

IoT BASED FIRE HAZARD PROTECTION SYSTEM

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This report presented in partial fulfillment of the requirement for the degree of
Bachelor of Science in computer science and engineering.

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APPROVAL

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We hereby declare that, the project has been done by us under the supervision of **Md Mahfujur Rahman, Lecturer, Department of CSE** Daffodil International University.

We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

Bangladesh is a fire accident prone country. The number of fires in Bangladesh has tripled since 1997 with 2018, an average of 53 views are being viewed daily. Figures from the Fire Service and Civil Defence show that between January 1, 1997 and December 31, 2018, there were about 250,000 fires, according to the online database Data hull. The fire caused a financial loss of about 6,400 crores to the country. Between 2004 and 2018, at least 1,970 people died in about 200,000 fires across the country, according to data available from the fire service. Urban experts have blamed unplanned urbanization, building construction violations, negligence on the part of the public, increased use of gas cylinders and devices, and a lack of supervision by relevant authorities. Fire safety is a set of practices that help reduce the damage caused by fire. Removes the onset of fire and helps to extinguish the fire.

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SECTION 01

INTRODUCTION

1.1 Introduction

The fire Hazard system must protect the lives of many .Even catches fire somehow it will help put out the fire. It will give information immediately everyone into the fire area and fire service department.

1.2 Motivation

Most fire accident victim of Bangladesh do not get immediately information and rescale when the fire spread. In fire accident situation Fire hazard system gives immediately alarm into the accident area and fire brigade. This system also helps to put out the fire.

1.3 Objectives

1. Sending alarm immediately fire accident area and fire brigade
2. Use fire ball, Carbon. Sand, Water for put out the fire automatically.

1.4 Expend Outcome

1. During fire risk alarm to the fire area
2. Give information to the fire brigade
3. Disconnecting electricity automatically
4. Quickly put out the fire use fire ball, sand, carbon, water.

SECTION 02

BACKGROUND

2.1 Introduction

Most of the people in the country are at risk of accidents due to fire. Many have faced this horrible accident. Some were died and others were seriously injured. Hundreds of crore of taka have been lost due to fire accident.

We are able to solve this terrible problem. Whenever there is a fire, our Fire Hazard System will give emergency information to everyone around and to the fire brigade. Electricity connection will be turned off automatically and Fire Ball, Sand, Carbon, Water will be used to put out the fire.

2.2 Related work

Much work has already been done in this area of the web. And there are some companies have created specialized systems. However, there are many fire hazard system that do not provide actual service and also have limitation about cost and others.

SECTION 03

NECESSITY DETERMINATION

3.1 Admin Requirement

1. First the user have to install the Blynk Server app and must have to log in to that.
2. In the event that for reasons unknown the administrator overlooks his secret phrase, he can set another secret word again by click the overlooked secret word button.
3. After login, admin will be able to see mail and notification.

3.2 Technical and legal Requirement

Must have to ensure the mobile network and internet connectivity unless he system can't send the notification or mail or SMS.

3.3 Hardware Requirement

To run this project minimum one pc and Internet connection need.

SL NO	Equipment Name
1	Flame sensor
2	DC motor
3	Sim 800I
4	Node mcu
5	Arduino
6	Mini Water Pump
7	Relay Module
8	Fire Ball
9	Bread Board
10	Jumper Wire

Table 3.1 Hardware Requirement

3.4 Programming Prerequisite

Diverse sort of programming need to creating and keeping up the system. Details given underneath.

Software	Use
Arduino IDE	To program the whole system.
Blynk App	To see the data.

Table 3.2 Software Requirement

SECTION 4
PROJECT DIAGRAM

4.1 Flow Chart

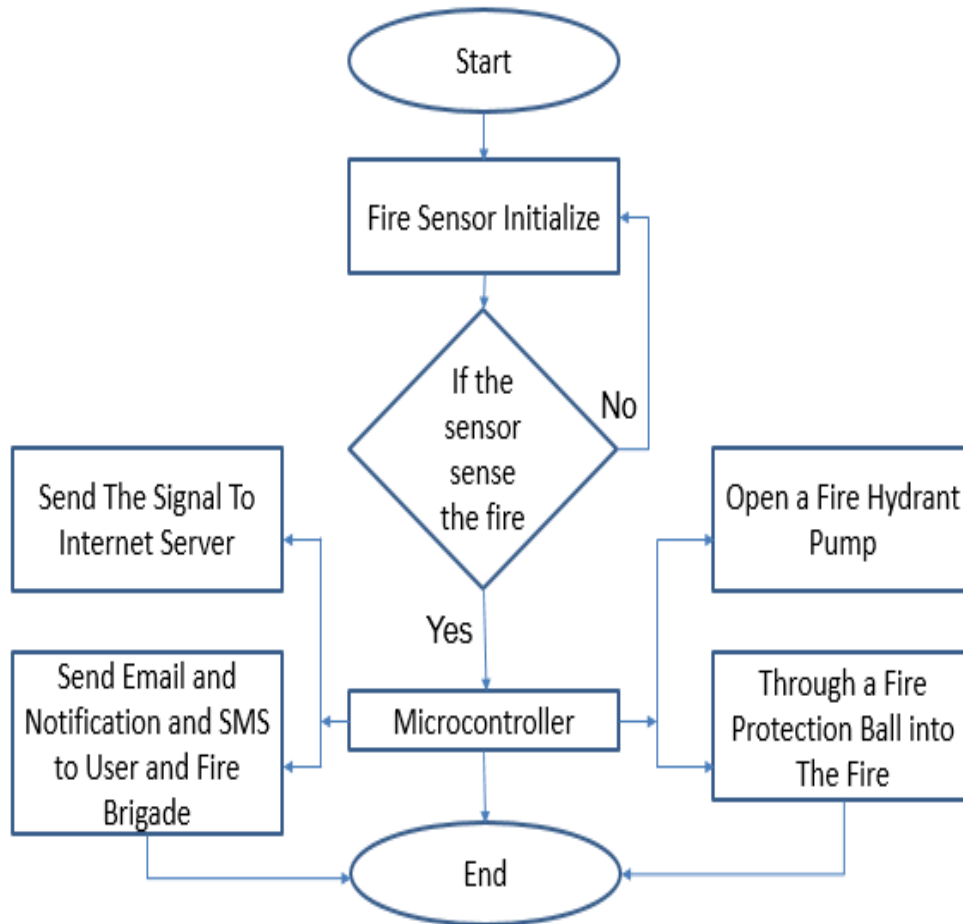


Figure 4.1 Flow Chart

4.2 Block Diagram

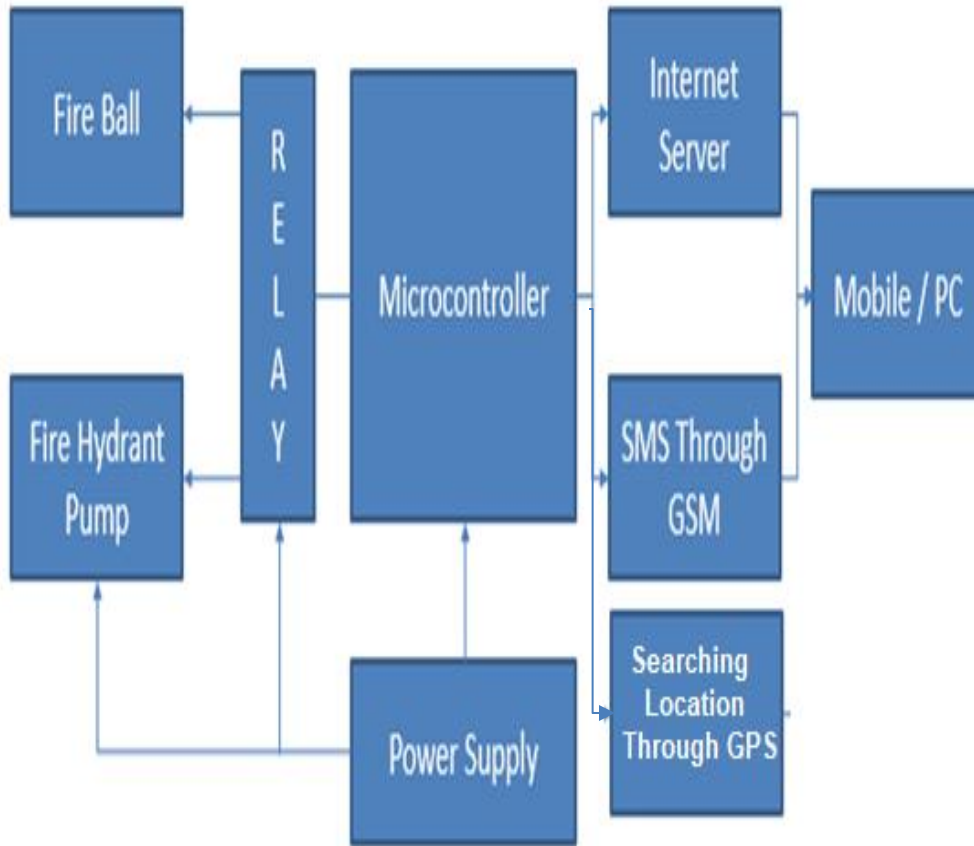


Figure 4.2 Block Diagram

SECTION 05

DESIGN SPECIFICATION

5.1 Flame sensor

Flame sensor is one kind of sensor which detects normal lights most sensitively. For this why this kind of sensors are being used in the flame alarms. This detector detects wavelength flames within the range of 760 nanometer to 1100 nanometer from the light source. This detector can simply be damaged at a high temperature. For this why a particular distance need to be maintained for placing this sensor. It can detect the flame from 100 cm and also it can detect from the angle of 600. This sensor can give us two kinds of signal, first one is analog and the second one is digital signal. In fire robots and fire alarms this sensors are oftenly be used. This sensor is mainly designed to detect the flame of the fire. For this first of all we need to set the sensor first. This kind of sensor are used in fire alarms, in natural gas line system, in petrol pump, and in the fire extinguisher system. This sensor is one of the most first and accurate sensor which is used now a days to detect flame and this is faster than the heat/smoke detector sensors.

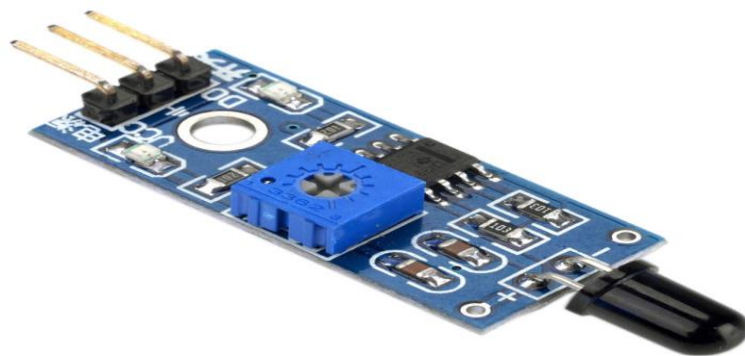


Figure 5.1: Flame Sensor

5.1.1 Flame Sensor Pin Configuration

- Pin1 (VCC pin): Positive voltage supply five volts DC.
- Pin2 (GND): For ground supply.
- Pin3 (AOUT): For analog output.
- Pin4 (DOUT): For Digital output.

5.1.2 Flame sensor feature

1. Identification flame.
2. It is reactive to the flame range.
3. Sensitivity can be adjustable.
4. The operating voltage 3.3V to 5V.
5. Power indicator and digital switch o / p indicator. Becomes higher than the distance of the detection will be higher than before.

5.2 DC Motor

Motor is an electrical machine. Which converts electrical energy into mechanical energy is motor. There are many kinds of motor available in industry and DC motor is one of them. Basically this motor is named as a dc motor for its input current. This motor is run by DC (Direct Current). Which is converted into mechanical rotation.



Figure 5.2: DC Motor

5.2.1 Types of DC Motors

There are different kinds of dc motors are available in industry and they are classified by their excitation and their input current also their voltage and method of running etc. And

they are in below -

- Separately excited
- Self-excited -
 - Series wound
 - Shunt wound
 - Compound wound -
 - Long shunt
 - Short shunt
- DC Servo Motor.
- DC Stepper Motor.

5.3 Sim 800L

K800i / K790 is a "block" (or "candy bar") style phone, weighing 115 kg, which is powered by a button on the thumb of the Sony Ericsson mobile phone from Sony t it simply the "dual-front" design of the digital camera has Ericsson K0000 on the back of a mobile phone designed like this, and will be kept side by side for taking pictures.



Figure 5.3: Sim 800L

5.4 Node MCU

NodeMCU ESP 8266 is an open source firmware from WiFi SOC Uses Espressoff and an on-module Flash-based SIFP file system. It has total 16 digital I/O pins and 1 analog i/o pin. Basically it's a normal microcontroller like others but it has built in wifi system. It can be programmed easily using many IDE. Arduino IDE is one of the best IDE for coding this device. Cause Arduino IDE has so many library file for NodeMCU board. And we know that much library files are the life of any microcontroller. It supports 3 communication methods. They are I2C, UART, and Serial Communication.

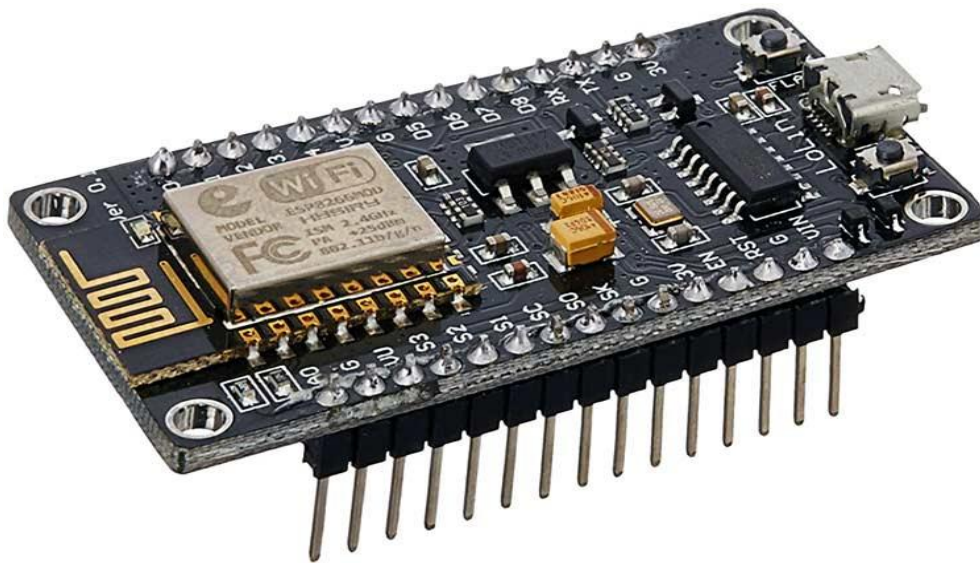


Figure 5.4: NodeMC

5.5 Arduino

Arduino is one kind of open source electronic platform which can be used to execute programs. Arduino is mainly designed for the designers and for the programmers for making the electronics more accessible to them. It will help them to reduce the cost of testing or making new things because they don't have to buy anything from the market, they can easily get access of many products which they needed to be bought from the market by money. A new arduino board can be made by their own or can be bought from the market. We all know that hardware design is open source, anybody can do this and people will accept the updated version of the product. So that the user has to either bought it from market and if it doesn't works as he wants than he can modify it in a new version. The arduino board which is newly assembled is includes with a microcontroller, which is

being coded with the arduino code and the real environment of the arduino is also be maintained in a assembled arduino board. By using this platform a user can create and program any kind of electric components and most of them can be used free. From the feedback of the arduino user it is clear to all that arduino language is easier than any other programming language like c or java.

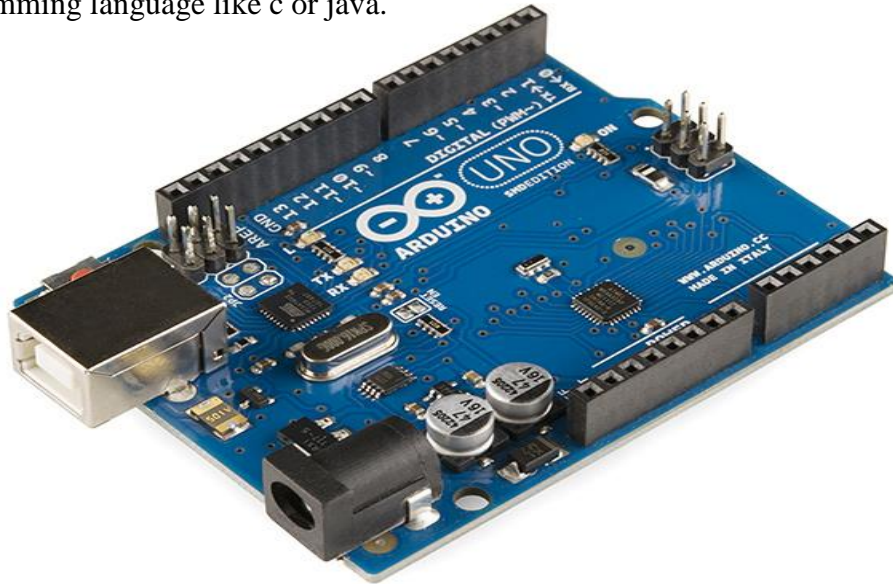


Figure 5.5: Arduino UNO

5.6 Mini Water Pump

This type of mini water pump is operated through a mini dc motor and 3d printed mini pump fan. This motor is powered by 6-12v DC power supply.



Figure 5.6: Mini Water Pump

5.7 Relay Module

Relay module is nothing but a relay (Relay is an electromagnetic switch. Which have 2 state that normally open and normally close and a common.) with low current enabled relay. Which can be 5V, 6V, 9V or anything else. Basically this type module or relay will be open only when the controlling voltage is triggered. The triggered voltage can be 0V or 5V depends the system.



Figure 5.7: Relay Module

5.8 AFO Fire Ball

AFO fire ball is a ball which contains fire prevent material inside it's own. Here AFO stands for Automatic Fire Off. This kind of balls have fire prevent material like CO₂, foam, wet powder and dry powder based on demand. Basically its one kind of fire extinguisher but it's automatic not as like common used fire extinguisher which need to squeeze to the fire. When the ball goes into the fire then automatically the ball will burst and the material which contains inside the ball will be spread into the fire and then the fire goes off.



Figure 5.8: Commonly Used AFO Fire Ball



Figure 5.9: Our Own Created Fire Ball

5.9 Bread Board

Bread board is a prototype board which is use for assemble electronic components without soldering. To make simple electronic circuit without any hassle this board is the best. Its made from plastic and good conductive metal.



Figure 5.10: Bread Board

5.10 Jumper Wire

Jumper wire is a normal electrical wire like others. But it's both end is connected to male pin or female port or both. Its use for connecting electronic equipment's lid to lid in bread board.

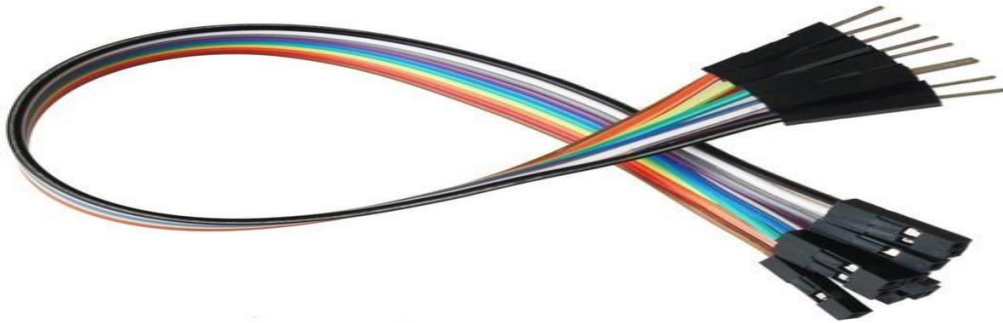


Figure 5.11: Jumper Wire

5.10 GPS

GPS stands for Global Positioning System. It is used for searching anything. And at first it is invented for detecting accurate any geographical locations. Basically it is a satellite communication system. Where there is a base station in earth. And a space station. In earth orbit that transmit information which allow to measure the distance between the satellites and the user. Here we used a GPS module named Neo 6.



Figure 5.12: GPS Module

SECTION 06

IMPLEMENTATION AND TESTING

6.1 Circuit Diagram

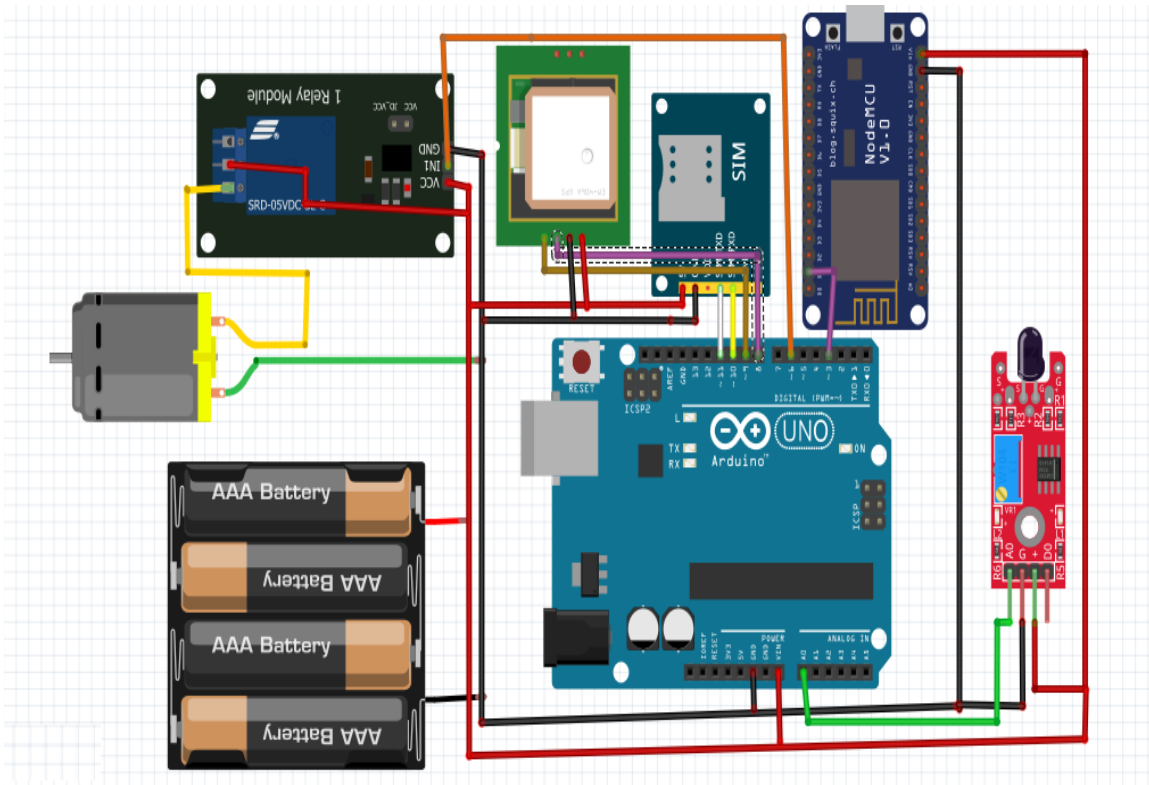


Figure 6.1: Circuit Diagram of the Project

6.1.1 Circuit Connection

At first we write a programming code for our project. Then we connect all the component as like the circuit diagram. We can see at the circuit that all the equipment is connected to the main microcontroller board. The flame sensor is connected to Arduino A0 pin and the relay module is connected to arduino digital pin D6 and the nodemcu is connected to arduino digital pin D4 and the GSM module is connected to Digital pin D10 and D11. And a GPS Module is connected to D8 and D9 pins. And a dc motor and a water pump is connected to relay module. The dc motor is for cutting the fire ball when the sensor detects the flame of fire.

6.2 Project Outlook

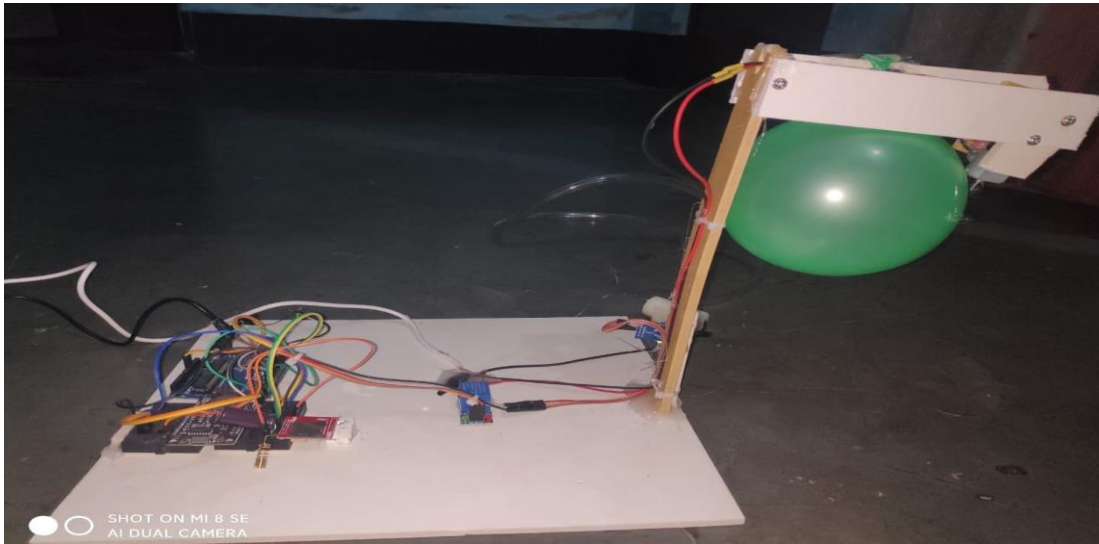


Figure 6.2 (A): Project Outlook

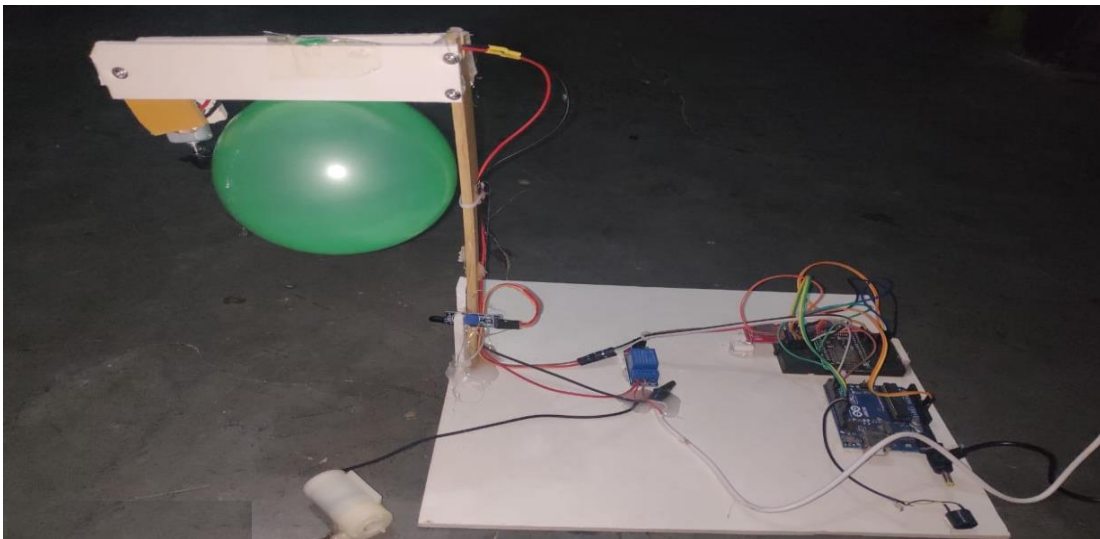


Figure 6.2 (B): Project Outlook

6.3 Testing and Output Result

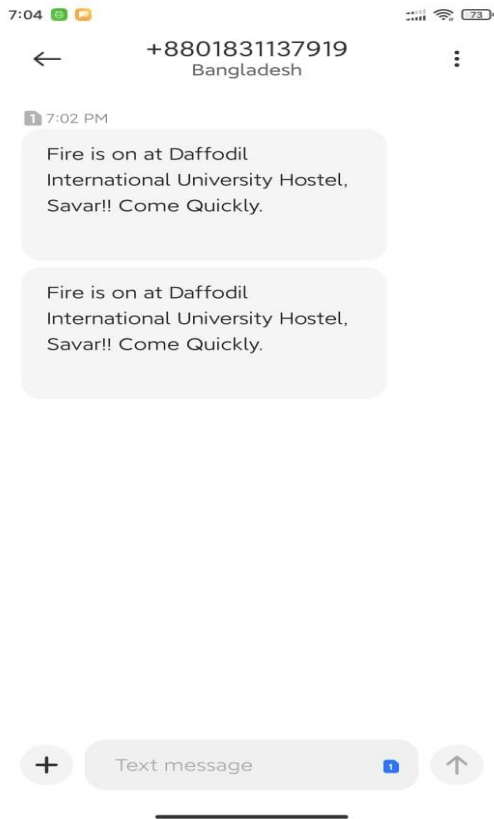


Figure 6.3 (A): SMS about Fire

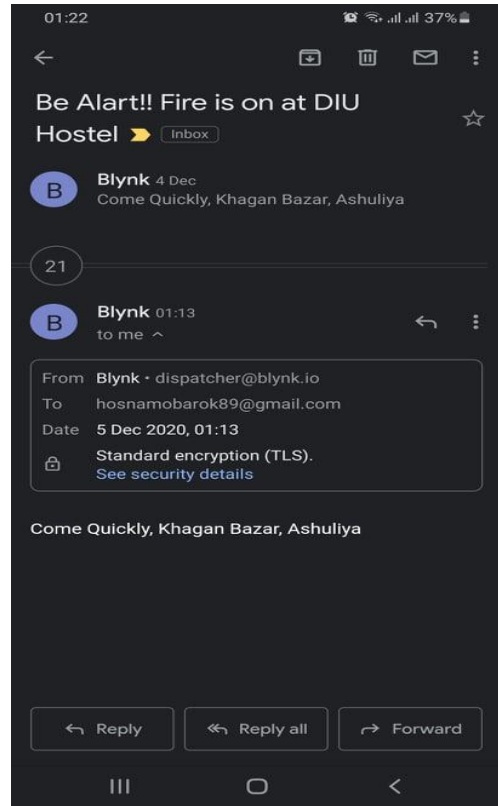


Figure 6.3 (B): Email about Fire

SECTION 07

CONCLUSION AND FUTURE SCOPE

7.1 Conversation and End

People need security to survive. Fire hazard system is a way to protect from fire. It works in a timely manner. We should be wary of fire for everyone's safety. Do not make mistakes that can cause fire.

7.2 Scope for future work

Future efforts of our projects:

- i. Technical support and skills need to improve content that helps users.
- ii. Privacy level and control level to be smoother and more perfect.
- iii. Bring internet charts, internet videos.
- iv. Multi language user, so people in the world anywhere can use it .
- v. Take it global

REFERENCES

- [1] Zanella, N. Bui, A. Castellani, L. Vangelista, and M. Zorzi, "Internet of Things for Smart Cities," *IEEE Internet of Things*, vol. 1, no. 1, pp. 22–32, 2014.
- [2] S. C. Folea and G. Mois, "A Low-Power Wireless Sensor for Online Ambient Monitoring," *IEEE Sensors Journal*, vol. 15, no. 2, pp. 742–749, 2015.
- [3] P. Changhai, Q. Kun, and W. Chenyang, "Design and Application of a VOC-Monitoring System Based on a ZigBee Wireless Sensor Network," *IEEE Sensors Journal*, vol. 15, no. 4, pp. 2255–2268, 2015.
- [4] S. D. T. Kelly, N. K. Suryadevara, and S. C. Mukhopadhyay, "Towards the implementation of IoT for environmental condition monitoring in homes," *IEEE Sensors Journal*, vol. 13, no. 10, pp. 3846–3853, 2013.
- [5] N. K. Suryadevara, S. Member, and S. C. Mukhopadhyay, "System for Wellness Determination of Elderly," *IEEE Sensor Journal*, vol. 12, no. 6, pp. 1965–1972, 2012.
- [6] S. Helal, W. Mann, H. El-Zabadani, J. King, Y. Kaddoura, and E. Jansen, "The Gator tech smart house: A programmable pervasive space," *Computer*, vol. 38, no. 3, pp. 50–60, 2005.
- [7] L. C. De Silva, C. Marikina, and I. M. Petra, "State of the art of smart homes," *Engineering Applications of Artificial Intelligence*, vol.25, no.7, pp.1313–321, 2012.

Appendix

Programming Code A

```
#include <SoftwareSerial.h>
SoftwareSerial sim(10, 11);

String number = "+8801"; // +880 is the country code
const int firepin = 2; // the number of the pushbutton pin
const int buzzerpin = 13;
const int mailpin = 3; // the number of the pushbutton pin
const int motorpin = 4;
void setup() {
  // initialize the LED pin as an output:
  pinMode(buzzerpin, OUTPUT);
  pinMode(mailpin, OUTPUT);
  pinMode(motorpin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(firepin, INPUT);
  Serial.begin(9600);
  Serial.println("Wait few seconds...");
  delay(5000);
  Serial.println("Sistem Started...");
  sim.begin(9600);
  delay(1000);
}

void loop() {
  int buttonState = digitalRead(firepin);

  // check if the pushbutton is pressed. If it is, the buttonState is HIGH:
  if (buttonState == LOW) {
    // turn LED on:
    SendMessage();
    Serial.println("Fire is on");
    digitalWrite(buzzerpin, HIGH);
    digitalWrite(mailpin, LOW);
    digitalWrite(motorpin, LOW);

  } else {
    digitalWrite(mailpin, HIGH);
    digitalWrite(motorpin, HIGH);
    digitalWrite(buzzerpin, LOW);
  }
}
```

```

if (sim.available() > 0)
  Serial.write(sim.read());
}

void SendMessage()
{
  sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"\" + number + "\"\r");
  delay(1000);
  String SMS = "Fire is on at Daffodil International University Hostel, Savar!! Come Quickly.";
  sim.println(SMS);
  delay(100);
  sim.println((char)26);
  delay(1000);
}

```

Programming Code A

```

#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
char auth[] = "WoTbjcqpXnPbBvorCViZnLw8tu0iC8Q4";
char ssid[] = "M";
char pass[] = "";

const int buttonPin = D1; // the number of the fire pin

// variables will change:
int buttonState = 0; // variable for reading the fire status

void setup() {
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  pinMode(buttonPin, INPUT_PULLUP);
}

void loop() {
  Blynk.run();
  buttonState = digitalRead(buttonPin);

  if (buttonState == LOW) {

```

```
Blynk.notify("Fire is on at DIU Hostel");  
Blynk.email("Be Alart!! Fire is on at DIU Hostel","Come Quickly, Khagan Bazar, Ashuliya");  
}  
else {}  
}
```