee IP, 6LoWPAN, IEEE 802.15.4 standards, and Ethernet network layer supporting IPv6 protocol were their components. Mainly they proposed a protocol if-this-then-that. So it connected many devices together using WIFI connection [10].

K. M. Abubeker, Jose J Edathala, Shinto Sebastian from India introduced PIR sensors and an intelligent power saving mode in ATM counter. This uses pyro- electric infrared sensors to detect pedestrians and the ATM users. The system is controlled by the real time clock RTC DS 1307 to differentiate the day and night time with a surveillance video. This gives an excellent security to the ATM counter. According to an article by Suresh, J. Bhavya, S. Sakshi, using PIR sensor with Arduino Mega is a cheap and effective security system that can inform about an intruder through text message. In India, people largely rely on personal security guard for shop security. Same goes for Bangladesh. They made this easier and cheaper than costly surveillance video cameras [11].

Again, there is another article to prevent theft in Shop byP. Satya Ravi Teja, V. Kushal, A. SaiSrikar titled “Photosensitive security system for theft detection and control using

GSM technology". They did it using LDR (Light Dependent Resistor) based sensor which acts as an electronic eye for detecting the theft or attempt, and a signaling procedure based on SMS using GSM (Global Systems for Mobile communications) technology. It is also quiet cheap [12]. These are the few previous researches done on similar topic. It is mentioned earlier that most of them lack either the security system or the controlling system. We avoided the face recognition system for shop security because people are trying to minimize a lot of error in recognition of face. The face has to be at a particular angle so that the computer is able to recognize. Therefore fingerprint recognition module is more reliable for door security.

CHAPTER 03

PROJECT PARAMETERS

3.1 Introduction

To begin with the project, let's get the idea of all the components that we used for the project. It is very important to know all the information about both hardware and software specifications. The components we are using are as follows:

- Arduino nano (ATmega328)
- Sensors:
    - Gas Sensor MQ-2 (SEN 00091)
    - 103 Temperature Sensor
    - IR sensor
    - PIR Motion Detector (HC – SR501)
- GSM Shield SIM800L
- LCD Display with header (16x2)
- Breadboard
- Adapter (AC to DC 12V)
- Buzzer
- LED Light

3.2 Introduction to Arduino NANO ATmega328 Microcontroller

This is a microcontroller board based on the ATmega 328 microcontroller; it runs at 16 MHz and has 1 hardware serial port, 6 ADC inputs, 14 digital I/O pins and runs on 5volt power [9].

A microcontroller is a miniaturized computer in a chip of silicon and can accept instructions and follow those instructions. To change the operation of the microcontroller, we only need to write a new set of instructions or program. The ATmega 328 microcontroller is a very versatile device that is adequate for the role intended in this project, which is to monitor and control the rest of the hardware. It is able to provide 40mA of drive current for any device connected to its ports. The board also has an on-board 5volt regulator, which means it can run from a power supply even higher than 5 volts.

SIM800L GSM MODULE The SIM800L is a 2G module that can operate on the common GSM bands. It requires a 4 volts supply and has quite a number of features that make it very useful for the project. Some of these are:

1.Voice Communications;

2. SMS service;

3. GPRS communication;

4. HTTP protocol;

5. FTP Protocol;

This module will operate under the control of the microcontroller to send alert messages to reassigned numbers, thus summoning assistance in the event of a fire.

3.2.1 Function of Arduino NANO

Defining Arduino

An Arduino is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005.

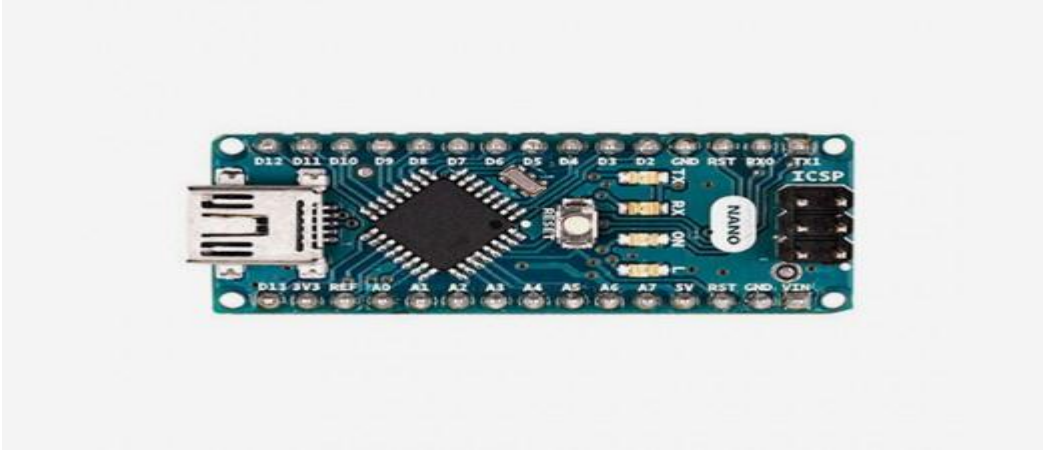


Figure 3. 1 ***Arduino NANO***

Arduino Architecture:

Arduino's processor basically uses the Harvard architecture where the program code and program data have separate memory. It consists of two memories- Program memory and the data memory. The code is stored in the flash program memory, whereas the data is stored in the data memory. The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the bootloader), 2 KB of SRAM and 1 KB of EEPROM and operates with a clock speed of 16MHz.

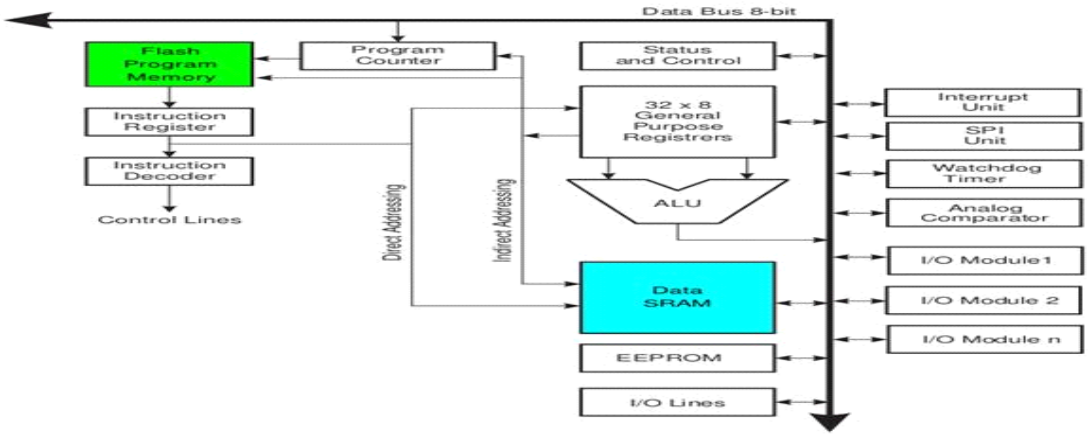


Figure 3. 2 ***Block Diagram of Arduino Architecture***

3.2.2 Arduino Pin Diagram:

A typical example of Arduino board is Arduino Uno. It consists of ATmega328- a 28 pin microcontroller.

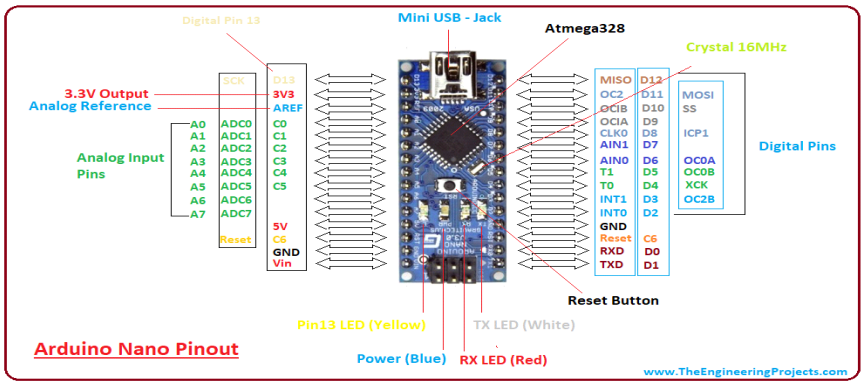


Figure 3. 3 ***Pin Diagram of Arduino***

Power Jack: Arduino can be power either from the pc through a USB or through external source like adaptor or a battery. It can operate on a external supply of 7 to 12V. Power can be applied externally through the pin Vin or by giving voltage reference through the IORef pin.

Digital Inputs: It consists of 14 digital inputs/output pins, each of which provide or take up 40mA current. Some of them have special functions like pins 0 and 1, which act as Rx and Tx respectively , for serial communication, pins 2 and 3-which are external interrupts, pins 3,5,6,9,11 which provides pwm output and pin 13 where LED is connected.

Analog inputs: It has 6 analog input/output pins, each providing a resolution of 10 bits.

ARef: It provides reference to the analog inputs

Reset: It resets the microcontroller when low.

3.2.3 How to program an Arduino?

The most important advantage with Arduino is the programs can be directly loaded to the device without requiring any hardware programmer to burn the program.

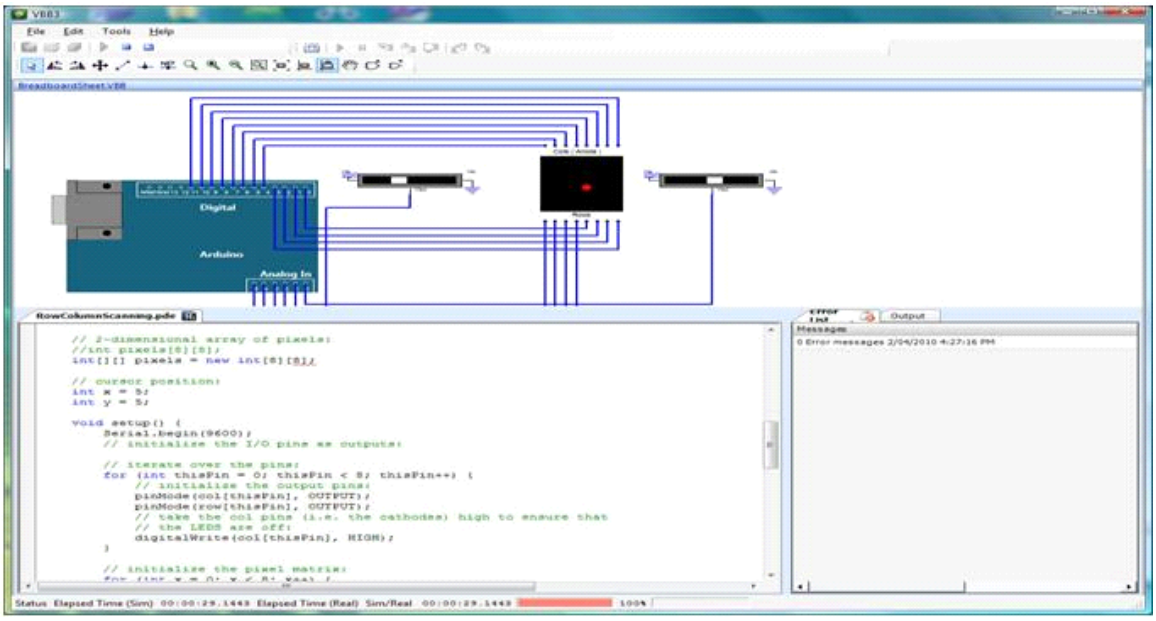


Figure 3. 4 ***Program file of Arduino***

This is done because of the presence of the 0.5KB of Bootloader which allows the program to be burned into the circuit. All we have to do is to download the Arduino software and writing the code.

The Arduino tool window consists of the toolbar with the buttons like verify, upload, new, open, save, serial monitor. It also consists of a text editor to write the code, a message area which displays the feedback like showing the errors, the text console which displays the output and a series of menus like the File, Edit, and Tools.

Five Steps to program an Arduino

1. Programs written in Arduino are known as sketches.
2. The sketch is saved with .ino extension. Any operations like verifying, opening a sketch, saving a sketch can be done using the buttons on the toolbar or using the tool menu.
3. The sketch should be stored in the sketchbook directory
4. Chose the proper board from the tools menu and the serial port numbers.
5. Click on the upload button or chose upload from the tools menu. Thus the code is uploaded by the boot loader onto the microcontroller.

A basic sketch consists of 3 parts:

1. Declaration of Variables
2. Initialization: It is written in the setup () function.
3. Control code: It is written in the loop () function.

Few of basic Adruino functions are:

1. digitalRead(pin): Reads the digital value at the given pin.
2. digitalWrite(pin, value): Writes the digital value to the given pin.
3. pinMode(pin, mode): Sets the pin to input or output mode.
4. analogRead(pin): Reads and returns the value.
5. analogWrite(pin, value): Writes the value to that pin.
6. serial.begin(baud rate): Sets the beginning of serial communication by setting the bit rate.

How to Design your own Arduino?

We can also design our own Arduino by following the schematic given by the Arduino vendor and also available at the websites. All we need are the following components- A breadboard, a led, a power jack, a IC socket, a microcontroller, few resistors, 2 regulators, 2 capacitors. **The procedure as follows**:

1. The IC socket and the power jack are mounted on the board.
2. Add the 5v and 3.3v regulator circuits using the combinations of regulators and capacitors.
3. Add proper power connections to the microcontroller pins.
4. Connect the reset pin of the IC socket to a 10K resistor.
5. Connect the crystal oscillators to pins 9 and 10
6. Connect the led to the appropriate pin.
7. Mount the female headers onto the board and connect them to the respective pins on the chip.
8. Mount the row of 6 male headers, wh ich can be used as an alternative to upload programs.
9. Upload the program on the Microcontroller of the readymade Adruino and then pry it off and place back on the user kit.

Seven Reasons why Arduino is being preferred these days

1. It is inexpensive

2. It comes with an open source hardware feature which enables users to develop their own kit using already available one as a reference source.

3. The Arduino software is compatible with all types of operating systems like Windows, Linux, and Macintosh etc.

4. It also comes with open source software feature which enables experienced software developers to use the Arduino code to merge with the existing programming language libraries and can be extended and modified.

5. It is easy to use for beginners.

6. We can develop an Arduino based project which can be completely stand alone or projects which involve direct communication with the software loaded in the computer.

7. It comes with an easy provision of connecting with the CPU of the computer using serial communication over USB as it contains built in power and reset circuitry.

3.4 LM35 Precision Centigrade Temperature Sensors:

LM35 is a precision integrated circuit temperature measuring device. Its output is voltage which is linear to the temperature. LM35 device draws only 60 μA from the supply, it has very low self-heating of less than 0.1°C in still air.

(a) (b)

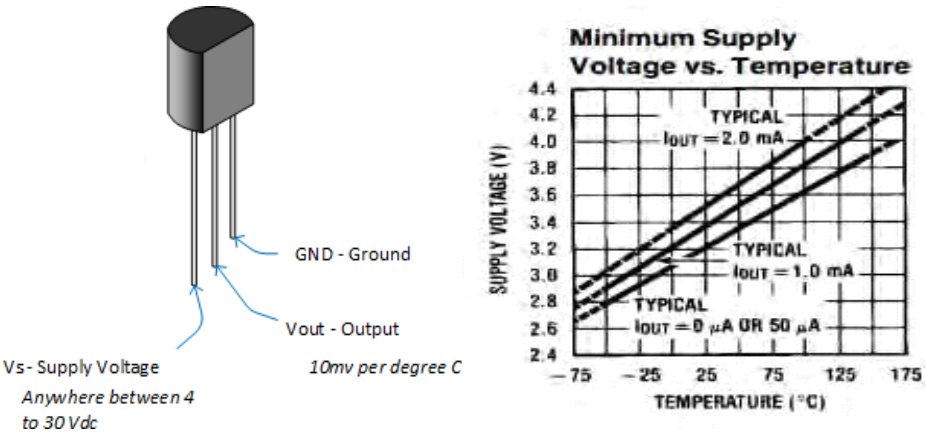


Figure 3. 5 **(a) Pin configuration of LM35 temperature sensor.**

Features:

This sensor is easy to use because it is already calibrates into Celsius. It is very low costing. It can take -55o to +150oC range. It takes only 0.1W for 1mA load.

3.4.1 Working Principle of LM35 Temperature Sensor:

The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical o/p comparative to the temperature (in °C). It can measure temperature more correctly compare with a thermistor. This sensor generates a high output voltage than thermocouples and may not need that the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.

The LM35 does not need any exterior calibration and maintains an exactness of +/-0.4°C at room temperature and +/-0.8°C over a range of 0°C to +100°C.One more significant characteristic of this sensor is that it draws just 60 micro amps from its supply and acquires a low self-heating capacity. The LM35 temperature sensor available in many different packages like T0-46 metal can transistor-like package, TO-92 plastic transistor-like package, 8-lead surface mount SO-8 small outline package.

3.4.2 LM35 Temperature Sensor Applications:

1. Measuring temperature of a particular environment
2. Providing thermal shut down for a circuit/component
3. Monitoring Battery Temperature
4. Measuring Temperatures for HVAC applications.

3.5 PIR Motion Detector (HC – SR501)

For most of our Arduino projects that need to detect when a person has left or entered the area, or has approached, HC-SR501 PIR sensors are a great choice. They are low

power and low cost, pretty rugged, have a wide lens range, easy to interface with and are insanely popular among hobbyists.

The PIR Motion Sensor Detector Module HC-SR501 allows you to sense motion. It is almost always used to detect the motion of a human body within the sensor;s. It is often referred to used “PIR”, “Pyroelectric”, “Passive Infrared” and “IR Motion” Sensor

PIR Motion Detector Features:

1. Wide range on input voltage varying from 4.V to 12V (+5V recommended)
2. Output voltage is High/Low (3.3V TTL)
3. Can distinguish between object movement and human movement
4. Has to operating modes - Repeatable (H) and Non- Repeatable (H)
5. Cover distance of about 120° and 7 meters
6. Low power consumption of 65mA
7. Operating temperature from -20° to +80° Celsius

3.5.1 Working Principle of PIR Motion Detector (HC – SR501)

PIR sensor is specially designed to detect such levels of infrared radiation. It basically consists of two main parts: A Pyroelectric Sensor and A special lens called Fresnel lens which focuses the infrared signals onto the pyroelectric sensor.

A Pyroelectric Sensor actually has two rectangular slots in it made of a material that allows the infrared radiation to pass. Behind these, are two separate infrared sensor electrodes, one responsible for producing a positive output and the other a negative output. The reason for that is that we are looking for a change in IR levels and not ambient IR levels. The two electrodes are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

When the sensor is idle, i.e. there is no movement around the sensor; both slots detect the same amount of infrared radiation, resulting in a zero output signal.

But when a warm body like a human or animal passes by; it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the

warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. The corresponding pulse of signals results in the sensor setting its output pin high.

3.6 GSM SIM800L Module

SIM800L is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, EGSM900MHz, DSC1800Mhz, and PCS1900MHz. SIM800L Features GPRS multi-slot class 12 / class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

GSM SIM800L Module Features:

1. Supply voltage: 3.8V - 4.2V

2. Recommended supply voltage: 4V

3. Power consumption:

    - sleep mode < 2.0mA
    - idle mode < 7.0mA
    - GSM transmission (avg): 350 mA
    - GSM transmission (peek): 2000mA

4. Module size: 25 x 23 mm

5. Interface: UART (max. 2.8V) and AT commands

6. SIM card socket: microSIM (bottom side)

7. Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)

8. Antenna connector: IPX

9. Status signaling: LED

10. Working temperature range: -40 do + 85 °

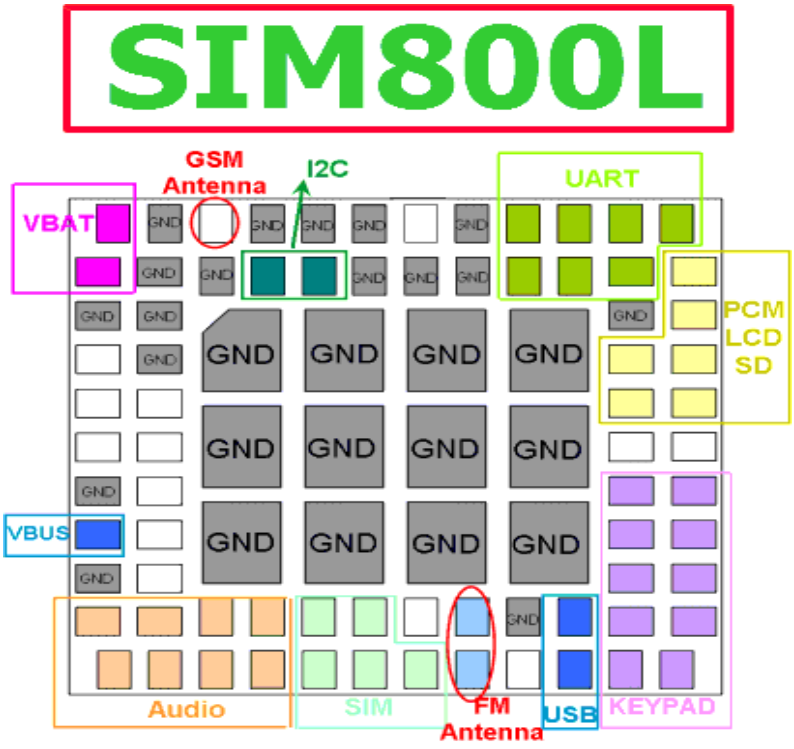


Figure 3. 6 ***Pin diagram of SIM800L Module.***

SIM800L Arduino Circuit:

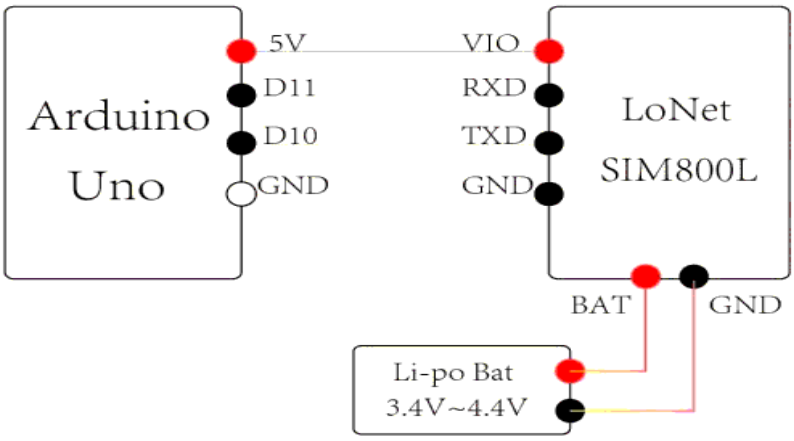


Figure 3. 7 ***SIM800L Arduino Circuit.***.

3.6.1 Working Principle of GSM SIM800L Module:

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking)

3.6.2 Applications of GSM SIM800L Module:

GSM SIM800L Module can feature all the functionalities of a mobile phone through computer like making and receiving calls, SMS, MMS etc. These are mainly employed for computer based SMS and MMS services. The GSM/GPRS module demonstrates the use of AT commands.

3.7 LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5×8 dot resolution.

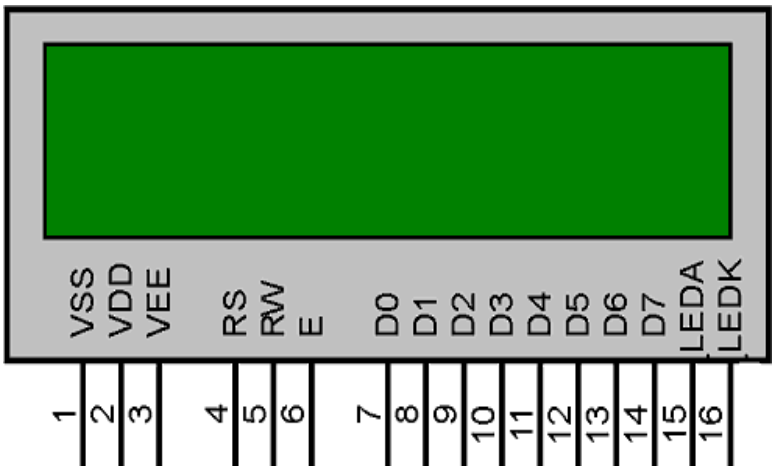


Figure 3. 8 ***Liquid Crystal Display***

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD

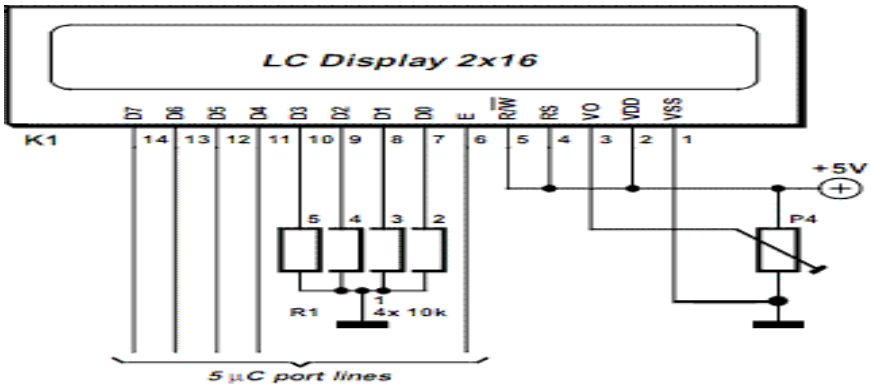


Figure 3. 9 ***Connection diagram of LCD***

3.7.1 Pin Description of LCD:

Pin No	Function	Name
1	Ground(0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register	Register
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4

Figure 3. 10 ***Pin Description of LCD***

3.8 Breadbroad:

A breadboard is a construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wood used for slicing bread. In the 1970s the solder less breadboard (a.k.a. plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these.
Because the solder less breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solder less breadboards are also popular with students and in technological education

3.9 Adapter (AC to DC 12V):

The main principle, we use this project to reduce the voltage from AC-line 220V to 12V DC. An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Other common names include plug pack, plug-in adapter, adapter block, domestic mains adapter, line power adapter, wall wart, power brick, and power adapter. Adapters for battery-powered equipment may be described as chargers or rechargers (see also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from mains power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply.

External power supplies are used both with equipment with no other source of power and with battery-powered equipment, where the supply, when plugged in, can sometimes charge the battery in addition to powering the equipment

3.10 LED Light:

LED (Light Emitting Diode) is basically a small light emitting device that comes under “active” semiconductor electronic components. It’s quite comparable to the normal general purpose diode, with the only big difference being its capability to emit light in different colors. The two terminals (anode and cathode) of a LED when connected to a voltage source in the correct polarity, may produce lights of different colors, as per the semiconductor substance used inside it.

3.10.1 Working Principle of LED Light:

A light-emitting diode is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

3.11 Buzzer:

This module is a low cost alarm buzzer called Piezo Buzzer. This device is the alarm for this system. It starts ringing when temperature increases very high and smoke is detected. It also starts ringing when PIR sensor is high.



Figure 3. 11 ***Piezo Buzzer.***

Features of Buzzer:

1. Rated Voltage: 6V DC
2. Operating Voltage: 4-8V DC
3. Rated current: <30mA
4. Sound Type: Continuous Beep
5. Resonant Frequency: ~2300 Hz
6. Small and neat sealed package
7. Breadboard and Perf board friendly

3.11.1 Working Principle of Buzzer:

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

3.11.2 Application of Buzzer:

1. Alarming Circuits, where the user has to be alarmed about something
2. Communication equipment's
3. Automobile electronics
4. Portable equipment, due to its compact size

CHAPTER 04

HARDWARE AND SOFTWARE IMPLEMENTATION

4.1 Hardware Implementation:

An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits. An important aspect of the Arduino is the standard way that connectors are exposed, allowing the CPU board to be connected to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²Cserial bus, allowing many shields to be stacked and used in parallel. Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a level shifter circuit to convert between RS-232-level and TTL-level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. Some variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.)

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers. Several plug-in application shields are also commercially available.

The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board to be plugged into solderless breadboards.

There are many Arduino-compatible and Arduino-derived boards. Some are functionally equivalent to an Arduino and may be used interchangeably. Many are the basic Arduino with the addition of commonplace output drivers, often for use in school-level education to simplify the construction of buggies and small robots. Others are electrically equivalent but change the form factor, sometimes permitting the continued use of Shields, sometimes not. Some variants use completely different processors, with varying levels of compatibility.

Components can be divided into two categories: sensors and modules. All of them are described below:

Sensors:

All sensors are connected with the microcontroller through wires. All input voltages are applied from the microcontroller with the computer. They are described below with diagram. In this section hardware implementation of all sensors are described below.

4.2 LM35 Precision Temperature Sensor:

There are only three pins. The output pin (pin 2) is connected to the analog input of Arduino board.

4.3 GSM SIM800L Module:

This module has 6 pins in which two pins are VCC and GND. The rest are 3VR, 3VT (3 volts RX and TX) and 5VR, 5VT (5 volts RX and TX). The connections are as follows:

VCC to 5V GND

to GND

5VR to digital pin

5VT to digital pin

Before working with the GSM, we have to check the following conditions:

Insert SIM: Placing the SIM card in the card holder marked in the figure. Make sure there is balance in the SIM card.

Connect the antenna: We fix the RF antenna to the SMA antenna connector and tighten it by rotating the nut.

Connect the pins: We connect the pins according to our schematic diagram.

Power the modem: We power the modem for suitable power supply (>1A). We have used an adapter for the power supply.

For check the status of LED:

1, PWR LED: Red LED lights immediately

2, STS LED: Green LED lights after 1-2 seconds

3, NET LED: Blue LED will start to blink fast at first for few second (searching for network) and blink slowly once the modem registers with the network.

4, Baud rate: We chose the baud rate 800.The connections are made according to the figure above with the LCD monitor. All pin configurations are done according to the pin configuration.

4.6 16x2 LCD Display:

A register select (RS) pin that controls where in the LCD's memory data will be writing is connected with analog pin 9.An Enable pin that enables writing to the registers is connected with analog pin 8.Data pins (D4 -D7) are connected with corresponding analog pins (4, 5, 6, 7).Power supply pins +5V and GND is connected in the breadboard.

4.6.1 LCD Display pins Configuration:

S/N	Ardiuno UNO	LCD
1	4	D7
2	5	D6
3	6	D5
4	7	D4
5	8	En
6	9	Rs

Pin connection of LCD display with microcontroller.

4.7 Software Implementation:

The Arduino Mega2560 can be programmed with the Arduino software. The Atmega2560 on the Arduino Mega comes pre burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).You can also bypass the bootloader and program the microcontroller through the ICSP

(In-Circuit Serial Programming) header the Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a "sketch".

Arduino programs are written in C or C++. The Arduino IDE comes with a software library called "Wiring" from the original Wiring project, which makes many common input/output operations much easier. Users only need define two functions to make a runnable cyclic executive program.

4.7.1 Arduino C Programs

- Arduino calls these “sketches”
- Basically C with libraries
- Program structure
- Header: declarations, includes, etc.
- setup()
- loop()
- Setup is like Verilog initial
- executes once when program starts

- loop() is like Verilog always
- continuously re-executed when the end is reached

4.9 GSM SIM800L Module:

Basic AT commands: To change sending mode the function is:
mySerial.println("AT+CMGF=1");
To read SMS in text mode the function is:
mySerial.println("AT+CNMI=2,2,0,0,0");
In this system the GSM works as bidirectional data transmitter. It has two types of functions: sender and receiver.
We have used the GSM to control any shutter security appliances from a distance. The Bluetooth works only in Personal Area Network (PAN). We can control shop appliance from outside the house through GSM. It works like a Bluetooth but in a larger network area. Through Android we can control lights, fans, air conditioner, TV, door etc via GSM. It receives the user's text message and passes it to the microcontroller to control any appliance inside the house.
For the security system, the GSM sends text message based on all the sensors used in this system. If the PIR sensor gets any unusual movement inside the house, the user gets a text message. This means that there is someone inside the house in absence of the user. The GSM also plays an important role in fire alarming system with the help of LM35 temperature sensor and the gas sensor. When the temperature rises very high and CO (carbon monoxide) is detected, the system sends text message through GSM.
The gas component ranges are mentioned above in the component introduction section. Also, when the dust level of the room increases, the user gets text message. These wireless communications are done both inside and outside the house. Therefore, the user is able to get information from all the sensors. It doesn't need any of the Android Application or the Voice Control Application. Here the GSM acts as a sender.

4.9 Android Application:

In this system we have the Android application to control all the shop shutter and electrical appliances. From Android phone we select any shop appliance from the options that appear in the App then we select ON or OFF. This can be done only when the user is inside the house. There should be Wi-Fi connection for the App. The user cannot run the App from outside the house even if there is internet connection in the phone. It is related with the Bluetooth module. It allows establishing point-to-point connection with Bluetooth support devices. This technology is known by Android's support for the Bluetooth network stack which permits to exchange data wirelessly.

The Android Software Development Kit (SDK) provides all necessary tools to develop Android Application (API). This application is a Java based program. The Android uses .apk file to install the application. The code is written in Android Studio IDE. All appliances buttons list will appear first. Then the user has to choose an option. Later the action button ON and OFF appears. There are 2 layouts of the code structure, two Class code and user permission code. These are written in Android Studio IDE. The code is written according to the appearance of the options in the phone.

4.9.1 Applications:

1. Xoscillo: Open-source oscilloscope
2. Arduinome: a MIDI controller device that mimics the Monome
3. OBDuino: a trip computer that uses the on-board diagnostics interface found in most modern cars
4. The Humane Reader and Humane PC from Humane Informatics: low-cost electronic devices with TV-out that can hold a five thousand book library (e.g. offline Wikipedia compilations) on a micro SD card
5. Ardupilot: drone software / hardware
6. ArduinoPhone

CHAPTER 05

WORKING PRINCIPLE

5.1 Working Principle

In this Shutter security system project we use an ARDUINO, LCD display, GSM module, Step-Down transformer, gear motor, IR sensor, 12v relay, 3.7v Rechargeable battery, buzzer and some other necessary equipment. Step-down transformer convert 220v ac to 12v ac. We used 2 diode for rectify and 1000uf capacitor for filtrating.3.7v 3 battery are connect to series. This battery charged from this rectifier and filtered dc voltage. We use 1708 linier voltage regulator for 12v to 5 regulation that call VCC. Center tape transformer middle terminal connect to capacitor negative terminal and battery negative terminal that called GND.in this projects we use as a programmable microcontroller. Here our all sensor and output device connect to arduino's analog and digital input/output pin. We also use a GSM module for commination system That's why we can call this project "IOT based Shop Protection system or Shutter security system". In this project Temperature Sensor connect to Arduino A0 pin, Motion sensor A3 pin. Gear motor driver relays connect to D2 and D3. And IR sensor connect to A4 pin. Touch plate connect to A5 pin. For GSM module we choose TX and RX pin, GSM TX pin connect to Arduino RX pin and GSM RX pin connect to Arduino TX pin. And LCD 6 data pin connect to Arduino D12, D11, D10, D9, D8, D7 pin. When we send sms to system foe shutter open then system automatically open the shutter. And when we send sms for shutter close then system close the door. If alarm switch on and anybody move inside shop then system send sms to our phone and start alarm.

5.2 Block Diagram of Shutter Security System

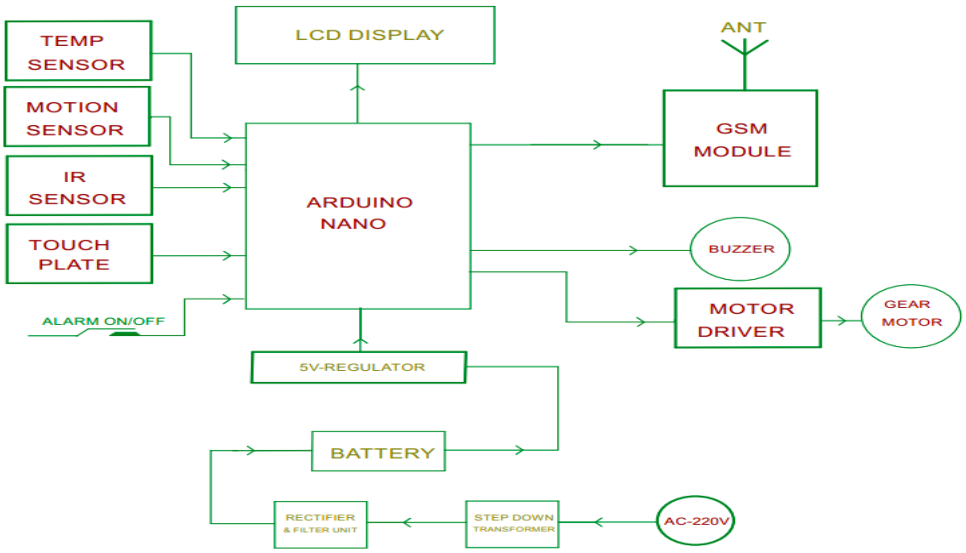


Figure 5. 1 Block Diagram of Shutter Security System

5.3 Circuit Diagram of Shutter Security System

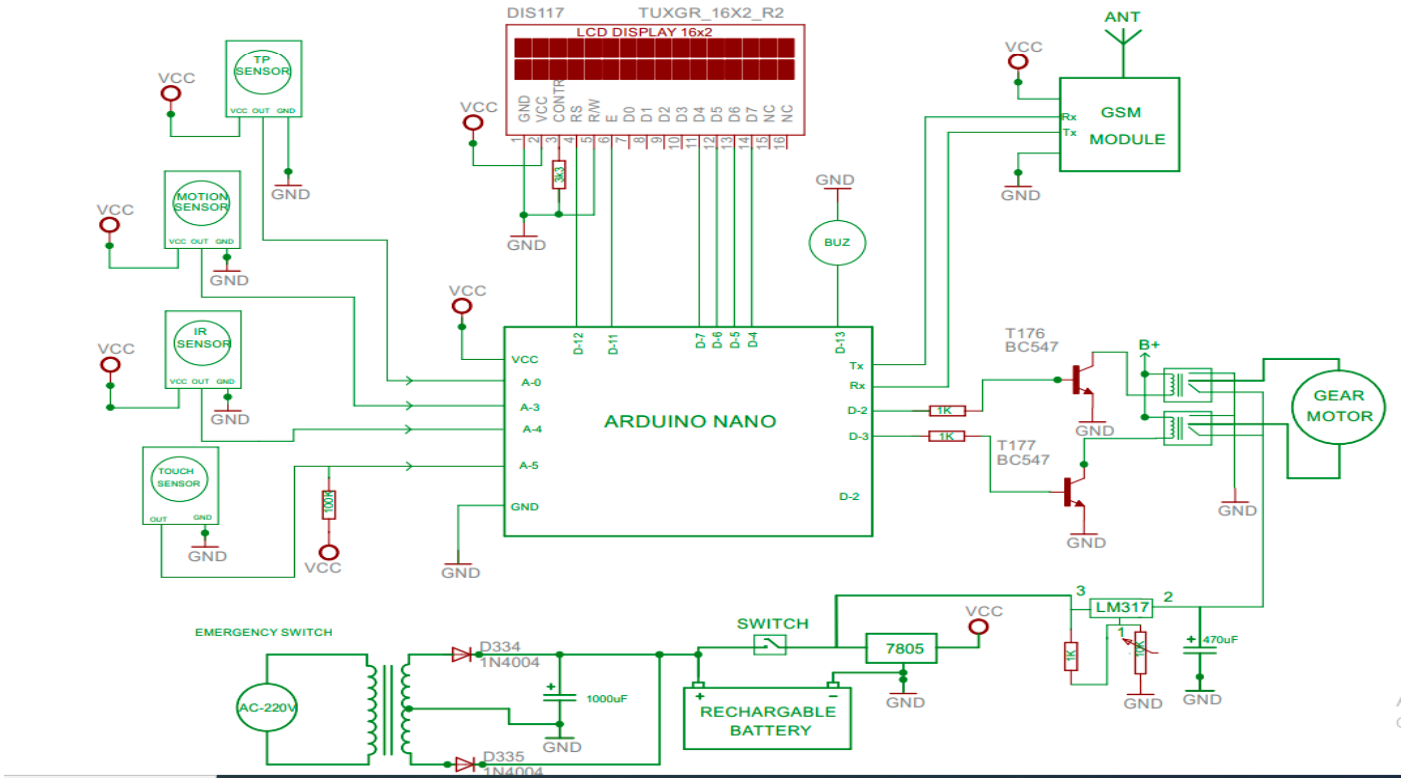


Figure 5. 2 ***Circuit Diagram of Shutter Security System***

5.1 Microcontroller and control unit

A microcontroller (MCU) is a small computer on a single metal-oxide-semiconductor (MOS) integrated circuit chip. In modern terminology, it is similar to, but less sophisticated than a system on a chip (Soc). A Soc may include a microcontroller as one of its components. A microcontroller contains one or more CPUs with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR, flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microcontroller used in personal computers or other purpose applications consisting of various discrete chips.

A control unit is a main part of the system that controls its operation. In this device Microcontroller ATmega328 is used as the controller unit which controls the relay. The ATmega328 provides UART TTL (5V) serial communication, which is available on

digital pins 0 (RX) and 1 (TX). An ATmega2560 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The firmware uses the standard USB COM drivers, and no external driver is needed.
Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems. In the context of the internet of things, microcontrollers are an economical and popular means of data collection, sensing and actuating the physical world as edge devices

5.4 Apparatus

- Arduino nano (ATmega328P)
- Sensors:
- Gas Sensor MQ-2 (SEN 00091)
- LM 35 Temperature Sensor
- Light Dependent Resistor (LDR) sensor
- GSM Shield SIM800L
- LCD Display with header (16x2)
- Breadboard
- Adapter (AC to DC 12V)
- Buzzer
- LED Light

5.5 Advantages:

1, First and foremost installation cost is least to establish the system.

2. For developing the system users need to install the little circuit board containing a low cost microcontroller, motion sensor etc.

3. Its program installation is very easy.

4. Shutter Security system is possible to cut down electricity bill; since it saves energy.

5. It is obvious that today‘s world is busier than in days what went before. It saves the time.

5.6 Applications:

1. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in shop.

2. shutter security system used for controlled shutter and shop parameters and security purpose.

3. By some modifications this project can be used in any Institution.

4. This project can be used in hospital or Clinic where need to be advance security.

5.7 List of Components with price:

SL no	Components	Price in TK
1	Arduino NANO	
2	GSM Module	
3	LCD Display	
4	Power supply	
5	PIR Motion sensor	
8	Temperature sensor	
9	Buzzer	
10	Lm317 voltage regulator	
11	7805 voltage regulator	
12	12v relay	
13	IR Sensor	
14	sample PCB	
15	Other parts	
16	Gear motor	
	Market price=	

List of Components with price

CHAPTER 06

RESULT AND ANALYSIS

6.1 Results

After connecting and programming all the components with the, we conducted the experiment. We have run all the components according to the proposed system. We have designed a prototype of a Shop placing inside room and outside door. All modules and microcontroller are kept together with a lot of wires.

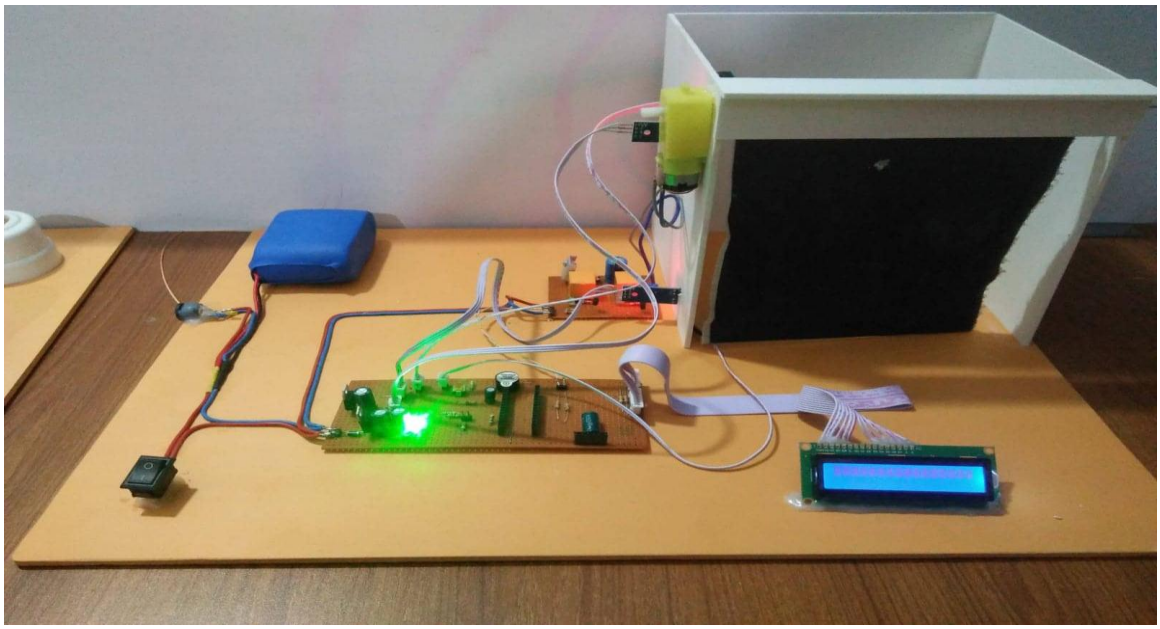


Figure 6. 1 ***view of the Shutter Security system showing different sensors and modules placed in the required places.***

A text message is sent in the mobile when temperature is very high; temperature is measured through LM35 sensor. To test fire alert system, we have used a lighter and hold it near the LM35. The LCD display shows “gas leakage” when smoke and harmful gas is detected. At the same time it is notified with text message. LCD display shows theft detection from the second PIR sensor. Intruder alert is notified via text message too. When all the sensors are high the Piezo Buzzer starts ringing. When there is fire inside the house notification of both high temperature and smoke is sent through SMS.



Figure 6. 2 ***Testing fire near the temperature sensor.***

The system sends text and also displays it to the monitor when there is gas leakage inside the house.

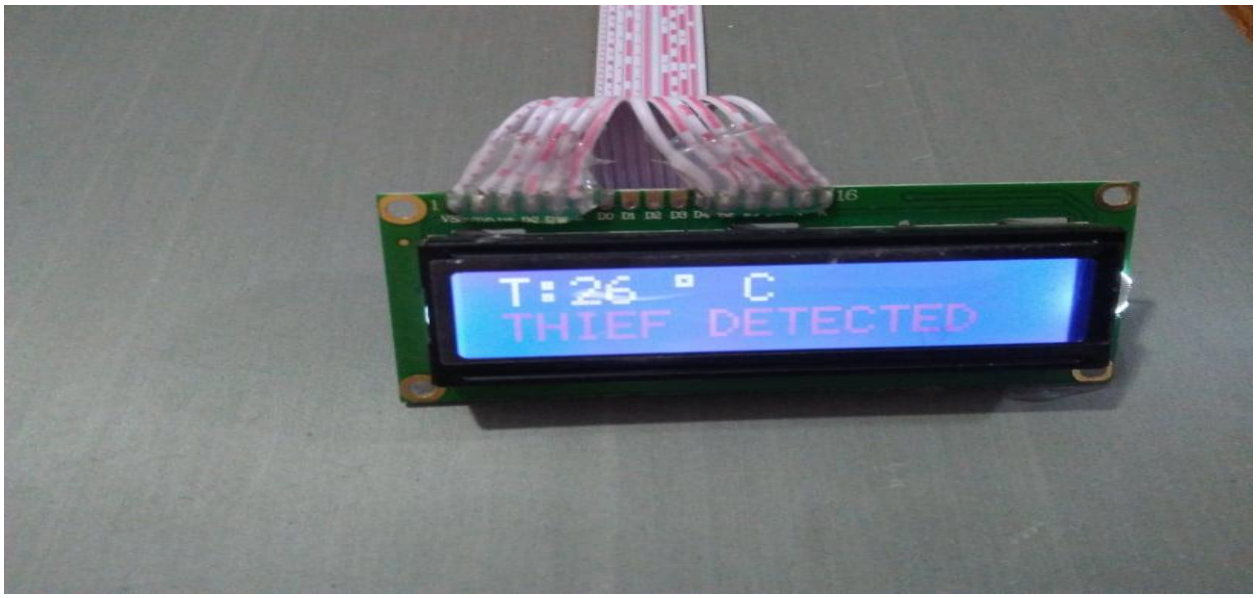


Figure 6. 3 ***Testing the PIR sensor for detecting intruder. (b) Thief detection mobile notification. (c) LCD display showing thief detected.***

Another feature of this project is automatic lights on and off. When PIR sensor detects presence of a person inside the house, the light turns on automatically. The light turns off when the person leaves.

6.2 Analysis

This thesis is not a complete project. This is a prototype of another larger system for lager house. There are a lot of important matters to observe in this project. After performing all the tasks we have seen that the voltage and current is not the same always as given in the components' specifications. We have used a lot of devices that that need high and constant supply. Otherwise there is delay in the task. There is also a risk of destroying the devices if there is very high voltage supply.

The number of wires that we have used in this project doesn't make significant power loss but the modules need constant power supply. In case of the GSM module, it needs 3A current to send and receive text message. Otherwise no communication is possible. From the test we conducted it seems the mobile communication is very fast.

To maintain a constant power supply, we had to add DC-DC buck converter and an adapter. There will be a problem if there is no electricity or internet.

All sensors need time to give a stable reading like, temperature and motion sensor. Again, in processing text command, it has maximum 4 seconds delay. The sensitivity of the sensors can be varied according to the need of the user. The whole program is written in a single Arduino IDE so it is very easy for the user to change any kind of function. Overall the use of this automation system is easy, flexible and reliable. We can easily add extra features with system.

CHAPTER 07

CONCLUSION

7.1 Discussion

From the project carried out, we find the system effectively low cost and user friendly. The whole house remains under the user's control all the time. In future we may find some devices that are more reliable, faster and cheaper. We have tried to make a good controlling and security system. The components that we have used can be changed with the latest device but it should have the right software and the right driver. The system is very easy to install. For this, just need internet connection and for motion detection a motion sensor. Shop security system is definitely a resource which is capable of make a shop shutter setting automated. People can be in command of their electrical devices via these Shop security devices and set up the controlling actions in the workstation. We think this device have high potential for marketing in the future. All the tasks of this project are done successfully. We were able to fulfill our goals as proposed in this system. We had our limitations in time and expenses but we hope that it will serve as basis of other latest systems as that of western countries. Almost all scientific and latest technologies have both good and bad sides. That doesn't mean we should avoid technology. This type of work inspires us to do better for our country. Smart Technology is a blessing for our country. We should try to avoid the bad consequences and use it for our betterment

7.2 Conclusion:

This project is based on microcontroller, due to which hardware requirement is reduced. Hence we can conclude that the required goals and objectives of our project have been achieved. It provides the flexibility & system reliability with low cost as well as less maintenance. It provides remote access to the system to deliver service at any time of the day. With this system, we can control as well as monitor the devices at remote location.

7.3 Advantages:

1, First and foremost installation cost is least to establish the system.

2. For developing the system users need to install the little circuit board containing a low cost microcontroller, motion sensor etc.

3. Its program installation is very easy.

4. Shutter Security system is possible to cut down electricity bill; since it saves energy.

5. It is obvious that today‘s world is busier than in days what went before. It saves the time.

7.4 Disadvantages

Like other projects there have few disadvantages.

1. Need SMS package for this system.
2. We can’t identify thief face. Because there don’t have any camera.

7.5 Future scope

In future we can use this system in many places,

1. Small shop
2. Large shop.
3. Megamall.
4. Gold shop
5. Mobile Shop.
6. And many other shops.

7.6 Future Work.

1. In future we will add an IP Camera in our system.
2. Add WIFI control for live monitoring.

7.7 Applications:

1. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in shop.
2. shutter security system used for controlled shutter and shop parameters and security purpose.
3. By some modifications this project can be used in any Institution.

4. This project can be used in hospital or Clinic where need to be advance security.

References

- Li, Rita Yi Man; Li, HerruChing Yu; Mak, Cho Kei; Tang, Tony Beiqi. "Sustainable Smart Home and Home Automation: Big Data Analytics Approach" (PDF). *International Journal of Smart Home*. 10 (8): 177–198.
- HamitErdem, "Implementation of software-based sensor linearization algorithms on low cost microcontrollers" *Original Research Article ISA Transactions*, Volume 49, Issue 4, October 2010, Pages 552-558.
- http://www.bbc.com/news/av/world-asia-18275363/high-pollution-hits- HYPERLINK "http://www.bbc.com/news/av/world-asia-18275363/high-pollution-hits-bangladeshcapital"_____ HYPERLINK "http://www.bbc.com/news/av/world-asia-18275363/high-pollution-hits-bangladeshcapital"bangladeshcapital HYPERLINK "http://www.bbc.com/news/av/world-asia-18275363/high-pollution-hits-bangladeshcapital" accessed 22 march 2018.
- Types of Home Automation, retrieved Nov 23, 2017 http://www.homeimprovementpages.com.au/article/Types_Home_Automation
- Hill, Jim (12 September 2015). "The smart home: a glossary guide for HYPERLINK "http://www.t3.com/features/the-smart-home-guide"___ HYPERLINK "http://www.t3.com/features/the-smart-home-guide"the HYPERLINK "http://www.t3.com/features/the-smart-home-guide"__perplexed". T3. Retrieved 27 March 2018.
- Tieyan Li, "Employing Lightweight Primitives on Low-Cost RFID Tags for Authentication", Vehicular Technology Conference 2008. VTC 2008-Fall. IEEE 68th, pp. 1-5, 2008, ISSN 1090-3038.
- Best Home Automation System - Consumer Reports". HYPERLINK "http://www.consumerreports.org/"www.consumerreports.org Retrieved 2018-02-14
- Atmel 42735A ATmega328/P Datasheet Complete 06/2016 http://www.datasheetspdf.com/pdf/1057332/ATMEL/ATmega328P/3
- Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh "Universal Mobile Application Development (UMAD) On Home Automation" Marathwada Mitra Mandal's Institute of Technology, University of Pune, India Network and Complex Systems ISSN 2224-610X (Paper) ISSN 2225-0603 (Online) Vol 2, No.2, 2012
- http://www.learningaboutelectronics.com/Articles/Arduino-LED-flasher- HYPERLINK "http://www.learningaboutelectronics.com/Articles/Arduino-LED-flasher-circuit.php%2C%20%20accessed%2016%20February%202018"_ HYPERLINK "http://www.learningaboutelectronics.com/Articles/Arduino-LED-flasher-circuit.php%2C%20%20accessed%2016%20February%202018"circuit.php, accessed 16 February 2018
- SIM800L Hardware Design V1.00. Retrieved 2018-01-20.

  http://datasheetcafe.databank.netdna-cdn.com/wp-content/uploads/2016/03/SIM800L.pdf

• Store Home>Arduino Uno Rev3 https://store.arduino.cc/usa/arduino-uno-rev3 accessed 23 January 2018

• K. M. Abubeker, J. J. Edathala and S. Sebastian, "Some investigations on 'PIR' SENSOR and their application on significant energy savings in ATM counter," 2013 IEEE Conference on Information & Communication Technologies, JeJu Island, 2013, pp. 37-41.

• Suresh S., J. Bhavya, S. Sakshi, K. Varun and G. Debarshi, "Home Monitoring and Security system," 2016 International Conference on ICT in Business Industry & Government (ICTBIG), Indore, 2016, pp. 1-5.

Appendix

```
#include<LiquidCrystal.h>

LiquidCrystal lcd(12,11,10,9,8,7);

#define RLdn 2

#define RLup 3

#define BUZ 13

#define TEMPIN A0

#define MPIN A3

#define IRupP A4

#define IRdnP A5

#define ALsw A6

int temp=0,

int led=2;

int led=3;

int MOTION,FIRE,almstp=0,IRup,IRdn,ASW;

int tp;



void setup()
```

```
{
  lcd.setCursor(0,0);
  lcd.print("DIGITAL SHUTTER ");
  lcd.setCursor(0,1);
  lcd.print("SECURITY SYSTEM ");
  delay(1500);
  lcd.setCursor(0,0);
  lcd.print("SUBMITTED BY:   ");
  lcd.setCursor(0,1);
  lcd.print("            ");
  delay(2000);
  lcd.setCursor(0,0);
  lcd.print("            ");
  lcd.setCursor(0,1);
  lcd.print("            ");
  delay(2500);
  lcd.setCursor(0,0);
  lcd.print("            ");
  lcd.clear();
  lcd.print("Circuit Digest");
  delay(1000);

  SendMessage1();
}
```

```
////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////
void loop()
{
  SENSOR();
  DISPLAY1();
  CONTROL();
}
////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////
void DISPLAY1()
{
    lcd.setCursor(0,0);
    lcd.print("T:");
    lcd.setCursor(2,0);
    lcd.print(tp);
    lcd.println(" 'C   ");
}
////////////////////////////////////////////////////////////////////////////
void SENSOR()
{
  MOTION = analogRead(MPIN);
  tp = analogRead(TEMPIN);
  IRup=analogRead(IRupP);
```

```
  IRdn=analogRead(IRdnP);
  ASW = analogRead(ALsw);
  delay(1);
}
////////////////////////////////////////////////////////////////////////////
void CONTROL()
{
  ////////////////////////////////
  if(tp > 42)
  {
   almstp =1;
   SendMessage2();
   alarm();
  }
  ////////////////////////////////
  if(ASW < 200)
  {
     if(MOTION > 400)
     {
       almstp =2;
       SendMessage3();
       alarm();
     }
  }
```

```
}

////////////////////////////////////////////////////////////////////////////

void check()
{



  if(!(strncmp(str,"SUP",3)))
    {
      SendMessage4();
      while(IRup==0)
      {
        digitalWrite(RLup, HIGH);
      }
      digitalWrite(RLup, LOW);
    }
   else if(!(strncmp(str,"SDN",3)))
   {
      SendMessage5();
      while(IRdn==0)
      {
        digitalWrite(RLdn, HIGH);
      }
```

```
      digitalWrite(RLdn, LOW);
    }
}
////////////////////////////////////////////////////////
void alarm()
{
  int alm=0;
  for(alm=0;alm < 6;alm++)
  {
      SENSOR()
      digitalWrite(BUZ, HIGH);
      lcd.setCursor(0,1);
      lcd.print("                ");
      delay(300);
      digitalWrite(BUZ, LOW);
      lcd.setCursor(0,0);
      lcd.print("T:");
      lcd.setCursor(2,0);
      lcd.print(tp);
      lcd.setCursor(5,0);
      lcd.print((char)223);
      lcd.setCursor(6,0);
      lcd.println(" C         ");
      if(almstp==1)
```

```
      {
       lcd.setCursor(0,1);
       lcd.print("FIRE DETECTED  ");
      }
      if(almstp==2)
      {
       lcd.setCursor(0,1);
       lcd.print("THIEF DETECTED ");
      }
      delay(300);
  }
  almstp=0;
  lcd.setCursor(0,1);
  lcd.print(" OK    OK    OK   ");
}
////////////////////////////////////////////////////////

void SendMessage1()
{
 Serial.println("AT+CMGS=\"+8801844076448\"\r");
 Serial.println("SYSTEM READY");
}
void SendMessage2()
{
```

```
 Serial.println("AT+CMGS=\"+8801844076448\"\r");
 Serial.println("FIRE DETECTED !");
}
void SendMessage3()
{
 Serial.println("AT+CMGS=\"+8801844076448\"\r");
 Serial.println("THIEF DETECTED !");
}
void SendMessage4()
{
 Serial.println("AT+CMGS=\"+8801844076448\"\r");
 Serial.println("SHUTTER OPEN !");
}
void SendMessage5()
{
 Serial.println("AT+CMGS=\"+8801844076448\"\r");
 Serial.println("SHUTTER CLOSE !");
}
```