# SMART HOME ENTRY SYSTEM

A Course project report submitted in partial fulfilment of requirement of

**SMART SYSTEM DESIGN**

By


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# ABSTRACT

The main objective of this project is to provide a digital door lock system for a home. In the present scenario, many people are preferring automated system over the non - automated ones. In this project we use a password as lock so that only the owner of the house knows the password. In addition to this, when a person enters the house the sensors detect the temperature and switches on the fan. Depending on the brightness in the house the led bulb will be in on mode. Also, the brightness of the bulb will be controlled by the sensor. This type of home automation system will save our money, provide security to the house and reduces consumption of electricity.

# CONTENTS

# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

Security system is to detect intrusion and unauthorized entry into a building. Security systems are mainly used in residential, commercial, industrial, and military properties for protection against theft or property damage, as well as personal protection against intruders. In prisons also we use security systems for control of inmates. Nowadays, home security and surveillance system is an essential part of any modern automated home. Non-Automated security systems were found non-reliable. Doors were fitted with lock and key system which can be opened easily.

So, we are using a Password based lock so that only the one who knows the password can will be able to go into the house. A temperature sensor has been used to measure the temperature of the room and the speed of the fan is varied according to the room temperature using. When a person enters the room the fan speed will be controlled based on the room temperature. Depending on the brightness in the room the led will glow and its brightness will also be controlled. The temperature in the room, speed and brightness in the room will be displayed on Liquid Crystal Display.

**Advantages**

Nowadays, there is no proper security if we use the old lock and key system. And it is better to have an automated home. There are several advantages with this project.

1. Power consumption is less.
2. It provides good security instead of using the lock and key system.
3. Automation provides great convenience to the users.
4. The sensors switch on the light and controls the speed of fan based on brightness and temperature in the room which provides the user a great comfort.

**Disadvantages**

1. If the user forgets the password then it is not possible to go into the house.
2. If the intruder hacks the code then he can get access to the house.

## 1.2 OVERVIEW OF THE PROJECT

- It helps the user have a secure home.
- It reduces the consumption of electricity.
- Users can monitor the status of the appliances on the LCD monitor.

## 1.3 OBJECTIVES

- The main objective of this project is to provide a secure and an automated home at a low cost. It aims to increase the security of the home.

# CHAPTER 2

# PROJECT DESCRIPTION

## 2.1 BLOCK DIAGRAM OF THE PROJECT

As shown in the below Fig.2.1 it consists of an Arduino, keypad, temperature sensor, photodiode, micro servo, buzzer, relay, fan and an LCD. When the user enters the correct password the micro servo rotates and he can enter the house. The sensors detect the brightness and temperature in the room and according to that the led, fan switches on and the brightness of led, speed of fan will be controlled.

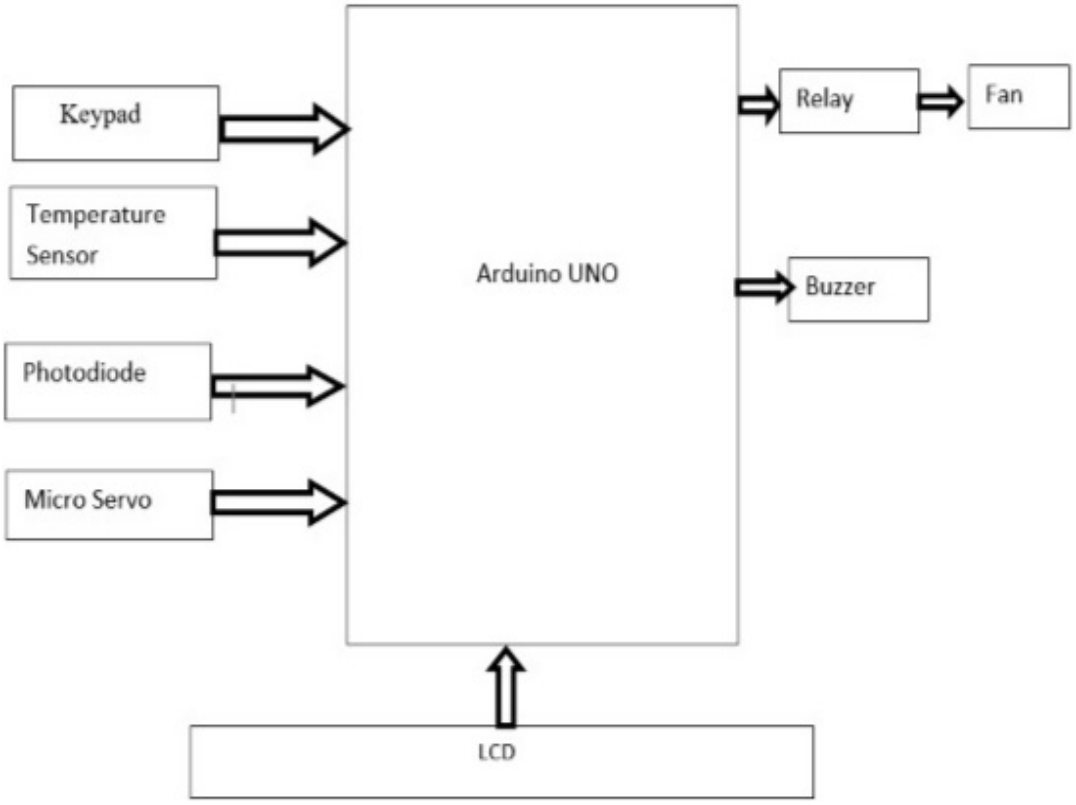


Fig.2.1 Block diagram

## 2.2 HARDWARE DESCRIPTION

### 2.2.1 Arduino UNO

The Arduino Uno is an open source micro controller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The Uno board is the first in a series of USB-based Arduino boards. The word uno means one in Italian and was chosen to

mark the initial release of Arduino Software. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins, 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB Cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

**Technical specifications**

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage (recommended): 7 to 12 Volts
- Input Voltage (limits): 6 to 20 Volts
- Digital I/O Pins: 14
- Analog Input Pins: 6
- DC Current per I/O Pin: 20mA
- DC Current 3.3V Pin: 50mA
- Flash memory: 32KB of which 0.5Kb used by bootloader
- SRAM: 2KB
- EEPRON: 1KB
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g

**Applications:**

- Arduboy, a handheld game console based on Arduino.
- Arduinome, a MIDI controller device that mimics Monome.
- Ardupilot, drone software and hardware.
- ArduSat, a cubesat based on Arduino.
- C-STEM Studio, a platform for hands-on integrated learning of computing, science, technology, engineering and mathematics (C-STEM) with robotics.
- Data loggers for scientific research.
- OBDuino, a trip computer that uses the on-board diagnostics interface found in most modern cars.

- OpenEVSE an open-source electric vehicle charger.
- XOD, a visual programming language for Arduino.

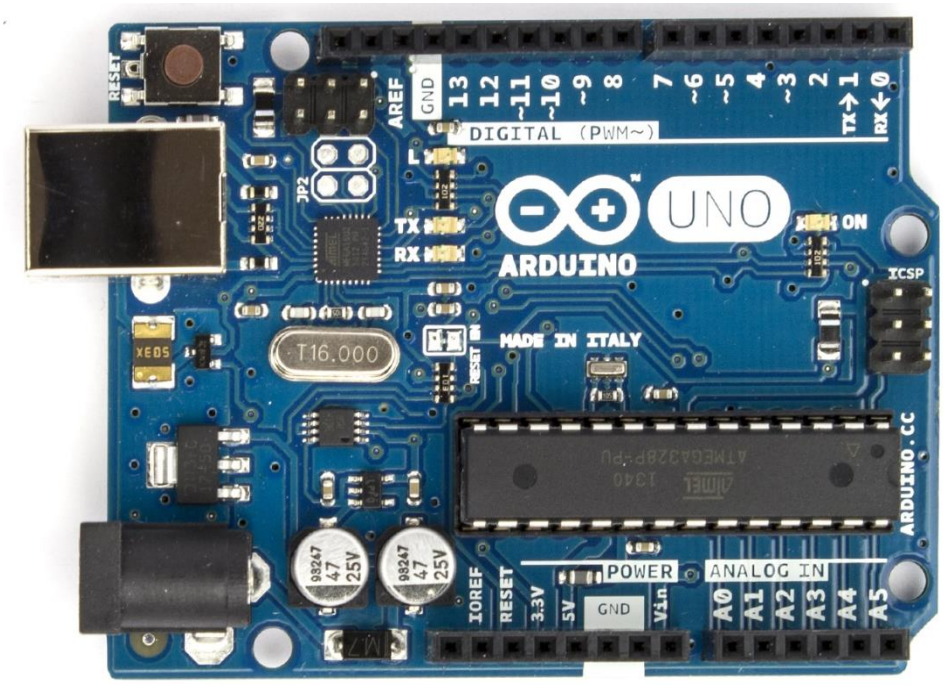


Fig. 2.2 Arduino UNO

## 2.2.2 Temperature Sensor

Temperature sensor detects the change in temperature and converts into electrical signal. There are 5 types of temperature sensors

- Bi-metallic strips(420°C)
- Thermocouples (-220°C to +2000°C)
- Resistance Temperature Detectors (-200 to +600°C)
- Thermistors (-50 to -200°C)
- Thermo diodes and transistors (-50 to -150°C)

**TMP36**

Here we are using a TMP36 sensor which measures the temperature in the room. Unlike a thermistor, the TMP36 does not have a temperature sensitive resistor. Instead this sensor uses the property of diodes as a diode changes temperature the voltage changes with it at a known

rate. The sensor measures the small change and outputs an analog voltage between 0 and 1.75VDC based on it.

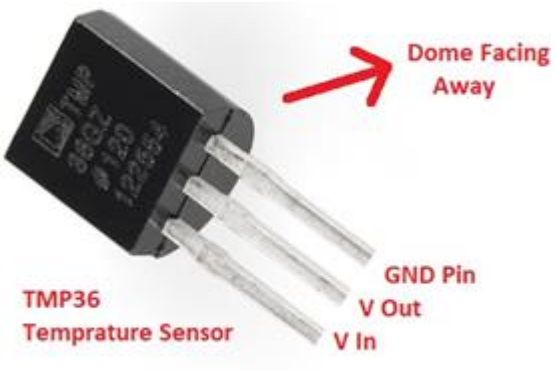


Fig. 2.2 TMP36

**Specifications**

- Voltage Input: 2.7 V to 5.5 VDC.
- 10 mV/°C scale factor.
- ±2°C accuracy over temperature
- ±0.5°C linearity
- Operating Range: −40°C to +125°C.

**Applications**

- Power Supplies
- Battery Management
- A.C
- Refrigerators, microwave ovens
- Washing machines
- Incubators
- Poly houses, poultry forms

## 2.2.3 Light Sensor

Light sensors devices that are used to convert light energy into electrical energy. There are 3 types of light sensors

- Light dependent Resistor
- Photodiode

- Phototransistor

**Photodiode**

A photodiode is a semiconductor device that converts light to electric current. The current is generated when photons are absorbed in photodiode. Photodiode may contain optical filters, built-in lenses and may have large or small surface areas.

Fig. 2.4 Photodiode

**Specifications**

- Wavelength Sensitivity: 940nm.
- Open Circuit Voltage: 0.39V.
- Reverse breakdown voltage: 32V.
- Reverse Light current: 40μA.
- Reverse Dark current: 5nA.
- Rise Time/ Fall Time: 45/45nS.
- View Angle: 80 deg.
- Package: 5mm.

### 2.2.4 PIR Sensor

A passive infrared sensor (PIR Sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. It is often referred as “Passive Infrared”, “Pyroelectric” or “IR Motion” sensor. PIRs are basically made of a pyroelectric sensor which detect levels of infrared radiation. This sensor is used to detect motion of “Humans or Animals”.

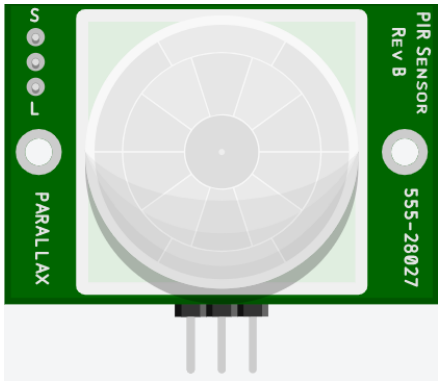


Fig. 2.5 PIR Sensor

**Repeatable trigger(H):** The sensor output is high until object is present in the sensing range

**Non – Repeatable trigger(L):** If the sensor output is high, delay time is over then output is automatically changed from high to low.

**Specifications of PIR Sensor:**

- Voltage: 5 Volts to 20 Volts
- Low power Consumption: 65mA
- TTL Output: 3.3 Volts, 0 Volts
- Trigger methods:
    - L – Disable repeat trigger
    - H – Enable repeat trigger
- Sensing range: <120 degree, within 7 meters
- Temperature: -20°C to +80°C

## 2.2.5 Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as mouse click or keystroke. There are 3 types of buzzers

- Electromechanical
- Mechanical
- Piezoelectric

Fig. 2.6 Piezo Buzzer

**Electromechanical buzzer**

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz (the contacts buzz at line frequency if powered by alternating current). Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

**Mechanical buzzer**

A joy buzzer is an example of a purely mechanical buzzer and they require drivers. Other examples of them are doorbells.

**Piezo electric buzzer**

A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

**Applications:**

- Novelty uses
- Judging Panels
- Educational Purposes
- Annunciator panels
- Electronic Metronomes

- Game show lock-out device
- Microwave ovens and other House hold appliances
- Electrical alarms
- Joy buzzer (mechanical buzzer used for pranks)
- Sporting events such as basketball games

## 2.2.6 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal.

Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

There are four types of relays

- Single Pole Single Through (SPST)
- Single Pole Double Through (SPDT)
- Double Pole Single Through (DPST)
- Double Pole Double Through (DPDT)


Fig. 2.7 Relay

**Applications of Relay**

- Electromechanical relays include motor control

- Automotive applications such as electrical fuel pump
- Industrial applications where control of high voltages and currents in intended and controlling large power loads

### 2.2.7 Micro Servo

A servomotor is a rotatory actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Fig. 2.8 Micro Servo

Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. The SG90 micro servo has 3 wire interface in which the connections should be made in the following way

- Ground pin is connected to ground
- Power pin is connected to 5 Volts
- Signal pin is connected to digital pin

**Specifications**

- Operating voltage: 4.8 V (~5V)
- Operating speed: 0.1 s/60 degree
- Stall torque: 1.8 kgf·cm
- Dead band width: 10 µs
- Temperature range: 0 ºC – 55 ºC

### 2.2.8 Keypad

Keypads allow users to give data while a program is running. We can access the keypad by using the library Keypad.h. A 16-button keypad has four columns and four rows. Pressing a button will short one of the row outputs to one of the column outputs. From this information, the Arduino can determine which button was pressed. For instance, when key 1 is presses, column 1 and row 1 are shorted. The Arduino will detect that and input 1 to the program.

**Specifications**

- Maximum Rating: 24 VDC, 30 mA.
- Interface: 8-pin access to 4x4 matrix.
- Operating temperature: 32 to 122 °F (0 to 50°C)
- Dimensions: Keypad, 2.7 x 3.0 in (6.9 x 7.6 cm)

**Applications**

- Security systems
- Menu selection

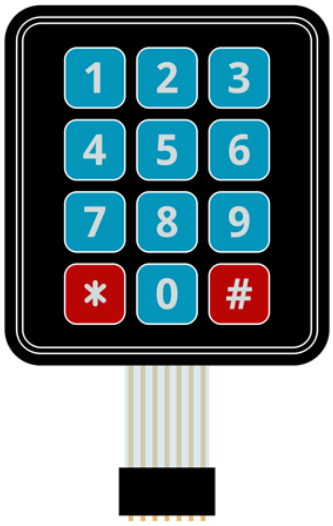


Fig. 2.9 Keypad

### 2.2.9 Liquid-Crystal Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. 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. The 16 x 2

display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and data.

LCD is a dot matrix liquid display crystal that displays alphanumeric characters and symbols. Internal refresh is provide in the LCD. All the functions required for dot matrix LCD drive are internally provided.

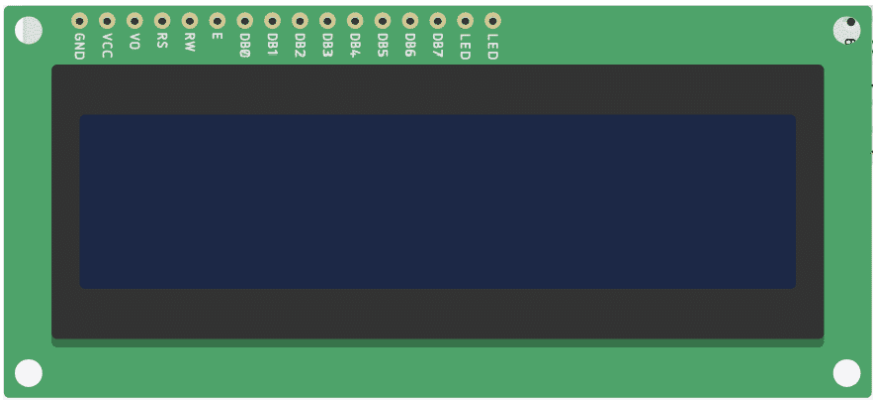


Fig. 3.0 LCD

**Specifications**

- Operating Voltage: 3.3 Volts to 5.3 Volts
- Alphanumeric LCD display module
- 8*2, 12*2, 16*1, 16*2, 16*4, 20*2, 20*4, 24*2, 40*4
- Each character is built by a 5 x 8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

## 2.2.10 DC Motor

A motor is an electrical machine which converts electrical energy into mechanical energy. Motors are frequently used as actuators in automatic control systems. Basically, it consists of two parts

- Stator
- Rotor

Fig. 3.1 DC Motor

DC motors are usually classified of the basis of their excitation configuration, as follows

- Separately excited - field winding is fed by external source.
- Series Dc Motors - field winding is connected in series with the armature.
- Shunt Dc Motors - field winding is connected in parallel with the armature.
- Compound Dc motors

**Features**

- Standard 130 Type DC motor.
- Operating Voltage: 4.5V to 9V.
- Recommended/Rated Voltage: 6V.
- Current at No load: 70mA
- No-load Speed: 9000 rpm.
- Loaded current: 250mA
- Rated Load: 10g*cm.
- Motor Size: 27.5mm x 20mm x 15mm.

## 2.2.11 Resistor

Resistor is defined as a passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits. Resistor is used to reduce the current flow and to lower the voltage in any particular portion of the circuit. It is made of copper wires which is coiled around a ceramic rod and the outer part of the resistor is coated with an insulating paint. Basically, there are 2 types of resistors

- Linear resistor – The values change with change in temperature and voltage These are of two types
    - Fixed resistors - These resistors have a specific value and these values cannot be changed.
    - Variable resistors - These resistors do not have a specific value and the values can be changed with the help of dial, knob, and screw.
- Non-linear resistors - The resistor values change according to the temperature and voltage applied and is not dependent on Ohm's law.
    - Thermistors
    - Varistors
    - Photo resistors

**Specifications**

- Resistance Value: 1Ω to 1MΩ
- Tolerance: ±1% to ±20%
- Power rating: 0.1 watts to hundreds of watts

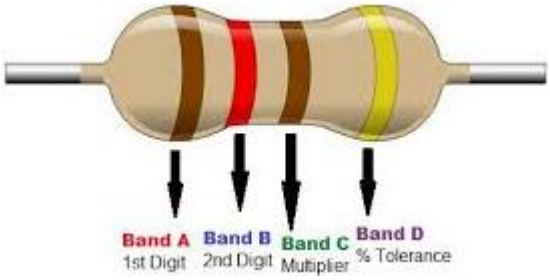


Fig. 3.2 Resistor

## 2.2.12 LED

LED stands for "Light-Emitting Diode." An LED is an electronic device that emits light when an electrical current is passed through it. Early LEDs produced only red light, but modern LEDs can produce several different colours, including red, green, and blue (RGB) light.

Fig. 3.3 LED

**Specifications**

- Voltage: 220-240 Volts
- Operating frequency: 50-60Hz
- Light Colour: Warm white
- Lifetime: 35,000 hrs = 16 years

## 2.3 SOFTWARE DESCRIPTION

The software used here is ARDUINO SOFTWARE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

**Writing Sketches:**

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

**NB:**

Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension pde. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the ino extension on save.

***Verify***

Checks your code for errors compiling it.

***Upload***

Compiles your code and uploads it to the configured board. See uploading below for details.

**Note:** If you are using an external programmer with your board, you can hold down the "shift" key on your computer when using this icon. The text will change to "Upload using Programmer"

***New***

Creates a new sketch.

***Open***

Presents a menu of all the sketches in your sketchbook. Clicking one will open it within the current window overwriting its content.

**Note:** due to a bug in Java, this menu doesn't scroll; if you need to open a sketch late in the list, use the File | Sketchbook menu instead.

***Save***

Saves your sketch.

***Serial Monitor***

Opens the serial monitor.

Additional commands are found within the five menus: File, Edit, Sketch, Tools and help.

**Programming on Arduino uno**

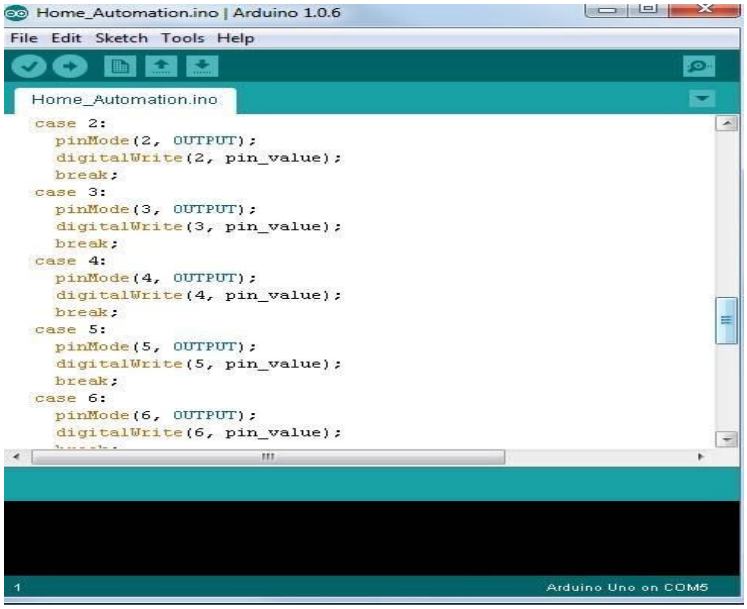


Fig. 3. 4 Software IDE

In order for the Arduino-Uno board to be able to interact with the application used in this project certain program (code) needs to be uploaded to the Arduino-Uno.

Arduino Company provides user friendly software which allows writing any code for any function wanted to be performed by the Arduino-Uno and upload it to the board. Refer to appendix A for the full source code of the Arduino-Uno board.

# CHAPTER 3

# CIRCUIT DIAGRAM AND DESCRIPTION

## 3.1 Working

In this project we used Keypad through which we can open the door if we give the correct password. After giving the correct password the PIR Sensor detects the person and switches on the LED based on the brightness in the room. Brightness in the room is detected by the Photodiode. Also, based on the temperature in the room the fan will be switched on and its speed will be controlled. The temperature will be detected by the temperature sensor. If we give the wrong password, then piezo buzzer will alert us. The working is shown in the below Fig 3.5

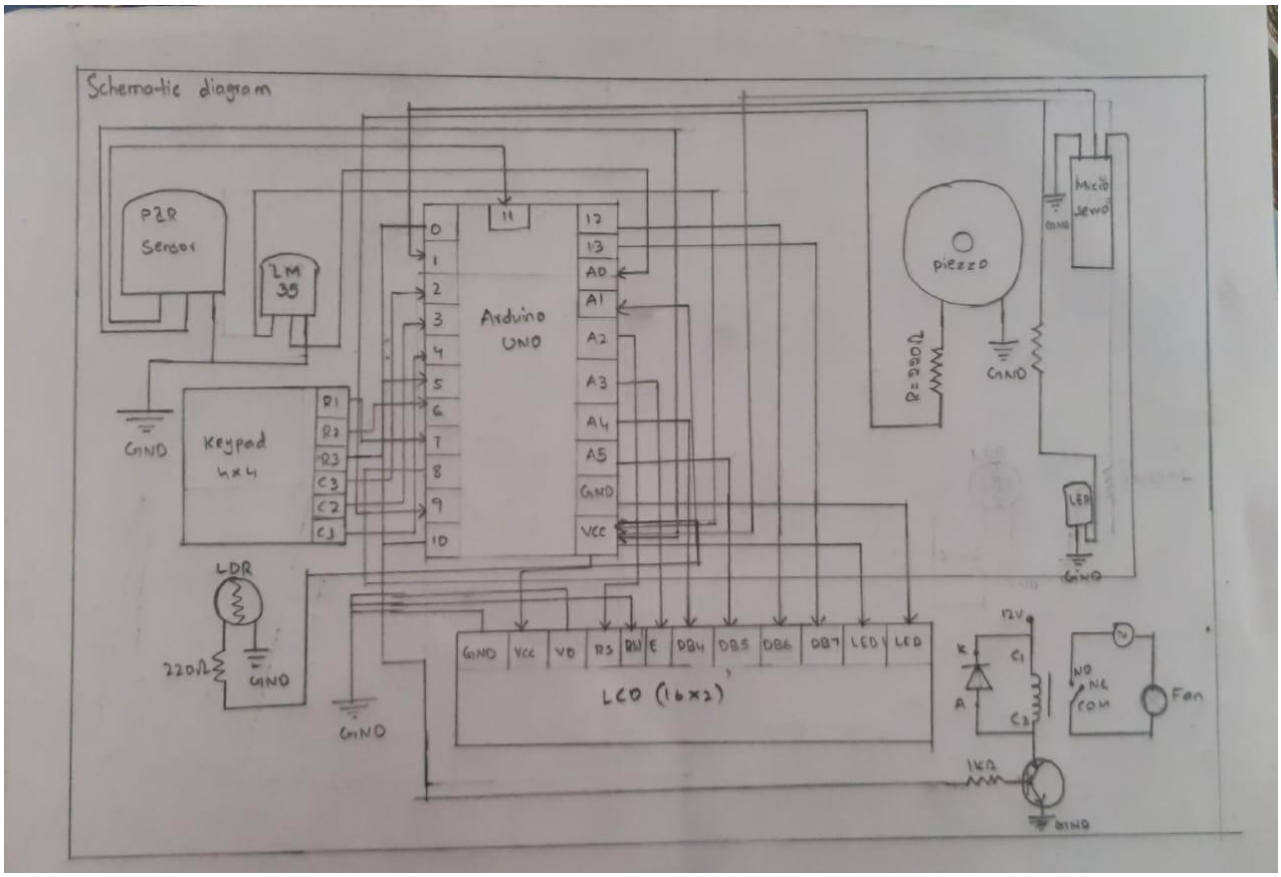


Fig. 3.5 Schematic Diagram

- The Schematic diagram in Tinker cad is shown in Fig.3.6.

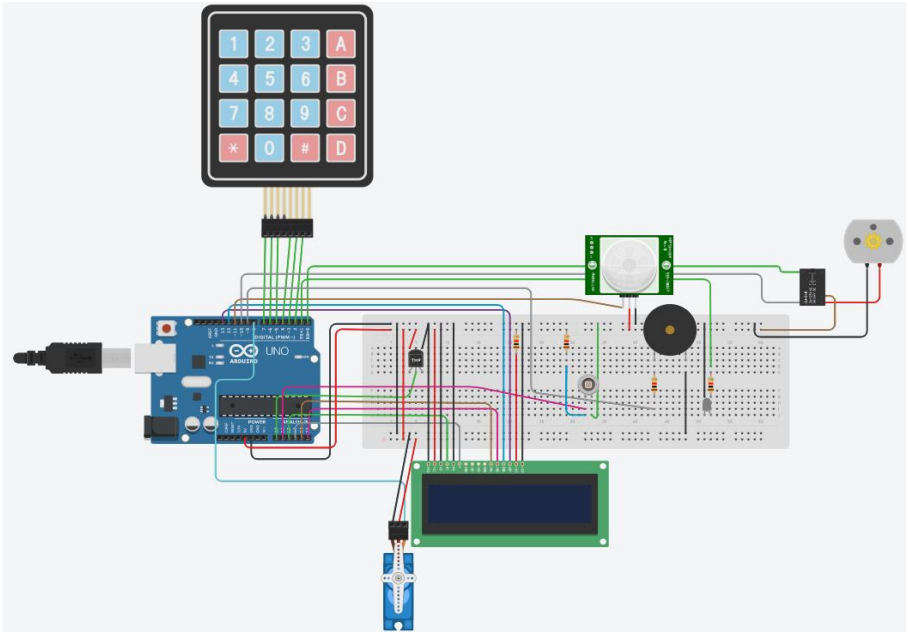


Fig.3.6. Schematic diagram in Tinker cad

## 3.2 Results

- First, it asks the user to enter the password as shown in Fig. 3.6. If the password is correct it prints Pwd is correct as shown in Fig. 3.7.


Fig. 3.7. Result 1

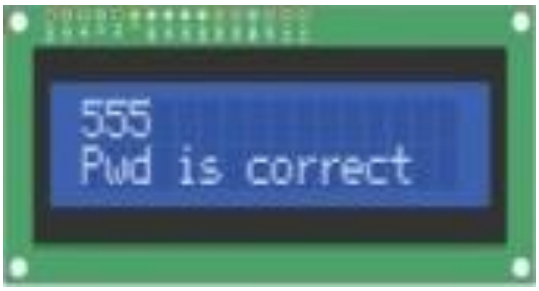


Fig. 3.8. Result 2

- The Temperature Sensor detects the temperature and prints it on the LCD screen as shown in Fig.3.8. According to the temperature the fan will be in On Mode and it' s speed will be displayed on the LCD screen as shown in Fig.3.9.

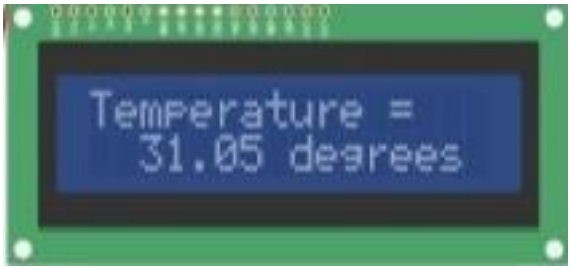


Fig.3.9 Result 3

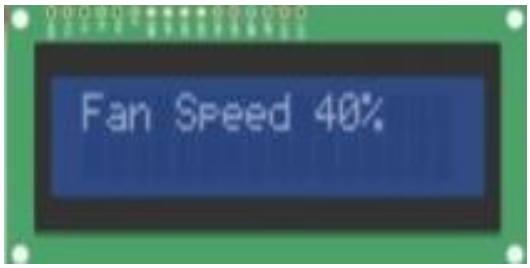


Fig.4.0 Result 4

- Photodiode detects the brightness in the room and based on that the brightness of led will be controlled as shown in Fig.4.0 and Fig.4.1.

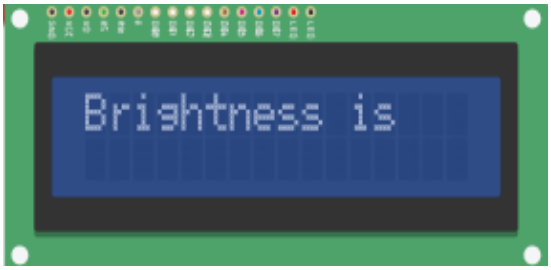


Fig.4.1 Result 5


Fig.4.2 Result 6

- If the given password is wrong, then it prints that the password is wrong on the LCD screen as shown in Fig.4.3. Also, the piezo buzzer will alert us as shown in Fig.4.4.

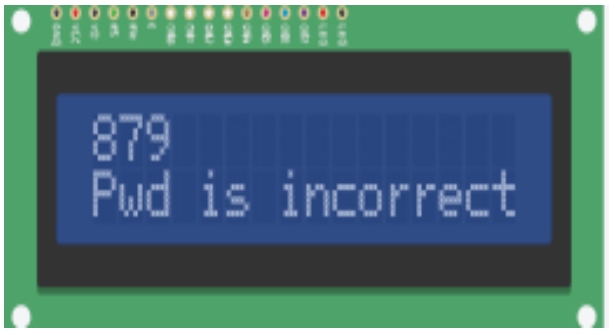


Fig.4.3 Result 7

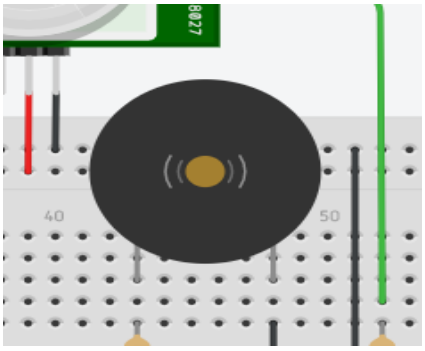

Fig.4.4 Result 8

## 3.3 Advantages

These days, there is no proper security if we use the old lock and key system. And it is better to have an automated home. There are several advantages with this project.

1. Power consumption is less.
2. It provides good security instead of using the lock and key system.
3. Automation provides great convenience to the users.
4. The sensors switch on the light and controls the speed of fan based on brightness and temperature in the room which provides the user a great comfort

## 3.4 Disadvantages

1. If the user forgets the password then it is not possible to go into the house.
2. If the intruder hacks the code then he can access to the house.
3. TMP36 sensor is not weatherproof.

# CHAPTER 4

# CONCLUSION

## 4.1 Conclusion

In short, there is a good security system which is based on the password. Also, the led also glows depending upon the brightness in the room and its brightness will be controlled. In addition to this, the speed of fan depends on the temperature in the room instead of regulating the fan speed manually. This saves the consumption of electricity and reduces manpower.

## 4.2 Future Scope

We cannot conclude this is the best option among all. We can add some more features to this project so that the efficiency of this project increases. To overcome the disadvantages in this project we can develop the project further in the following ways.

- We can try to connect this system with an android device to control the appliances with it.
- We can extend this automation to other appliances.
- We can also use a Bluetooth technology to control the appliances.
- Rather than using a Password based security system we can use biometric, iris scanning.
- Instead of using piezo buzzer we can use GSM interface which will send SMS if there is any invalid attempt.
- We can use gas sensors to detect the fire in case of any emergency.

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# APPENDIX

```
#include <LiquidCrystal.h>

#include <Keypad.h>

#include <Servo.h>

#define fan 0

#define codeLength 4

Servo myservo;

char Code[codeLength];

char PassW[codeLength]="555";

byte keycount=0;

const byte ROWS = 3;

const byte COLS = 3;

char hexaKeys[ROWS][COLS] = {{'1', '2', '3'},
                             {'4', '5', '6'},
                             {'7', '8', '9'}};

byte rowPins[ROWS] = {7, 6, 5};

byte colPins[COLS] = {4, 3, 2};

LiquidCrystal lcd(A2, A3, A4, A5, 12, 13);

Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);

int x = 0;

int ldr = 0;

int pir = 0;
```

```
float temp;
int tempPin = A0;
int relayPin = 10;
void setup()
{
   pinMode(11,INPUT);
   pinMode(9,OUTPUT);
   Serial.begin(9600);
   myservo.attach(8);
   pinMode(fan, OUTPUT);
   pinMode(relayPin, OUTPUT);
   lcd.begin(16, 3);
   lcd.print("Enter password");
   delay(2000);
   lcd.clear();
}
void loop()
{
   char customKey = customKeypad.getKey();
   if(customKey)
   {
     Code[keycount]=customKey;
     lcd.print(Code[keycount]);
     keycount++;
```

```
}
if(keycount==codeLength-1)
{
  if(!strcmp(Code,PassW))
  {
     lcd.setCursor(0,1);
     lcd.print("Pwd is correct");
     myservo.write(80);
     delay(500);
  }
  else {
      lcd.setCursor(0,1);
      lcd.print("Pwd is incorrect");
      myservo.write(10);
      tone(9,200);
      delay(500);
  }
 lcd.clear();
 while(keycount !=0)
      Code[keycount--]=0;
}
pir = digitalRead(11);
if(pir == HIGH)
{
```

```
ldr = analogRead(A1);
lcd.print("Brightness is ");
delay(2000);
lcd.clear();
lcd.setCursor(3,0);
lcd.print(ldr);
lcd.setCursor(3,1);
lcd.print("LED is ON");
int a =  map(ldr, 0, 1023, 0, 255);
analogWrite(1,a);
delay(2000);
lcd.clear();
lcd.setCursor(0,2);
temp = analogRead(tempPin);
float temperatureC = ((temp * 5.0)/1024.0 - 0.5) * 100 ;
lcd.setCursor(0, 0);
lcd.print("Temperature = ");
lcd.setCursor(2,1);
lcd.print(temperatureC);
lcd.println(" degrees C");
delay(3000);
lcd.clear();
if(temperatureC >= 20)
{
```

```
digitalWrite(relayPin, HIGH);
lcd.print("Fan ON");
delay(2000);
lcd.clear();
if(temperatureC >= 20 && temperatureC <= 25)
{
   analogWrite(fan,50);
   lcd.print("Fan Speed 20% ");
   delay(2000);
   lcd.clear();
}
else if(temperatureC <= 35)
{
    analogWrite(fan,100);
    lcd.print("Fan Speed 40% ");
    delay(2000);
    lcd.clear();
}
else if(temperatureC <= 40)
{
    analogWrite(fan,150);
    lcd.print("Fan Speed 60% ");
    delay(2000);
    lcd.clear();
```

```
            }
            else if(temperatureC <= 44)
            {
                analogWrite(fan,200);
                lcd.print("Fan Speed 80% ");
                delay(2000);
                lcd.clear();
            }
            else if(temperatureC >= 45)  {
                analogWrite(fan,250);
                lcd.print("Fan Speed 100% ");
                delay(2000);
                lcd.clear();
            }
        }
      else if(temperatureC < 20)   {
          digitalWrite(relayPin, LOW);
          analogWrite(fan,0);
          lcd.print("Fan OFF");
          delay(2000);
          lcd.clear();
     }
   }
}
```