



IoT Based Class Room Automation

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Abstract— IoT is a system of inter-related computing devices, objects, animals or people which are provided with unique identifiers and the ability to transfer data over a network without requiring any human interactions. IoT plays a major role in Automation. Our main aim here is to reduce the wastage of electricity at schools and colleges. Here a PIR sensor detects the presence of human body by capturing the heat emitted by the body in the form of Infrared waves. On detecting the presence of a human body inside the classroom, only after a delay of 1 minute the lights and fans will be turned ON. The speed of the fan is adjusted based on the surrounding Temperature, which is measured using the DHT11 Sensor. And LCD screen is used to show the current temperature and the Fan speed. The lights and fans within the human detected area will only be turned ON while the other areas remain OFF. After a Human leaves the classroom the lights and fans will be turned OFF automatically without any human interaction thus reducing the wastage of electricity. The key role here is played by the Arduino Uno Board and PIR Sensor.

Keywords— Class Automation, Arduino Uno, Detection of Human Presence, IoT, DHT11 Sensor, PIR Sensor, LCD, Save Electricity.

I. INTRODUCTION

In today's world, people are so busy that they are unable to manage each and every thing going on in their life. They schedule their tasks based on priority. Sometimes this can lead to a major catastrophe. So, today automation plays a key role in our day to day life. We can see automation in Home, Industry, Hospitals, Airports etc. Here the major aim is to complete a task more efficiently. In home automation the major task is to automate a bulk of electronic and electrical devices in the home along with the management of this devices remotely.

Similarly, here our system is used for automation of a class rooms in schools and colleges. It also controls fans and lights of the class room automatically. The system is used to reduce the wastage of electricity in schools and colleges. In most of the schools and colleges there is single person to check whether the fans and lights are turned off in each and every class room. It's a very tedious job for a single person to manage. In every schools and colleges we can see that most of time fans and lights are turned on without anybody in the room. So we are putting forward this system to reduce the wastage of electricity.

The system will detect the presence of human inside of a room with the help of a PIR sensor and based on the reading the lights and fans will be turned on automatically. When there is no one in the class room the lights and fans will be turned off automatically which will reduce the wastage of electricity and also it reduces the monotonous work of the peons in the schools and colleges.

II. HARDWARE DESCRIPTION

Arduino Uno:

It is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button. It can be programmed using the Arduino software IDE. It is supportable for large documentation, large library collection, low-power consumption and portable.

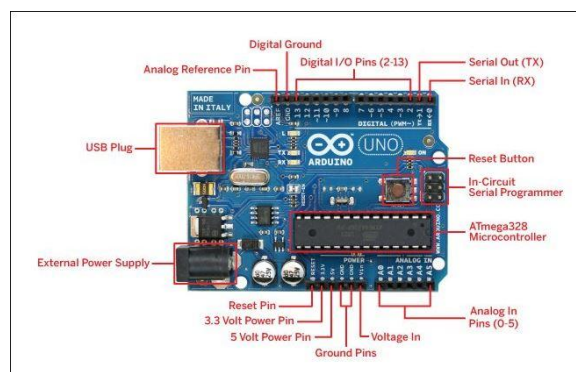


Fig: 1 Arduino Uno Board

16x2 LCD Display:

LCD stands for “Liquid Crystal Display” as the name suggest the LCD is used for displaying whatever we want it to show. Here 16x2 means 16 columns and 2 rows. This 16x2 LCD consists of 16 pins. Here we are using an LCD to display the temperature of the class room according to which the speed of the fan is adjusted.

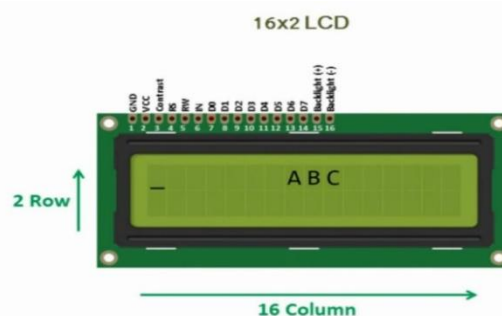


Fig: 2 16 x 2 LCD Display

PIR Sensor:

It is used for the detection of Human being in the class room. It is small, cheap and easy to use sensor. It Comprises of pyro-electric material to identify levels of radiation. Its range of detection is upto 6 meters. It has two triggering mode which can be changed according to the requirement. It has two potentiometer one is for adjusting the off time control for the PIR and the other one is for adjusting the sensitivity of the PIR sensor. There are two types of triggering modes in PIR they are H and L Mode. The H mode is the Repeatable Mode in which the pin will go high when a person is detected within the range and goes low after a particular time set by the off time control. In this mode the will go off irrespective of the presence of the human. L mode is the Non repeatable Mode in this mode the PIR sensor will be high as long as the person stays in the room. This mechanism is used in our class automation system. So that as long as the person is in the room the PIR will detect the human presence and make the lights and fans turned ON. And when there is no presence of human it will be turned off automatically.



Fig: 3 PIR Sensor

12V DC Fan:

A 12V DC Fan is used in the prototype design of the Class room automation system. The 12V DC Fan will be turned ON only when the PIR sensor detects the presence of Human also when the room temperature is above a certain temperature. According to various temperature the speed of the fan will be increased or decreased automatically.

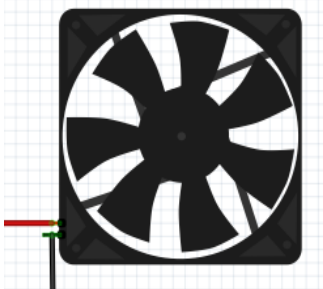


Fig: 4 12V DC Fan

DHT11 Sensor:

The temperature and humidity sensor used for our proposed project is DHT11 which is used specially to measure the temperature of the surrounding inorder to control the speed of the fans. It is having a capacitive humidity sensor and thermistor to read the values. It is highly reliable and more stable. It requires a power supply of 3.5V to 5.5V. The temperature and humidity data in serial fashion. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$.

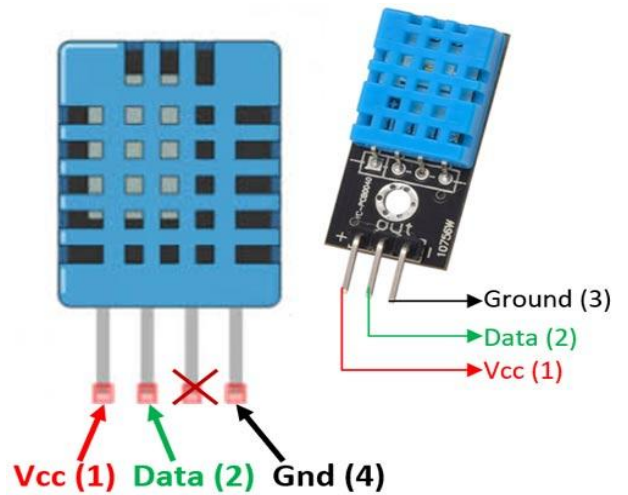


Fig: 5 DHT11 Sensor

LED:

LED stands for Light emitting diode. It is a semiconductor device. It has two legs one is Anode the longest leg and other one is the Cathode the shortest leg. Here a LED is turned ON when the PIR Sensor detects the presence of Human Being inside the class room.



Fig: 6 LED

III. CIRCUIT DIAGRAM DESCRIPTION

Circuit Diagram:

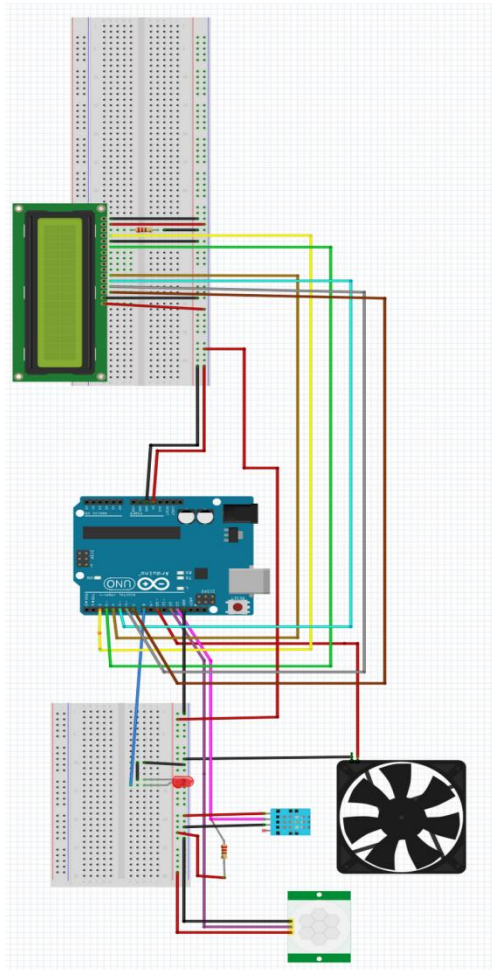


Fig 7: Circuit Diagram

The Arduino Uno is connected with all the required components to make an automated classroom. Firstly the LCD is connected with the Arduino Board. Connect the VSS pin of LCD to ground ,VCC to +5V Supply, Contrast Pin (VEE) of LCD is connected with a Resistor of 1Kohm to the ground, Connect the Register select(RS) of LCD to the PIN number 2 of Arduino, Connect the Read/Write(RW) pin of LCD to the ground, Connect the Enable Pin(E) to pin number 3 of Arduino, then connect PIN D4,D5,D6 and D7 pins of LCD to pin number 4,5,6,7 respectively of the Arduino Board. Now we connect the PIR Sensor to the Arduino Board. PIR sensor is a digital sensor consisting of three pins namely GND, Dout and VCC. The GND of PIR is connected to the Ground, VCC is connected to the 5V supply and the Dout is connected to the digital pin number 12 of Arduino Board. Now we connect the DHT11 with the Arduino Board. The DHT11 sensor consists of 4 pins out of which one pin is not used. The VCC of the DHT11 is connected to the 5V supply, DATA pin is connected to the pin 9 of Arduino and GND of DHT11 is connected to the ground. Then we connect the LED and Fan to the Arduino Board. The LED has two legs the longest is the Anode and the smallest is the cathode. The anode is connected to the pin 8 of Arduino Board and cathode is connected to the ground. The 12V DC fan has two pins namely VCC and GND. VCC is connected to the 5V supply and GND is connected to the ground.

The designed hardware prototype is shown in the Fig 8. This prototype contains a 12V DC fan, PIR sensor, LCD, Arduino Uno Board, LED, and DHT11 sensor. The individual connections of PIR sensor, LCD Display and DHT11 are shown in figure 9, 10, 11 respectively. The PIR sensor is a digital sensor so the output of the sensor either 0 or 1. The DHT11 sensor is a temperature and humidity sensor that captures the surrounding temperature. The LCD display shows the temperature of the surrounding. As per the temperature the speed of the fan is adjusted. So when the PIR sensor detects the human presence the LED and the 12v DC fan will be turned ON also the temperature will be displayed on the LCD screen. Fig 11 shows the code of implementation.

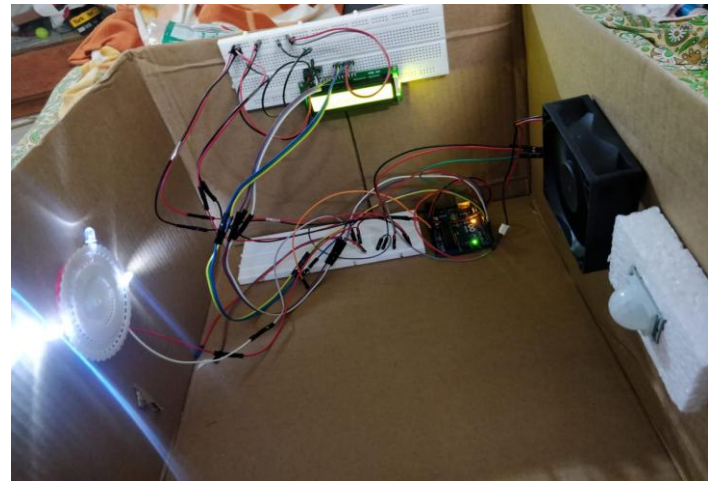


Fig 8: Hardware Prototype of Class Room Automation

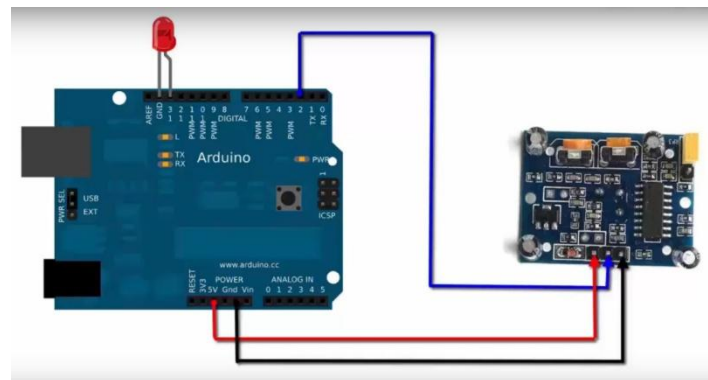


Fig 9: Connection of PIR sensor with Arduino Uno

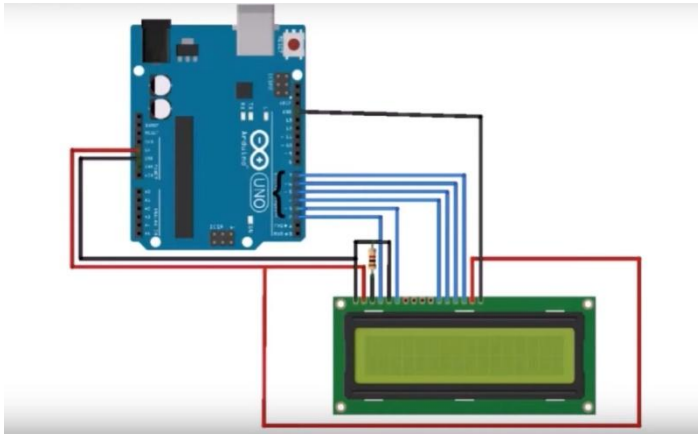


Fig 10: Connection of LCD Display with Arduino Uno

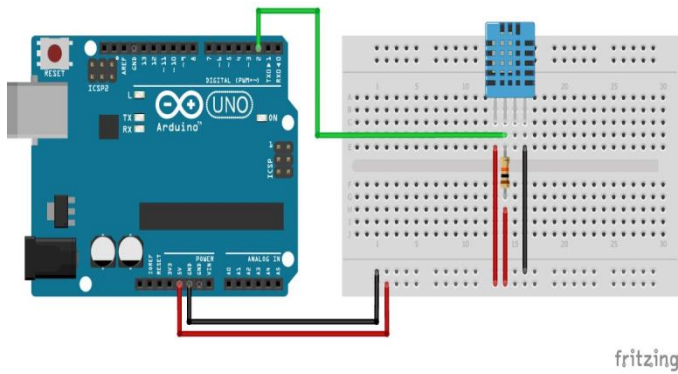


Fig 11: Connection of DHT11 with the Arduino Uno.

```

1 #include <LiquidCrystal.h>
2 LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
3 float temp;
4 int pirValue;
5 int minTemp=20;
6 int led_PIN=8;
7 int fan_PIN=10;
8 void setup() {
9   lcd.begin(16,2);
10  lcd.print("Temperature");
11  Serial.begin(9600);
12  pinMode(10,OUTPUT);
13  pinMode(12,INPUT);
14  pinMode(8,OUTPUT);
15 }
16 void loop()
17 {
18   lcd.setCursor(0,1);
19   temp=analogRead(A0);
20   temp=(temp/2.048);
21   Serial.println(temp);
22   Serial.println("PIR Value = ");
23   Serial.print(pirValue);
24   lcd.print((int) temp);
25   lcd.print(" Centigrade");

```

Fig 12: Implemented Program of Class Room Automation

```

26 if(digitalRead(12)==1)
27 {
28   delay(60000);
29   digitalWrite(8,1);
30   if(temp==minTemp)
31   {
32     analogWrite(fan_PIN,0);
33   }
34   else if(temp>21 && temp<=25)
35   {
36     analogWrite(fan_PIN,150);
37   }
38   else
39   {
40     analogWrite(fan_PIN,255);
41   }
42 }
43 else
44 {
45   digitalWrite(led_PIN,0);
46   analogWrite(fan_PIN,0);
47 }
48 }

```

Fig 12.1 Implemented Program of Class Room Automation

V. CONCLUSION

In large Educational Institutions the lights and fans will be ON even though there is nobody in the room. As the people are so busy that they do not notice whether the fans or lights are ON. By using this system the lights and fan of the class room will be turned ON only if there is someone in the room, otherwise the lights and fans will remain OFF. The Lights and fans will be turned OFF automatically when everyone leaves the class room. This system can help in reducing the wastage of electricity in large Educational Institutions.

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