REPUBLIC OF TÜRKİYE

ALTINBAŞ UNIVERSITY

Institute of Graduate Studies

Electrical and Computer Engineering

# AN EARLY WARNING SYSTEM FOR FIRES IN HOSPITALS AND HEALTH CENTERS VIA THE INTERNET OF THINGS TO REDUCE HUMAN AND MATERIAL LOSSES

**Omar Mohammed Abed AL-ISAWI**

Master's Thesis

Supervisor

Asst. Prof. Dr. Sefer KURNAZ

Istanbul, 2023

# AN EARLY WARNING SYSTEM FOR FIRES IN HOSPITALS AND HEALTH CENTERS VIA THE INTERNET OF THINGS TO REDUCE HUMAN AND MATERIAL LOSSES.

**Omar Mohammed Abed AL-ISAWI**

Electrical and Computer Engineering

Master's Thesis

ALTINBAŞ UNIVERSITY

2023

The thesis titled AN EARLY WARNING SYSTEM FOR FIRES IN HOSPITALS AND HEALTH CENTERS VIA THE INTERNET OF THINGS TO REDUCE HUMAN AND MATERIAL LOSSES prepared by OMAR MOHAMMED ABED AL-ISAWI and submitted on 13/04/2023 has been **accepted unanimously** for the degree of Master of Science in Electrical and Computer Engineering.

Asst. Prof. Dr. Sefer KURNAZ

Supervisor

Thesis Defense Committee Members:

| | | |
|---|---|---|
| Asst. Prof. Dr. Sefer KURNAZ | Department of Computer Engineering, Altınbaş University | _____ |
| Asst. Prof. Dr. Abdullahi Abdu IBRAHIM | Department of Computer Engineering, Altınbaş University | _____ |
| Asst. Prof. Dr. Zeynep ALTAN | Department of Software Engineering, Beykent University | _____ |

I hereby declare that this thesis meets all format and submission requirements of a Master`s Thesis.

Submission date of the thesis to the Graduate Education Institute: ____/____/____

I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

Omar Mohammed Abed AL-ISAWI

Signature

# DEDICATION

Dedication to my father, my mother, my wife, my brother, my sisters, my paternal uncles, my uncles, and to Rafi Al-Issawi, and to Sheikh Muhammad Abd Al-Rahman, and to everyone who taught me a letter.

# PREFACE

The work described in this thesis has been funded by Altınbaş University Office of Scientific Research Projects as part of the Project No.

# ABSTRACT

## AN EARLY WARNING SYSTEM FOR FIRES IN HOSPITALS AND HEALTH CENTERS VIA THE INTERNET OF THINGS TO REDUCE HUMAN AND MATERIAL LOSSES/DISSERTATION

AL-ISAWI, Omar Mohammed Abed

M.Sc., Electrical and Computer Engineering, Altınbaş University,

Supervisor: Asst. Prof. Dr. Sefer KURNAZ

Date: April / 2023

Pages: 55

A fire alarm circuit is an easy-to-build device that, upon detecting fire, sounds an audible alert (often a buzzer or siren). Smoke detectors and fire alarms are both components of security systems that play a significant role in early fire detection and the prevention of injuries and property loss. Fire alarms and smoke detectors must be installed in all public and commercial buildings. This includes schools, government buildings, and other institutions.

There are many expensive and complex fire alarm circuits in the form of stand-alone devices, but we designed a very simple fire alarm circuit using common components like Arduino uno r3,Flame sensor ,Wifi module ,DHT11 temperature and humidity sensor and Pressure sensor gy-68,the LCD screen and the GSM module.

It is powered by this project is designed to be a fire early warning system in hospitals and health centers via the Internet of Things to reduce human and material losses.

**Keywords:** Fire Alarm, Arduino Uno, GSM, UVTRON, Wi-Fi Module, Internet of Things (IoT).

# TABLE OF CONTENTS

**Pages**

# LIST OF FIGURES

**Pages**

# ABBREVIATIONS

| | | |
|---|---|---|
| NFPA | : | National Fire Protection Organization |
| IoT | : | Internet of Things |
| FDA | : | Fire Detection and Alarm |
| GSM | : | Global System for Mobile |
| LCD | : | Liquid Crystal Display |
| CPU | : | Central Processing Unit |
| SMS | : | Short Message Service |
| DHT11 | : | Temperature and Humidity |
| USP | : | Universal Serial Bus |
| LED | : | Light Emitting Diode |
| PWM | : | Pulse Width Modulation |
| EEROM | : | Electrically Erasable Programmable Read only Memory |
| SRAM | : | Static Random Access Memory |
| IC | : | Integrated Circuit |
| SOC | : | System on Chip |
| IP | : | Internet Protocol |
| TCP | : | Transmission Control Protocol |
| IDE | : | Integrated Development Enviroment |
| PCB | : | Printed Circuit Board |
| NTC | : | Negative Temperature coefficient Thermistor |

| | | |
|---|---|---|
| GPRS | : | General Packet Radio Service |
| GPS | : | Global Positioning System |
| BPSM | : | Barometric Pressure Sensor module |
| SDA | : | Serial Data Line |
| SCL | : | Serial Clock Line |

# 1. INTRODUCTION

## 1.1 INTRODUCTION

Fire has been a component of learning since people started constructing things out of wood rather than stone. In fact, catastrophic fires have occurred so frequently throughout history that they have largely destroyed every major city in the globe at some point or another. In Boston in 1872, a similar fire outbreak occurred. Despite not being as massive as the fires in Chicago the year before or San Francisco just over three decades later[1].

Broad preparation in firefighting undertakings, including battling, quenching, and forestalling fires, answering crisis calls, working and keeping up with local group of fire-fighters hardware and quarters, and the sky is the limit from there, are undeniably required. According to historical records, Rome was the location of the first modern fire departments. In order to ensure Rome's safety after a devastating fire in 60 A.D., Nero established a Corps of Vigils (Vigils). As firefighters and police officers, more than 7,000 volunteers used buckets and axes [2].

To fight, put out, and prevent fires, respond to emergency calls, operate and maintain fire department equipment, and conduct firefighting tasks expertly, firefighters need a variety of talents. Rome is where the first firemen were ever recorded. Emperor Nero founded the Corps of Vigils (Vigils) in 60 AD to defend Rome following a terrible fire. It was made up of 7,000 individuals who worked as police and battled flames while carrying buckets and axes. [3]

Many businesses and structures in the modern period are equipped with fire alarms, extinguishers, water systems, and other fire safety and control measures. Yet the problem is that these conventional fire extinguishers can't respond fast enough to save lives when a fire breaks out. The most effective strategy for reducing these costs is to act swiftly in the face of an emergency. So, it is essential to install a separate fire detection system. Hence, this project aims to build a microcontroller-based fire alarm and control system that, upon sensing the presence of excessive heat, immediately sounds an alarm, notifies authorities by SMS, and extinguishes the blaze [4].

Fire occurrences have grown to be a serious problem in modern times [5-6], which must be resolved quickly and without needless delay in order to prevent the loss of life and property [7-8]. If the observed temperature is more than $50^{o}$ C, a fire situation exists. Personnel must arrive for assistance in a fire hazard at vital locations including hospitals, schools, and banks in around 15 minutes. [9].

Around 2,950 lives are lost, 16,600 people are injured, and $14.8 billion in direct property damage is incurred each year in the United States due to the 1,291,500 structural fires that occur annually [10].

Two-thirds of home fires in the United States are caused by buildings without functioning smoke alarms, alarms that are not properly maintained, or alarms that are misplaced, according to the National Fire Protection Association (NFPA) [11]. A proactive warning and the proper positioning of fire alarms may reduce fatalities and property damage. [12, 13].

Especially, there are a few assortments of smoke and intensity identifiers and alarms [14], The best kind for a shop or home not entirely set in stone by examining these sorts. When the temperature reaches a certain level, heat detectors, for instance, are standard options [15]. As a result, it is best suited for situations in which a quick response is not required or for environments such as frozen regions where smoke detectors cannot be installed. Heat detectors continue to respond slowly due to the slow rise in temperature, but there are fewer false alarms.[16]

The concept of the internet of things (IoT) is currently utilized in a number of applications, including smart agriculture [18], smart industry [17], smart healthcare [19, 20], and smart hospital application [21]. The Internet of Things offers a number of advantages for home automation [22, 23].

To cut down on engineering costs associated with managing all the associated equipment, remote plant sites could use technology that enables remote operation and maintenance. This includes things like autonomous interappliance, where devices communicate with one another and are aware of the information flow.

Nowadays, fires can spiral out of control because individuals choose to install inadequate fire alarm systems in an effort to save money. Some issues, such cost, efficacy, and reactivity, still exist [24-25]. Examples of prior research in the field include the network-based real-time integrated fire detection and alarm (FDA) system with building automation [26] have been made to address these issues.

## 1.2 PURPOSE OF PROJECT

a. In the event of a fire, the main function of a fire alarm system is to alert people as quickly as possible so that they may evacuate the building.

b. As soon as the fire is discovered, measures may be taken to contain or extinguish it.

c. Maintaining the safety of patients and workers in hospitals and health centers.

## 1.3 PROBLEM STATEMENT

On the designated floor, a fire was started by the explosion of an oxygen gas cylinder on April 24, 2021 AD, which is the evening of Ramadan 11, 1442 AH. Ibn Al-Khatib Emergency clinic is found south of the Iraqi capital, Baghdad, and is assigned to get basic instances of individuals tainted with the Covid. requiring pneumonic revival at the emergency clinic, bringing about 82 passings and 110 consume wounds.[27]

Starter examinations, as per everything a clinical source said to France 24, demonstrate that the reason for the fire was inability to consent to somewhere safe circumstances connected with the capacity of oxygen chambers expected for the treatment of Covid patients. In addition, the Iraqi Civil Defense made the announcement at midnight on Sunday that it had taken control of the fire, which was said to have “started with the explosion of an oxygen cylinder, according to eyewitnesses.” The civil defense stated that "the secondary ceilings accelerated the spread of fire because they contained materials" and that "the hospital is devoid of a system" for sensing and extinguishing fires. Profoundly combustible plug. [28-29]

**Figure 1.1:** Ibn Al-Khatib Hospital Fire.

## 1.4 SOLVE THE PROBLEM

To avoid the problem of fire and its unpredictability, and to preserve the safety of patients, their companions, and doctors, a project was designed An early warning system for fires in hospitals and health centers via the Internet of Things to reduce human and material losses.

# 2. LITERATURE REVIEW

Several researchers have shared their findings in this regard. Here are a few of the highlights. Systems for disseminating information about fires, particularly those that do so using microcontrollers and mobile phones, have been the subject of several research. This system makes use of MQ-2 smoke sensors, UVTRON fire sensors, an ATmega32 microcontroller that acts as a controller, a mobile phone that transmits information, and UVTRON fire sensors. Using the SIM900, MQ-2 smoke sensors, and LM35 temperature sensors, SMS is used to notify users of fires. In the event that there is a fire outside the home, the framework can caution the proprietor. All of the components are controlled by an Arduino UNO. [30]

The smoke and temperature sensors on this detector work together to spot fires in their earliest stages. Included in the system are temperature sensors, smoke detectors, a digital-to-analog converter model 0809, AT89S52 microcontroller-based system controllers, and an alarm that sounds in the event of a fire. An early prototype fire detection system, it relied on data from temperature and smoke sensors to detect fires and immediately triggered an alarm. [31]

Investigators developed a system to notify the public of dangerous situations. A microcontroller and GSM modules were utilized in addition to the temperature e-sensor (LM35). At the point when a mishap is identified, sensors send a SMS message with the directions of the scene to the police through GSM.[32]

Many pieces of hardware are used in the following system: sensors (shock sensors), a microcontroller, GSM, LCD, buzzer, and CPU. If the sensor triggers the receiver, a text message will be sent to the driver's loved one. In addition to being shown on an LCD panel, this text message will also be sent.

The focus of this piece is on installing a monitoring and security system at your house. A microcontroller, relay, LM35, mobile phone, magnetic sensor, and passive infrared sensor round out the components (PIR). If a sensor goes off, the homeowner will get an SMS notification.[33]

Domestic petrol leak detection is explained in depth. Gas data are gathered and displayed on an LCD by the microcontroller, GSM, and LPG sensors. When a gas leak is detected, this microcontroller automatically issues a warning. In addition to the warning message that is displayed on the LCD screen, the user also receives a helpful SMS.[34]

In their paper, the scientists detailed a straightforward strategy for monitoring local climate changes. A Bluetooth microcontroller and many sensors are included in the hardware package. To collect data from a DHT 11 and wind speed sensors, an Android phone is used as a reader, and the information is sent to an Arduino through Bluetooth. Yet, all of these systems rely on the same short messaging service (SMS) format to send "fire alert" messages and alarms, complete with precise location information.[35]

As it is, it is problematic because fire services are often late at the scene of fires [36]. This may be accounted for in two ways. One is the staff's unreadiness to begin work. Second, there was heavy traffic close to the blaze, therefore it took longer for information to reach locals (1122 in Pakistan) [37]. It is hoped that the smoke, temperature, and fire detection system would be able to detect fires as soon as they start and promptly notify the local fire department. For the sake of people's safety in the event of an accidental fire, this is the first measure to take. The present systems are briefly described in Table 1.

As Burchan et al (2019). This study explores the potential use of fire extinguishing balls in a system where drone and remote-sensing technologies are utilised together to supplement traditional firefighting approaches. A firefighting UAS, a communication UAS, and a reconnaissance UAS make up the system, with the latter two serving to establish and improve the line of contact between the former two. Because to the intricacy of the technology, drone control is difficult and risky .[38]

Qin et al. (2018). Developed a ZigBee wireless sensor network for an intelligent smoke alarm system. A wireless connection module, an intelligent identification and data display module, and a smoke detector module make up the system. His system's drawback is that it is extremely costly and difficult to construct. [39]

Izang et al. (2018). developed a SMS-based fire alarm and detection system. The servo motor, the alarm system, and the GSM module are all activated when the system detects gas

or fire. The Arduino then sets off the GSM module to send SMSes. The servo motor, in contrast to the pump motor, operates at an angle of 170 degrees, making it impossible to stop fire from spreading. This is one disadvantage of the system. [40]

Jinan (2018) A smoke sensor, a GSM (Global System for Mobile Communication) module, and a sound module were designed and implemented into a factory security system. When a gas leak is found, a specific number will receive an SMS. The system's drawback is the lack of a mechanism to control gas leaks; as a result, when a fire breaks out, the system isn't equipped with the essential extinguishing equipment, which might result in property loss. [41]

Poonam and co. 2014). An intelligent system of fire extinguishers was developed. The highlights incorporate wise fire identification and concealment, pinpointing the area of the fire's starting point, compelling electrical control, revealing by SMS or email, and productive utilization of water supplies. A gas sensor, one of the ones used, can give a false alarm, making it unreliable. [42]

# 3. THEOREM BACKGROUND REQUIREMENT

## 3.1 INTRODUCTION

This chapter talks about the components that were used in this project. For this kind of project we need Arduino uno r3,Flame sensor ,Wifi module ,DHT11 temperature and humidity sensor  and Pressure sensor gy-68.

## 3.2 HARDWARE TOOLS

### 3.2.1 UNO Arduino

The Arduino UNO is a programmable open-source microcontroller board that can be utilized for a large number of electrical tasks. It is little, economical, and simple to utilize. This board has the ability to work with transfers, LEDs, servos, and engines and can work with other Arduino sheets, Arduino safeguards, and Raspberry Pi sheets. Six analog input pins, fourteen digital I/O pins, six of which are utilized for PWM output, an USB connector, and an Atmega328 AVR microprocessor make up the Arduino UNO. The Arduino Integrated Development Environment (IDE) is used to program this board, which is connected to your computer via USB. The device has 32 KB of flash memory, 2 KB of SRAM, and 1 KB of EEPROM for the program's instructions.

Although the unit's input voltage may be anywhere from 6V to 20V, the optimum input voltage is between 7V and 12V since the board's microprocessor and other related circuits function at 5V [43].

**Figure 3.1:** UBS Cable with Arduino UNO.

i. The Arduino boards

Hardware specialists have become intimately acquainted with the Arduino stage. The Arduino only requires a USB cable to upload new code, unlike other programmable circuit boards. Moreover, the Arduino's product utilizes a worked on variant of C++, making it simpler to figure out how to customized. Last but not least, the micro-function controllers are packaged in a more user-friendly package thanks to the Arduino's simpler user interface. [44]

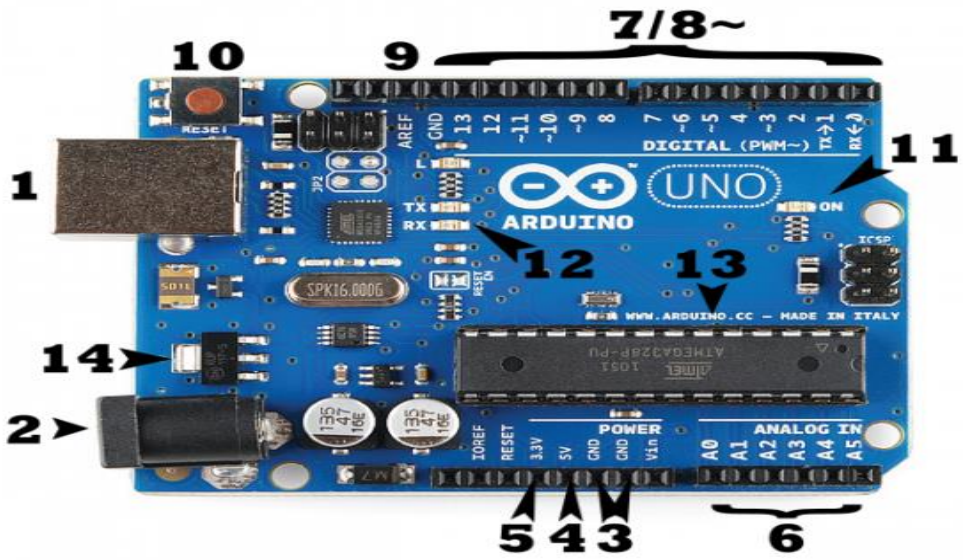


**Figure 3.2:** Board of Arduino UNO Part.

Below is an explanation of the parts on board:

ii. Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

With a breadboard and some wire, you may build a circuit by connecting components to the Arduino's pins. 'Headers' made of black plastic make it easy to connect wires to the board. Several types of pins serve various purposes on the Arduino board, and they are all clearly labelled.

a. GND (3): Name for the literal earth. The Arduino has many GND pins that may all be utilised to ground your circuit.

b. 5V (4) & 3.3V (5): The 5V pin provides 5 volts, while the 3.3V pin provides 3.3 volts, as you would expect. Several common Arduino components are 5 or 3.3 volt-friendly.

c. Analog (6): Pins labelled "Analog In" (A0 through A5 on the UNO) are used for analogue input. The signal from an analogue sensor (such a temperature sensor) may be read by these pins and converted to a digital value.

d. Digital (7): On the UNO, the digital pins are located in opposition to the analogue ones (0 through 13). You might involve these pins for either computerized input, (for example, detecting when a button is squeezed) or advanced yield (like fueling a Drove).

e. PWM (8): There may be a tilde () next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These jacks support pulse-width modulation (PWM), in addition to functioning as standard digital jacks. Our guide has more information on PWM, but for the time being, just imagine that these pins might behave like analogue outputs (like fading an LED in and out).

f. AREF (9): denotes analog reference You can leave this pin alone most of the time. It is sometimes used to set the analog input pins' upper limit at an external reference voltage (between 0 and 5 Volts).

iii. Button to Reset

The Arduino features a reset button, much like the original Nintendo (10). By pressing it, you may force the Arduino to restart whatever code is currently loaded. If your code doesn't have any repetitions but you still want to test it several times, this might be quite helpful. Nevertheless, unlike the original Nintendo console, issues with an Arduino are seldom resolved by just blowing on it.

iv. LED Power Indicator

On your circuit board, just below and to the right of the word "UNO," you can find the small LED that is next to the word "ON." This LED ought to begin blinking as soon as you connect your Arduino to a power source. Warning: something is presumably off-base on the off chance that this light doesn't come on. It's time to examine the wiring.

v. LEDs TX RX

Send is abridged as TX and gathering as RX. Such documentations are in many cases utilized in gadgets to recognize the association focuses for sequential information move. Our Arduino UNO has two instances of TX and RX; first by computerized pins 0 and 1, and again by the TX and RX sign LEDs (12). These lights will turn on whenever our Arduino sends or receives data, such as when it is uploading new software.

vi. IC Main

A coordinated circuit is the dark article with a few metal legs (13). Imagine it as the primary processing unit of our Arduino. The Arduino's central integrated circuit (IC) is typically an ATmega produced by the ATMEL company, though this can vary greatly from board to board. Before you can transfer another program utilizing the Arduino IDE, you might have to know the IC sort notwithstanding the board type. Typically, this information is printed on the top of the IC. Perusing the datasheets is really smart to dive more deeply into the distinctions between various sorts of ICs.

vii. Voltage Regulator

There is no need to (or ability for) user intervention with the Arduino's voltage regulator (14). Nonetheless, being aware of its existence and purpose might prove to be very helpful. The voltage regulator's stated purpose is to regulate the input voltage to the Arduino board. You may think of it as a gatekeeper that protects the system from dangerously high voltage. But, it does have certain restrictions, so make sure your Arduino isn't connected to more than 20 volts.

### 3.2.2 Breadboard

A breadboard consists of several little holes on a rectangular plastic board. Electronic components for prototyping may be inserted into these holes [45].

**Figure 3.3:** Breadboard.

### 3.2.3 Jumper Wires m-f & m-m

A 40-wire Ribbon Cable with female header connectors for use with breadboards. Easy to disassemble into single wires or bundles for use in various applications [46].

Features:

a. Multiple colours.
b. 30 cm long.
c. Female Sockets at each end.

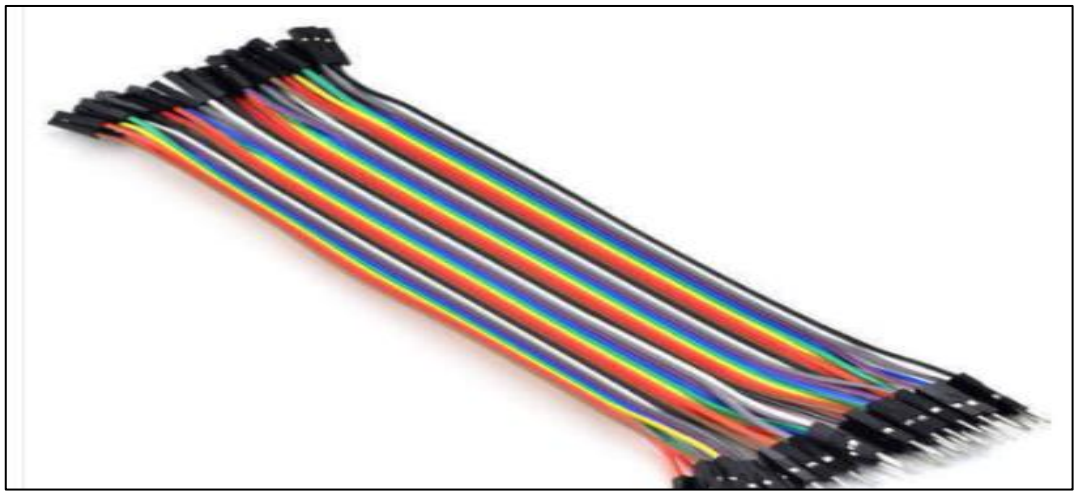

**Figure 3.4:** Jumper Wires m-f & m-m.

### 3.2.4 Flame Sensor

Among the many types of detectors, a flame-sensor is optimised for finding and reacting to fires. The reaction of the flame detector may be affected by how well it is fitted. It has a fire suppression system, propane, and a natural gas connection. There are industrial boilers that employ this sensor. Its primary use is as a means of verifying that the boiler is operating as it should. These sensors' technique for identifying fire allows for a quicker reaction time and more precision than that of a heat/smoke detector [46].

Highlights and Determinations

The highlights of this sensor incorporate the accompanying:

a. High photosensitivity.

b. Rapid reaction time.

c. Easy to utilize.

d. Sensitivity can be adjusted.

e. 600-degree detection angle,

f. It responds to the flame distance.

g. Adjustable accuracy is possible.

h. This sensor operates between 3.3V and 5V.

i. Simple voltage o/ps and advanced switch o/ps.

j. The PCB size is 3 cm X 1.6 cm.

k. Digital switch o/p indicator and power indicator.

l. If the fire power is lighter inside 0.8m, the fire test can be activated, if the fire force is high, the revelation of distance will be moved along.

Applications :

These sensors are used in several dangerous situations which include the following.

a. Hydrogen stations.

b. Industrial heating.

c. Fire detection.

d. Fire alarm.

e. Firefighting robot.

f. Drying systems.

g. Industrial gas turbines.

h. Domestic heating systems.

i. Gas-powered cooking devices.

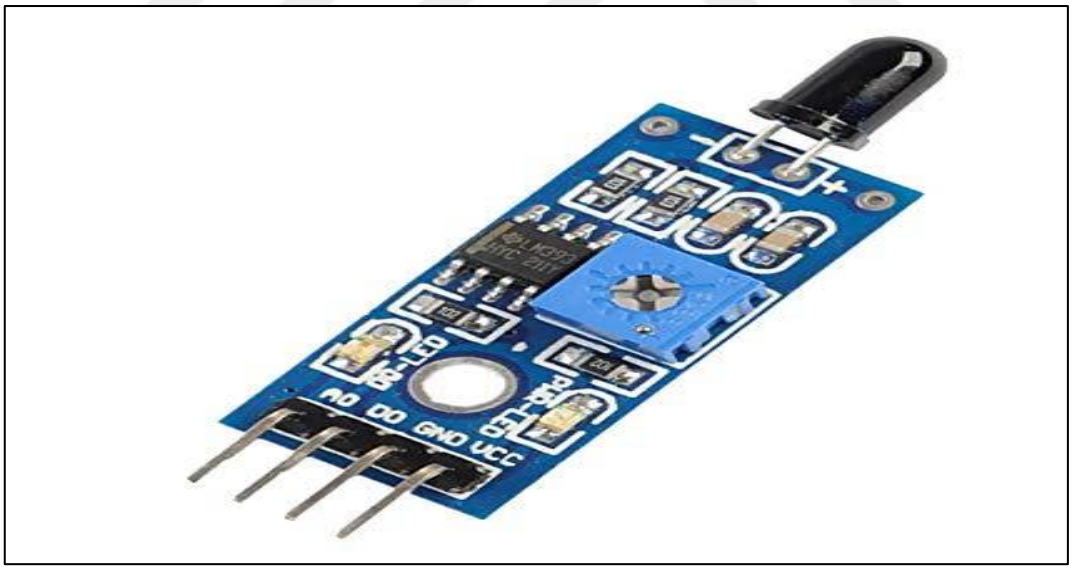


**Figure 3.5:** Flame Sensor.

### 3.2.5 Wi-Fi Module

One might think of the Arduino Uno WiFi as an Arduino Uno with a built-in WiFi module. The board uses the ATmega328P microcontroller and incorporates an ESP8266WiFi

Module. A system-on-a-chip (SoC) with an embedded TCP/IP protocol stack, the ESP8266WiFi Module allows you to connect to your wireless network (or the device can act as an access point).

The Arduino Software (IDE) is our Integrated Development Environment used across all of our boards and can be used both online and offline to programme the Arduino Uno WiFi [47].

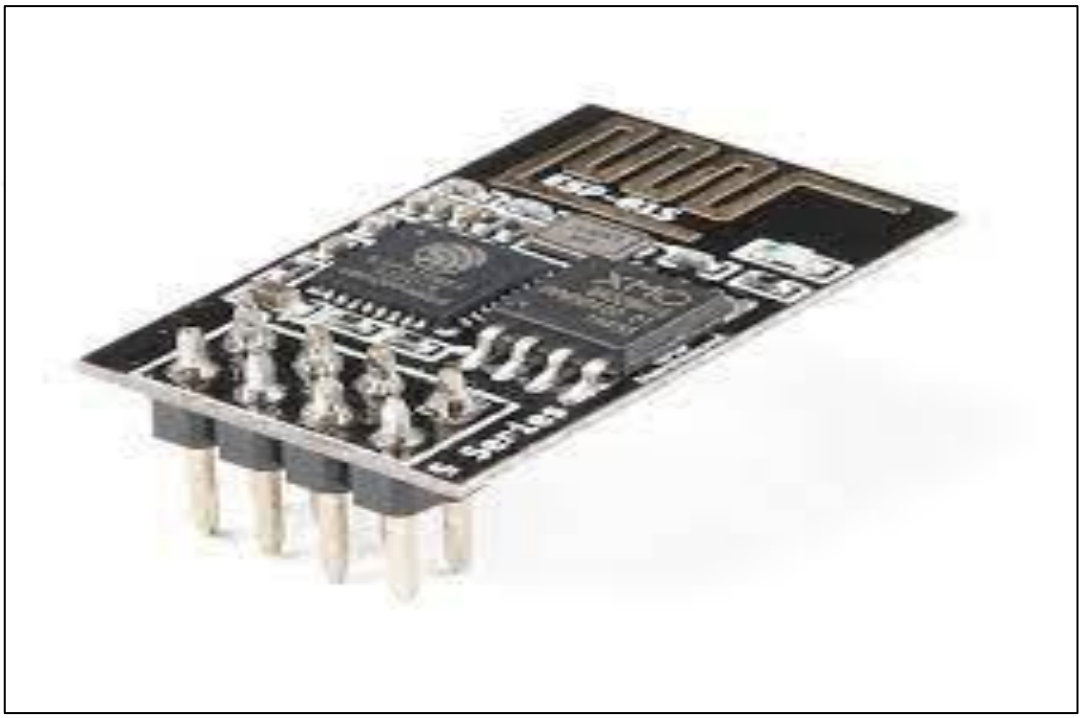

**Figure 3.6:** Wi-Fi Module.

### 3.2.6 DHT11 Temperature and Humidity Sensor

The humidity and temperature of their surroundings may be measured using an Arduino DHT11 board's sensor. Precision of humidity gauge is plus/minus 5%, with a range of 20% to 95%. Zero to fifty degrees Celsius is the temperature scale; Error in the reading is plus or minus 2 degrees. Voltage range of 3.3V to 5V The digital output features a standard bolt hole, making it simple to set up. Standard Printed Circuit Board Dimensions: 3.1 x 1.4 Centimeters Capable of gauging environmental conditions by measuring humidity and temperature Temperature and humidity may be measured between 20% and 95%. Plus or minus 5% relative humidity measurement error Range of temperature readings is from -50

to 50 degrees; The deviation in the readings is plus or minus 2 degrees. Input range of 3.3V to 5V The digital output features a standard bolt hole, making it simple to set up. Inches: 3.1cm x 1.4cm (PCB) The DHT11 is a calibrated digital signal output sensor that includes a temperature and humidity sensor unit. Since it uses proprietary digital signal gathering technology and temperature and humidity sensor technologies, it is very dependable and stable over time.

This sensor is of high quality, rapid reaction, and anti-interference capabilities thanks to its resistive type hygrometer and NTC temperature component, which are connected to a high-performance 8bit microcontroller [48].

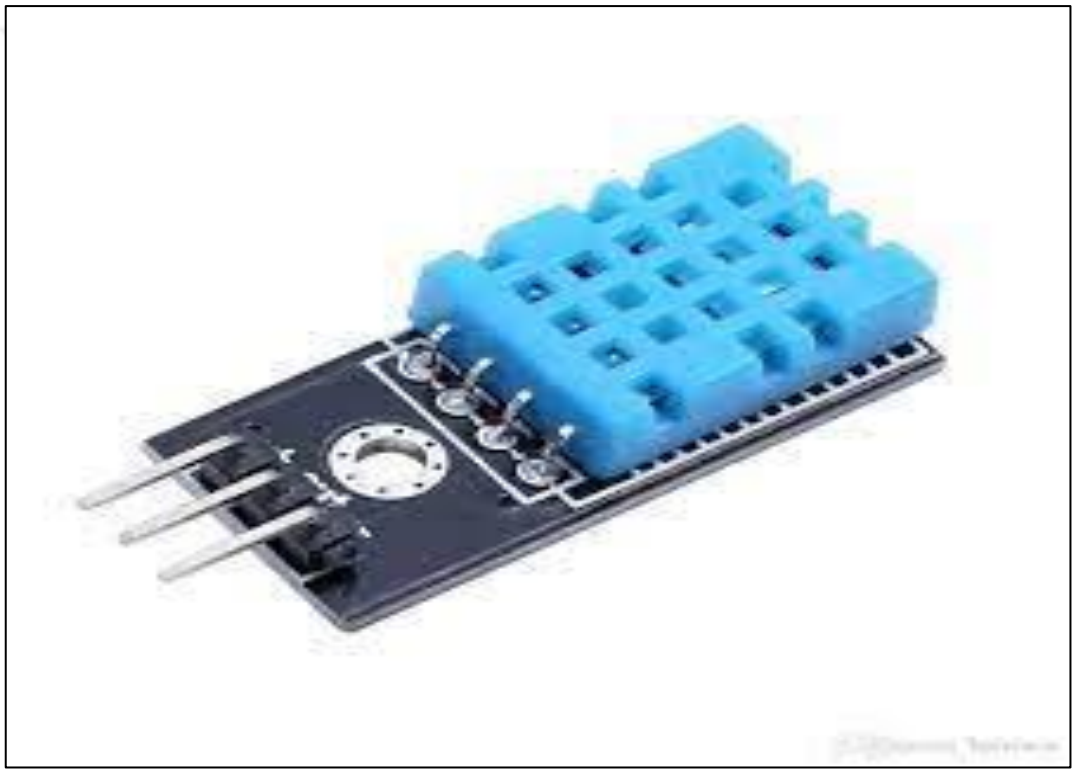

**Figure 3.7:**DHT11 Temperature and Humidity Sensor.

### 3.2.7 Pressure Sensor gy-68

The BMP180 is a high-precision pressure sensor that can be used with Arduino or any other microcontroller [49].

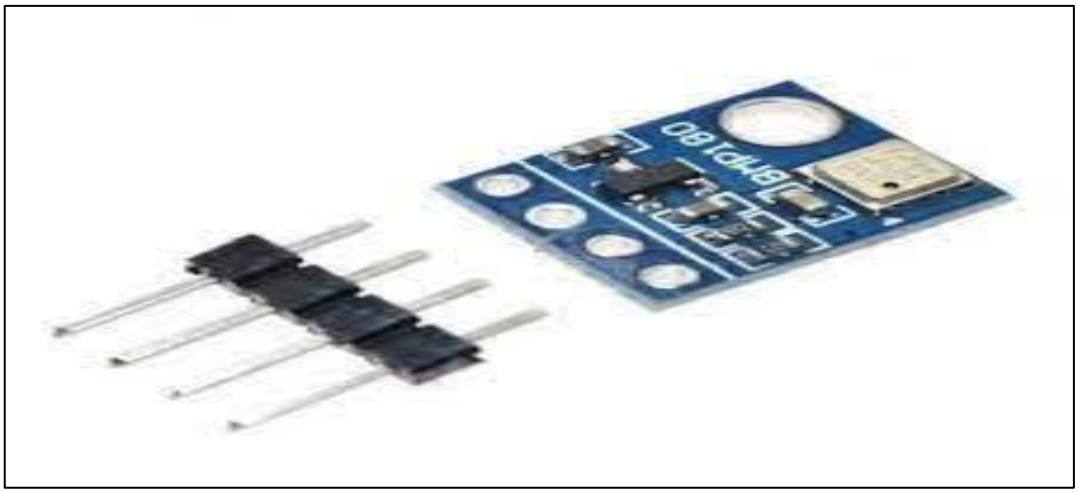

**Figure 3.8:** Pressure Sensor gy-68.

### 3.2.8 LCD Screen

A 16x2 character LCD panel can fit 32 characters into the same footprint as a standard two-line display. Most parallel character displays employ the HD44780 interface that this device supports; it is self-illuminating [50].

Features :

a. 16 characters x 4 lines LCD display.

b. HD44780 interface.

c. Input voltage: 5 V.

d. Operates without backlight.

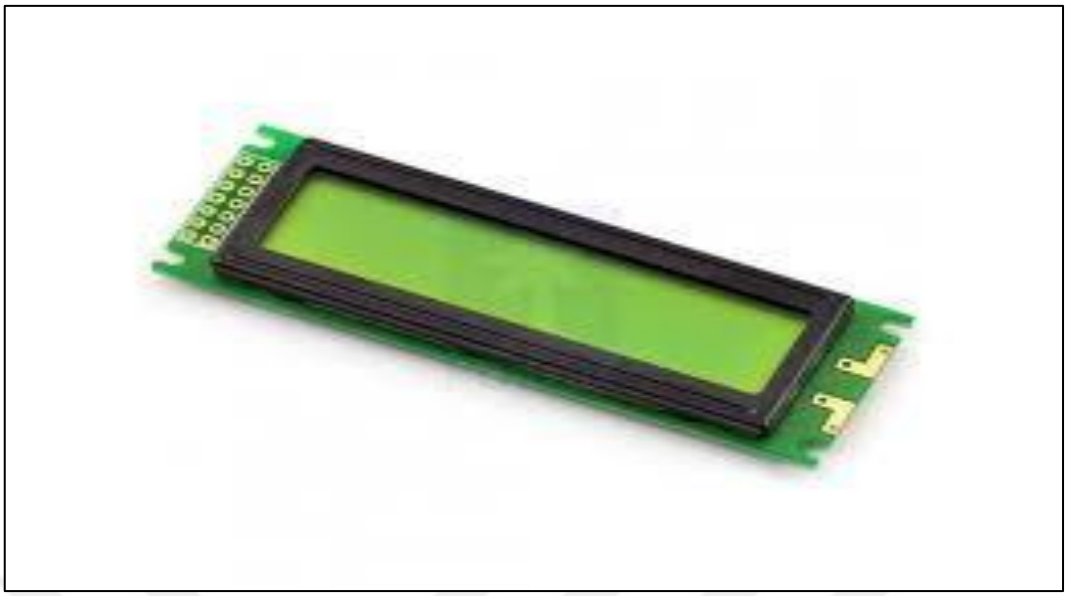

**Figure 3.9:** LCD Screen.

### 3.2.9 GSM Module

The SIM800L Module is a compact GSM/GPRS solution, making it a great choice for DIY initiatives of any size. The module is compatible with the quad-band GSM/GPRS network, allowing for the remote transfer of SMS and GPRS message data. The SIM800L can talk to the microcontroller through the UART interface, and it can process a variety of commands, such as the 3GPP TS 27.007, 27.005, and SIMCOM improved AT Commands. Also, the board is compatible with an augmentation of the global positioning system (A-GPS) method that obtains its location through a mobile network. Because of this, it may also function as a tracking component.

Maximum operating current for the SIM800L is 2Amps. In sleep mode, it only uses 1mA of current, thus reducing its impact on the environment. According to the specification, the operating voltage of the module is 3.7V to 4.2V. Anything higher than that will cause malfunctions in the module. A buck converter may be used to reach this voltage range [51].

Features :

a. 2G Quad-band 850/900/1800/1900MHz.

b. Receive and make calls using the speaker and microphone outputs.

c. Receive and send SMS.

d. Listen to FM radio broadcasts.

e. GPRS multi-slot class12 connectivity: max. 85.6kbps(download/upload).

f. GPRS mobile station class B.

g. Controlled by AT Command (3GPP TS 27.007, 27.005 and SIMCOM enhanced AT Commands).

h. Supports Real Time Clock.

i. Operating Voltage range 3.4V ~ 4.4V.

j. Supports A-GPS.

k. Low power consumption, 1mA in sleep mode.

l. Micro SIM Card.

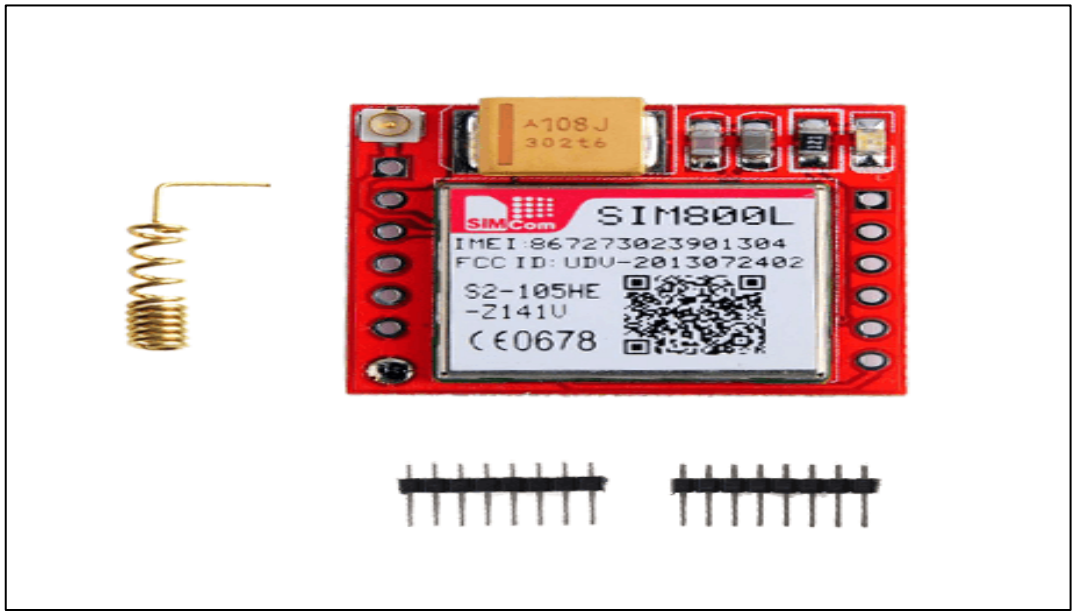


**Figure 3.10:** GSM Module.

## 3.3 SOFTWARE TOOLS

### 3.3.1 Arduino IDE

The Arduino Integrated Development Environment (IDE) is the hardware's corresponding programme. It's a notepad-like text editor with extra functionality. It's the go-to tool for drafting programmes, checking their compiled versions for bugs, and transferring them to an Arduino. It's a programme that can run on any System, including Windows, Linux, and macOS. C++ and C are both supported. It's free and open-source, so the user may modify it anyway they want. Furthermore, they have the option of developing their own supplemental modules or functionalities and incorporating them into the programme. The whole line of Arduino boards, from the mega to the Leonardo to the Ethernet, and beyond, are all supported. To save a document in Word format, it is termed a "Document." Similarly, the Arduino programming file is known as a Sketch. The Arduino file extension is.ino [52].

a. Work of Arduino IDE

The IDE creates a Hex file when a user writes code and compiles it. When a hex file (a Hexadecimal file that can be read by an Arduino) is created, it is sent to the board through a USB connection. All Arduino boards have a microcontroller built in, which will read the hex file and execute the programme as instructed [53].

b. Functions of Arduino IDE

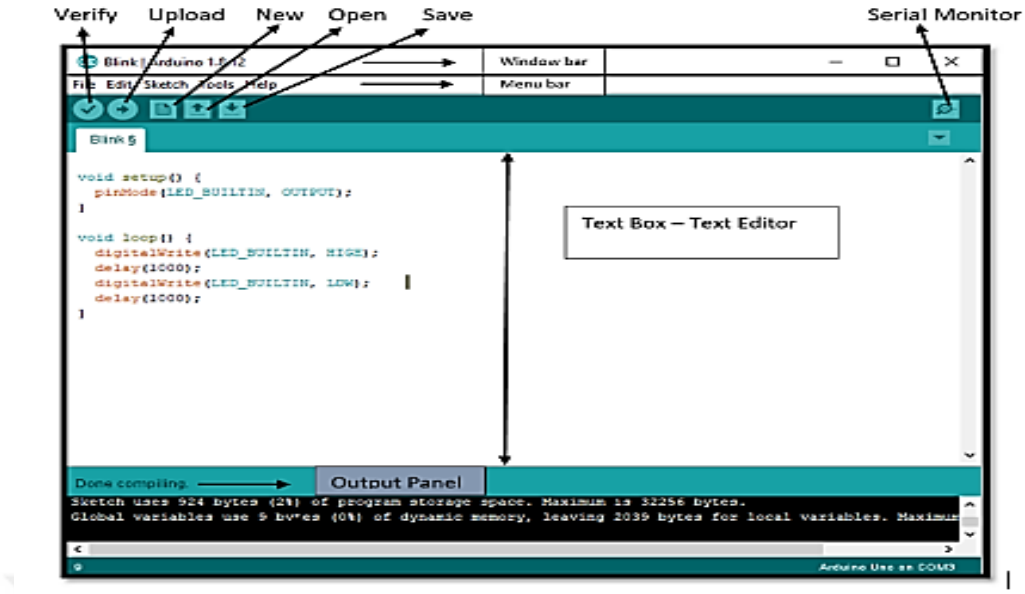


**Figure 3.11**: Code Entry Process 1.

c. WindowBar: The window bar consists the name of File and the Arduino IDE software version.

d. MenuBar: The menu bar consists of:

i. File.

ii. Edit.

iii. Sketch.

iv. Tools.

v. Help.

a. Shortcut Buttons.

b. Text Editor.

c. Output Panel: This output panel is used to give comments about the code.

i. if the code is successfully compiled or any error occurs.

ii. If the code has been successfully uploaded to the board [18].


**Figure 3.12**: Code Entry Process 2.

e. Programming.

We can finally get going now. We go right into coding without a lot of background theory. Practice makes perfect. The "sketches" are on the left, while the grayscale instructions and their explanation are on the right. Working through the included tutorials, you will quickly have a firm grasp of the system's coding and be able to use it independently. In time, you may learn about the rest of the functions. These guides should only be used as a jumping-off point into Arduino. If you go to www.arduino.cc and click on the "reference" tab, you'll get links to every conceivable feature and line of code [54].

First, a quick breakdown of the various error messages you could get while using the Arduino IDE. To name the two most typical examples:

a. The improper board was chosen or the installation was faulty. Upon successful upload, an error notice will be shown below the drawing. To my eyes, it resembles the one on the right. In the error report, it says that something is "not in sync.".

b. Figure 3.10: Code entry process 1.

c. Figure 3.10: Code entry process 1.

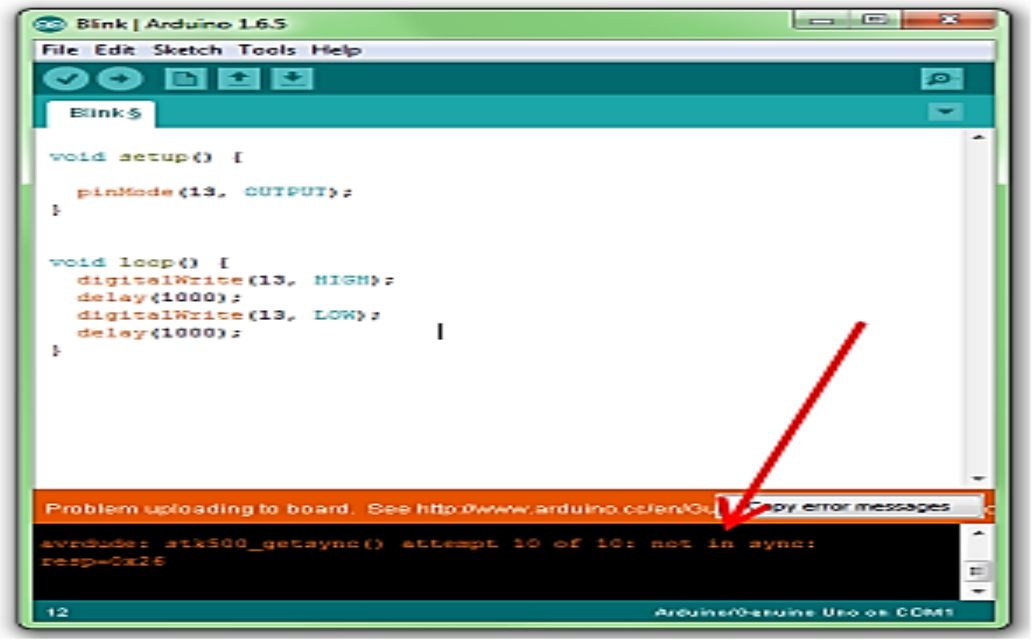


**Figure 3.13**: Code Entry Process 3.

d. The drawing has an error in it. A missing word or bracket is two common examples. As you can see on the left, the drawing is missing its last semicolon. Exceptional circumstances usually lead to an error report beginning with "excepted. For the programme to act like this, it must be looking for something that isn't there.

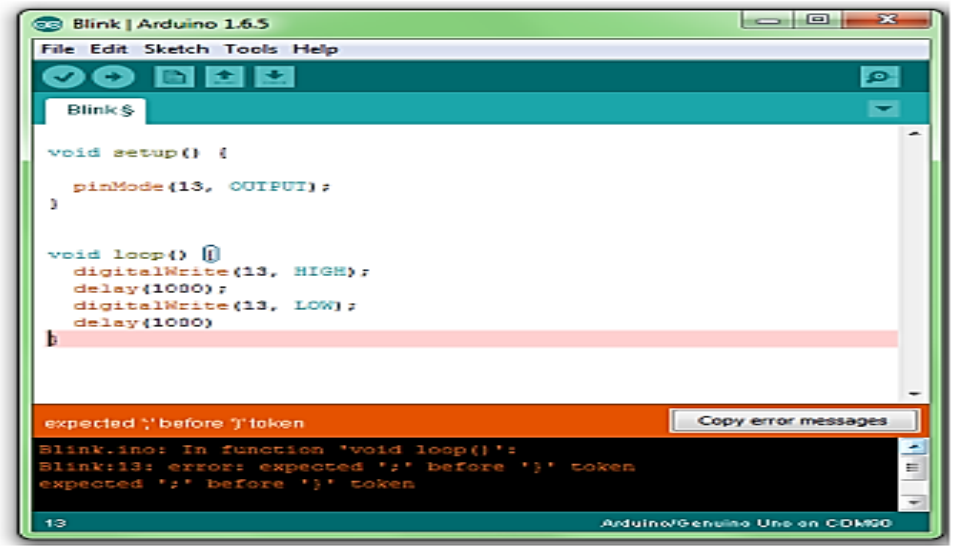


**Figure 3.14**: Code Entry Process 4.

f. Fundamental design of a sketch:

There are three distinct sections to a sketch.

a. Variable name: The first section gives names to the program's components (This will be explained in program number). 3). It is not necessary to include this section.

b. Setup, which is absolutely required for the program: The arrangement will be performed just a single time. Here, you tell the program, for instance, which pin (slot for cables) on the boards should be an input and which should be an output.

i. Characterized as Result: A voltage should emanate from the pin. For instance: An LED is intended to illuminate with this pin.

ii. An input is defined as: The board ought to peruse out a voltage. For instance: A switch is pushed open. Because it detected this, the board detected a voltage on the input pin.

```
void setup()
  {
    pinMode(pin, INPUT);
    pinMode(pin, OUTPUT);
  }
```

**Figure 3.15**: Code Processing.

g. Circle (totally fundamental for the program): The board will repeatedly repeat this loop section. It takes in the sketch from beginning to end, starts from scratch, and so on.

```
void setup()
  {
    Serial.begin(9600);
  }
```

**Figure 3.16:** Code Processing.

# 4. PRACTICAL PART

## 4.1 INTRODUCTION

This project is designed to be an early warning system for fire in hospitals and health centers to reduce human and material losses.

In this project, we used a Wemse D1R1 board, which has an ESP-WiFi module integrated with it, and we used Remote XY as a receiver for sensor data, and we used a BMP180 sensor for measuring temperature and barometric pressure, and three flame sensors, and we used a SIM800L GSM module that deals with a SIM card, and we used a 20 x 4 I2C LCD screen as a display for the data.

## 4.2 SYSTEM ANALYSIS

A system analysis is a representation of the current system with the goal of learning how it works.

### 4.2.1 Running System Analysis

Information on fires is still gathered the old fashioned way, by field observations, under the present system of fire management. Procedures presently in place for dealing with fires include the following:

a. The initial step for the local area or building proprietor is to recognize the fire by taking a gander at the smoke and blazes coming from the structure.
b. The second step is for the owner of the building or community to look up the firefighters' phone number and contact information.
c. The second step is for the owner of the building or community to call the fire department to ask for help (calls will continue until the fire department is successfully contacted).
d. Firefighters assist the community and victims of the fire. Since the current method of fighting fires does not include early detection, actions are taken based on fire reports. As a result, it has been determined that there was a significant fire, that there was damage to property, and that there may have been fatalities before police arrived to investigate the

fire. In this way, it is important to include a component to have the option to give early advance notice data ablaze.

### 4.2.2 Analysis of the Proposed System

The solution to an issue that previously existed in the operating system is presented by system analysis.

In the proposed framework examination, the fire recognition and taking care of cycle is separated into stages which are completely done naturally utilizing an Arduino Uno based microcontroller.

## 4.3 TOOLS OF PROJECT

a. Arduino UNO.

b. Breadboard.

c. Wires.

d. Flame Sensors.

e. The LCD Screen.

f. The Wi-Fi Module.

g. The GSM Module.

h. DHT11 Temperature and Humidity Sensor .

i. Pressure Sensor gy-68.

## 4.4 CONNECT THE PARTS OF THE PROJECT

a. We connect the signal pins of the torch sensors to the digital inputs of the Wemos board and the power pins (VCC, GND) to the power outputs of the board (VCC, GND), then we connect the BMP180 sensor and the screen through the I2C technical pins (SCL, SDA) on the I2C inputs of the board (SCL, SDA) in parallel.

b. Then we connect the GSM module through the data receiving and transmitting pins (TX, RX) to the digital inputs on the board (D2, D5) and because the board uses a 5 volt logic level, the RX pin cannot be connected to the board directly because the module operates at a 3.3 volt logical level, so this can be solved The problem is with the voltage divider, and that is by connecting a 10kΩ resistor between the RX pin and the D2 input, and also connecting a 20kΩ resistor between the RX pin and the GND output.

c. And because the unit does not come with a built-in voltage regulator, and because the unit needs a current of 2A and a voltage of 3.4v-4.4v, we will use a 3.7v battery as an external power source to equip the unit, and we will connect the positive end of the battery to the VCC pin of the unit, and we will connect the negative end of the battery to the GND output of the board, which will be common to all parts tethered As show in figure 4.1:

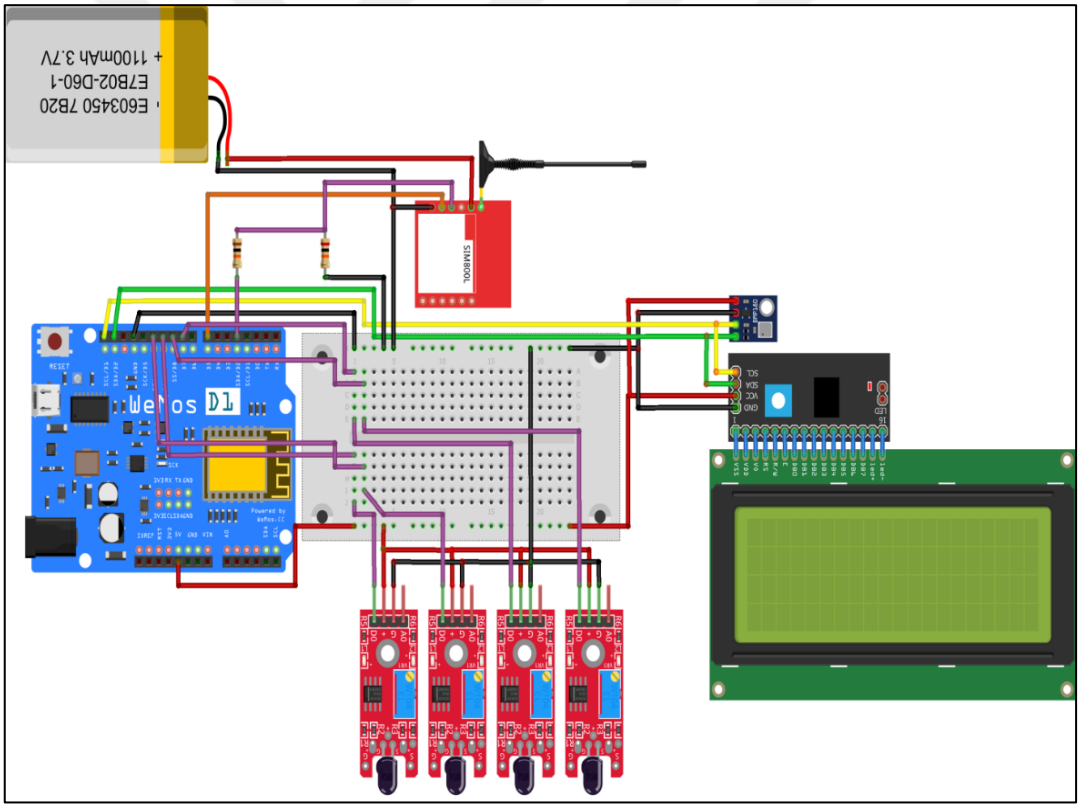


**Figure 4.1:** Connect the Project.

## 4.5 PROJECT OPERATION METHOD

We have a flame sensor, each one with a tip (a certain angle).Temperature, humidity and air pressure sensors display the readings for temperature, humidity and atmospheric pressure, while flame senses fire by sending a message to the mobile using Wi-Fi in the presence of a fire and specifying the angle at which the fire is located (the message is for reading and for civil defense).

When the project is fully run, it will connect to a WiFi point that is determined by the software code, and through it will connect to a server for the RemoteXY application, and through this application, we can know the pressure and temperature in the place where the project is located from anywhere in the world

Also, we can know if there is a fire or not, and also this data will be displayed on the display screen, and also when any fire occurs, a message is sent to the owner of the place, and also that there is a fire, and also a message is sent to the civil defense stating that there is a fire at the address that is specified through the code.


**Figure 4.2:** The First Stage is to Make a Fire.

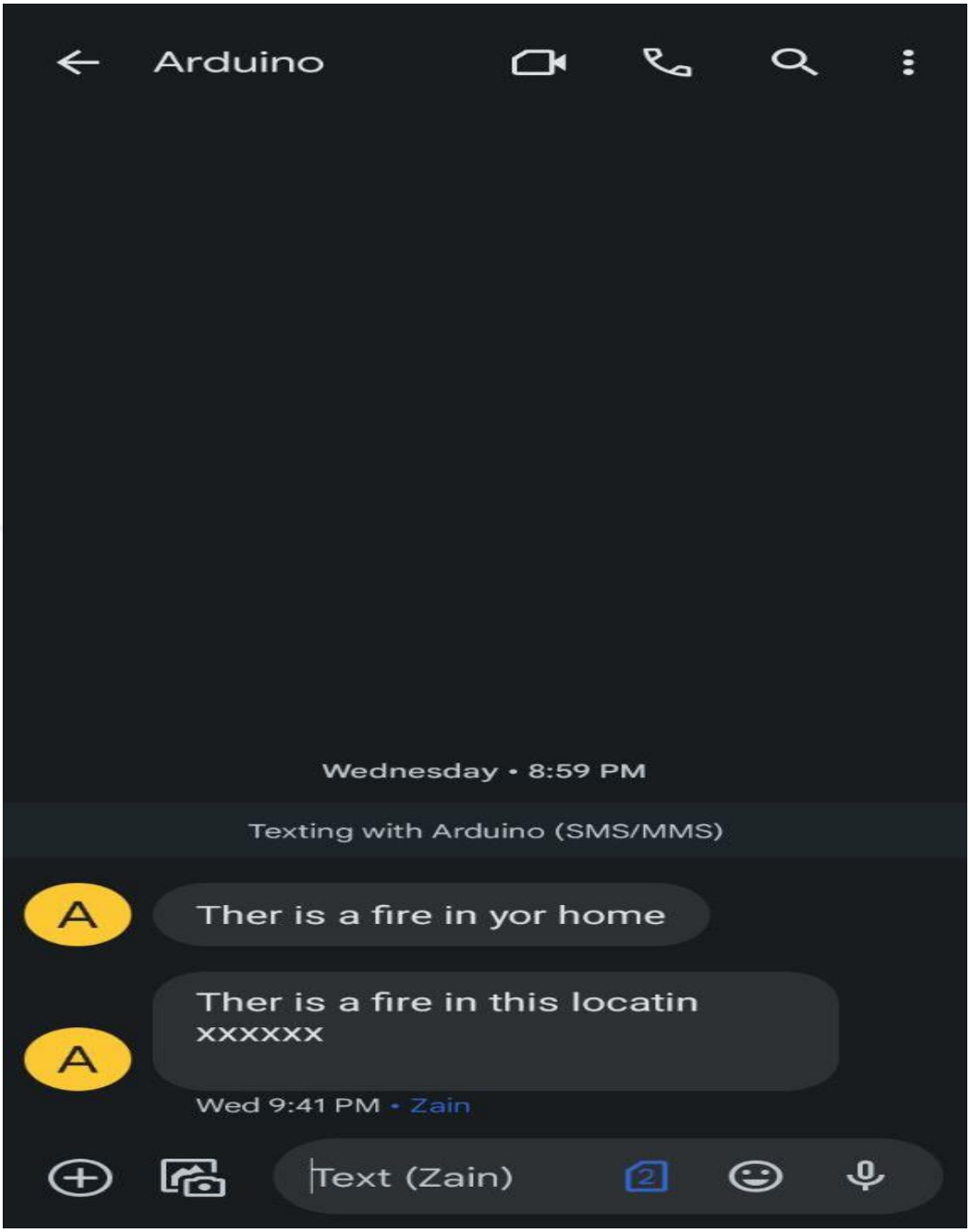


**Figure 4.3:** The Arrival of a Message to the Security Men.

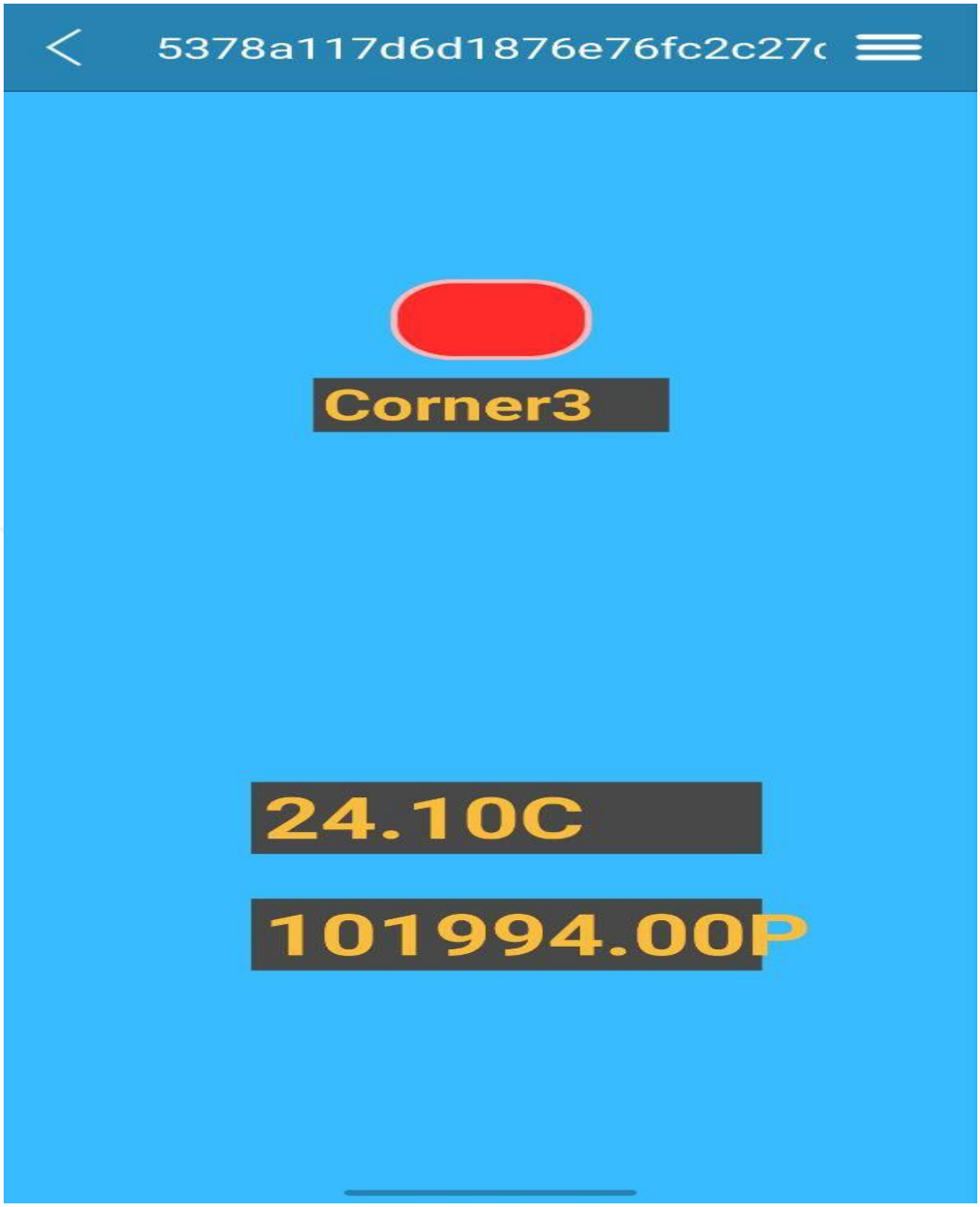


**Figure 4.4:** Read the Application Before Starting a Fire.

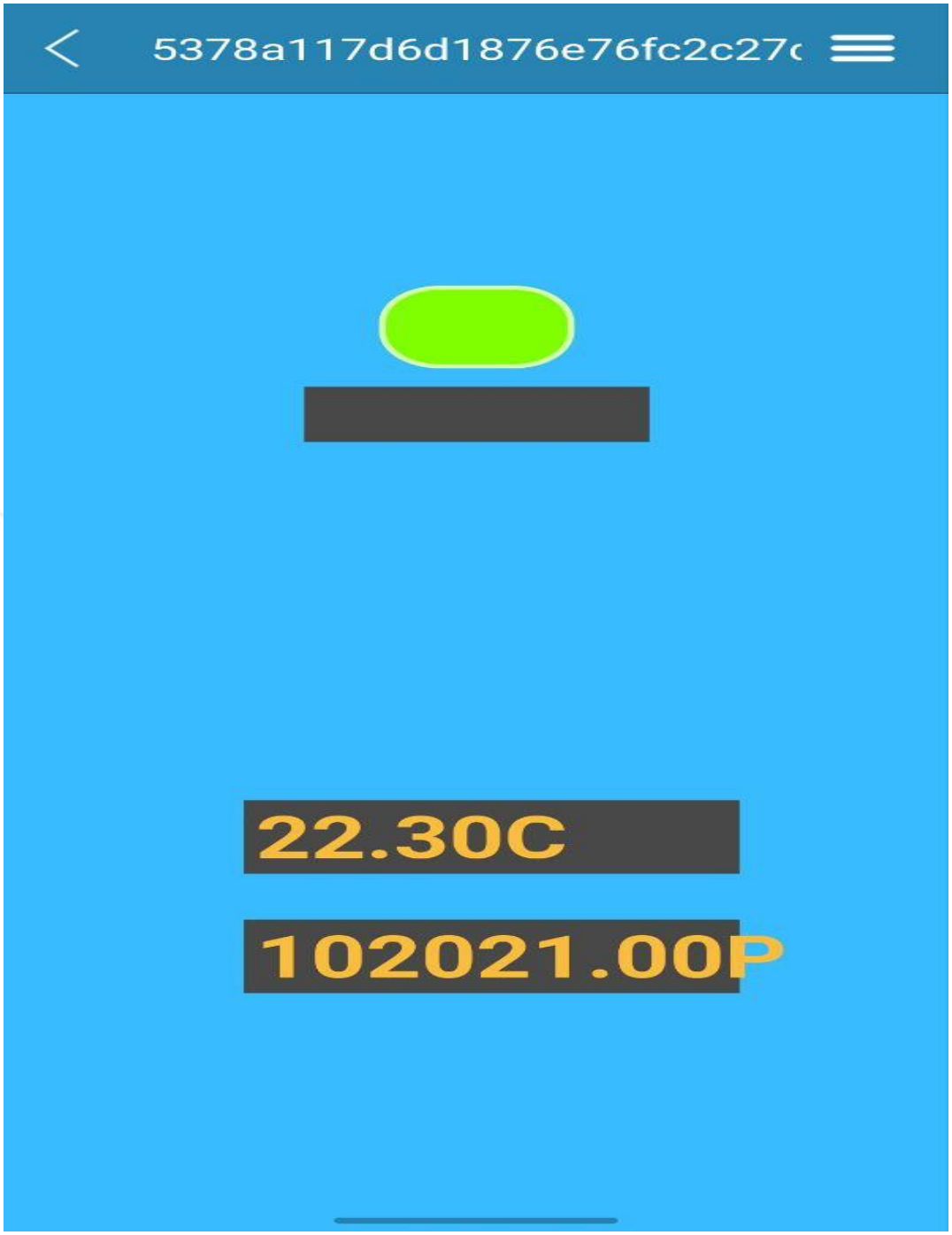


**Figure 4.5:**Read the Application after Starting a Fire.

# 5. CONCLUSION AND RECOMMENDATIONS

## 5.1 CONCLUSION

An effort was made in this paper to develop a fire alarm using a temperature sensor and a microprocessor optimised for low power consumption. It will save lives, cut down on accidents, and lessen the amount of rubbish produced by electrical gadgets. The measurement results confirmed the system's reliability in every environment.

The goal of this project was to create a circuit that, upon sensing an increase in temperature, would immediately sound an alarm, cut power to the building, notify authorities of the fire by short message service (SMS), and put out the blaze.

## 5.2 RECOMMENDATIONS

Developers can be advised and recommended to add an extinguishing system by placing small water pipes in the ceiling of the room. When a fire is predicted, the valves are opened and water is pumped.

# REFERENCES


[1] Amy, T., et al. (2019) Boston fire of 1872.encyclopedia of world history. Retrieved from https://www.britannica.com/event/Boston-fire-of1872

[2] Sarah B. ( 2017) The great fire of nero and the ancient history of firefighting. Retrieved from https://www.forbes.com/emperor-nero,.

[3] Erik, A.. Influential innovator. Ctesibius, (2016).

[4] Poole, B. et al (2012) Ordinary People and Effective Operation of Fire Extinguishers. (pp. 08 - 37).

[5] Bu, F. and Gharajeh, M. S., "Intelligent and vision-based fire detection systems: A survey," Image and Vision Computing, vol. 91, 2019, Art. no. 103803.

[6] Saeed, F., Paul, A., Karthigaikumar, P. and Nayyar, A., "Convolutional neural network based early fire detection," Multimedia Tools and Applications, vol. 79, pp. 9083-9099, 2020.

[7] Shokouhi, M., Nasiriani, K., Khankeh, H., Fallahzadeh, H. and Khorasani-Zavareh, D., "Exploring barriers and challenges in protecting residential fire-related injuries: a qualitative study," Journal of injury and violence research, vol. 11, no. 1, pp. 81-92, 2019.

[8] Kanwal, K., Liaquat, A., Mughal, M., Abbasi, A. R. and Aamir, M., "Towards development of a low cost early fire detection system using wireless sensor network and machine vision," Wireless Personal Communications, vol. 95, no. 2, pp. 475-489, 2017.

[9] Khalaf, O. I., Abdulsahib, G. M. and Zghair, N. A. K., "IoT fire detection system using sensor with Arduino," Revista AUS, pp. 74-78, 2019.

[10] Ahrens, M. and Evarts, B., "Report: Fire Loss in the United States in 2019," 2021, [online] Available: https://www.nfpa.org/News-and-Research/Publications-and-media/NFPA-Journal/2020/September-October2020/Features/Fire-Loss

[11] Ahrens, M., “Smoke alarms in US home fires,” National Fire Protection Association, Fire Analysis and Research Division, pp. 1-28, 2019.

[12] Shah, R., Satam, P., Sayyed, M.A. and Salvi, P., “Wireless Smoke Detector and Fire Alarm System,” International Research Journal of Engineering and Technology (IRJET), vol. 6, no. 1, pp. 1407-1412, 2019.

[13] Nfpa.org, “NFPA-Data, Research, and Tools,” 2018. [Online]. Available: https://www.nfpa.org/News-andResearch/Data-research-and-tools.

[14] Lee, D. and Kim, B., “Study on Detecting Fires and Finding Rescuers,” Korean Society of Hazard Mitigation, vol. 19, no. 1, pp. 225-230, 2019.

[15] Liu, Z., “Review of Recent Developments in Fire Detection Technologies,” Journal of Fire Protection Engineering, vol. 13, no. 2, pp. 129-151, 2003.

[16] Gong, F., Li, C., Gong, W., Li, X., Yuan, X., Ma, Y. and Song, T., “A real-time fire detection method from video with multifeature fusion,” Computational intelligence and neuroscience, vol. 2019, 2019.

[17] Faraci, G., Raciti, A., Rizzo, S. A. and Schembra, G., “Green wireless power transfer system for a drone fleet managed by reinforcement learning in smart industry,” Applied Energy, vol. 259, 2020, Art. no. 114204.

[18] Ayaz, M., Ammad-Uddin, M., Sharif, Z., Mansour, A. and Aggoune, E. H. M., “Internet-of-Things (IoT)-based smart agriculture: Toward making the fields talk,” IEEE Access, vol. 7, pp. 129551-129583, 2019.

[19] Muneer, A. and Fati, S. M., “Automated Health Monitoring System Using Advanced Technology,” Journal of Information Technology Research (JITR), vol. 12, no. 3, pp. 104-132, 2019.

[20] Fati, S.M., Muneer, A., Mungur, D. and Badawi, A., “Integrated Health Monitoring System using GSM and IoT,” In 2018 International Conference on Smart Computing and Electronic Enterprise (ICSCEE), 2018, pp. 1-7.

[21] Muneer, A., Fati, S. M. and Fuddah, S., “Smart health monitoring system using IoT based smart fitness mirror,” TELKOMNIKA Telecommunication, Computing, Electronics, and Control, vol. 18, no. 1, pp. 317-331, 2020.

[22] Hamdan, O., Shanableh, H., Zaki, I., Al-Ali, A. R. and Shanableh, T., “IoT-based interactive dual mode smart home automation,” 2019 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, 2019, pp. 1-2.

[23] Vishwakarma, S. K., Upadhyaya, P., Kumari, B. and Mishra, A. K., “Smart energy efficient home automation system using IoT,” 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoTSIU), Ghaziabad, India, 2019, pp. 1-4.

[24] Taha, I. A. and Marhoon, H. M., “Implementation of controlled robot for fire detection and extinguish to closed areas based on Arduino,” TELKOMNIKA Telecommunication, Computing, Electronics, and Control, vol. 16, no. 2, pp. 654-664, 2018

[25] Desima, M. A., Ramli, P., Ramdani, D. F. and Rahman, S., “Alarm system to detect the location of IoT-based public vehicle accidents,” 2017 International Conference on Computing, Engineering, and Design (ICCED), Kuala Lumpur, 2017, pp. 1-5.

[26] Anwar, F., Boby, R., Rashid, M., Alam, M. and Shaikh, Z, “Network-Based Real-time Integrated Fire Detection and Alarm (FDA) System with Building Automation,” IOP Conference Series: Materials Science and Engineering,vol. 260, 2017, Art. no. 012025.

[27] "Those killed in an explosion of oxygen cylinders in a hospital in Baghdad." Arabic. April 25, 2021. Archived from the original on April 25, 2021. Retrieved April 25, 2021.

[28] "At least 23 people were killed in Baghdad in a fire at a hospital designated for coronavirus patients - France 24." France 24 / France 24. April 24, 2021. Archived from the original on April 25, 2021. Retrieved April 25, 2021.

[29] Iraq: Three days of national mourning for the victims of the Corona Hospital fire. The Middle East. Archived from the original on April 25, 2021. Retrieved April 25, 2021.

[30] V. K. Singh, “Automation in fire protection system using internet of thing (IoT): a review,” Int. J. Sci. Res. Eng. Trends, vol. 5, pp. 1354–1356, 2019.

[31] B. Sarwar, I. S. Bajwa, N. Jamil, S. Ramzan, and N. Sarwar, “An intelligent fire warning application using IoT and an adaptive neuro-fuzzy inference system,” Sensors, vol. 19, 14 pages, 2019.

[32] V. K. Singh, “Automation in fire protection system using internet of thing (IoT): a review,” Int. J. Sci. Res. Eng. Trends, vol. 5, pp. 1354–1356, 2019.

[33] V. K. Singh, “Automation in fire protection system using internet of thing (IoT): a review,” Int. J. Sci. Res. Eng. Trends, vol. 5, pp. 1354–1356, 2019.

[34] Hossain and Turab, “A review on GSM based fire alarm system module,” IICT, vol. 10, 2022.

[35] Bs 5839-1, “Fire detection and fire alarm systems for buildings—Part 1: code of practice for design, installation, commissioning and maintenance,” 2013.

[36] I. Ehsan, “A conceptual model for blockchain-based agriculture food supply chain system,” vol. 2022, 2022.

[37]Rescue 1122, Rescue 1122 Official Website, 2022, http://www.rescue.gov.pk/accessed Mar. 08, 2022).

[38] Aydin, B., Selvi, E., Tao, J. and Starek, M. J. (2019) Use of Fire-Extinguishing Balls for a Conceptual System of Drone-Assisted Wildfire Fighting, (PP.1 -15).

[39] Qin, W. Jiashuo, C. and Chuang, Z. (2018) Intelligent Smoke Alarm System with Wireless SensorNetwork Using ZigBee, (pp. 1 - 10).

[40] Izang, A. A., Ajayi, S.W. Onyenwenu, C. B. and Adeniyi. F.(2018) An SMS Based Fire Alarm and Detection System,.(pp. 58 - 61).

[41] Shehab, J. N. (2018) Design and Implementation of Factory Security System. (PP. 162 - 171).

[42] Sonsale, p., Gawas, R., Pise, S. and Kaldate, A. (2014). Intelligent Fire Extinguisher System. (pp. 59 -61)

[43] Definition of Arduino UNO: https://www.rs-online.com/designspark/what-is-arduino-uno-a-getting-started-guide

[44] Arduino board: https://learn.sparkfun.com/tutorials/what-is-an-arduino/all#whats-on-the-board

[45]Breadboard: https://www.sciencebuddies.org/science-fair-projects/references/how-to-use-a-breadboard#what-breadboard

[46] Jumper wires m-f & m-m: https://www.indiamart.com/proddetail/jumper-wire-m-m-m-f-f-f-15359553673.html

[47] Flame sensor: https://www.elprocus.com/flame-sensor-working-and-its-applications/

[48] Wi-Fi module: https://docs.arduino.cc/retired/getting-started-guides/ArduinoUnoWiFi

[49] DHT11 temperature and humidity sensor: https://www.juthourtech.com/ar/%D9%84%D9%84%D8%A3%D8%B1%D8%AF%D9%88%D9%8A%D9%86%D9%88-dht11%D8%A8%D9%88%D8%B1%D8%AF%D8%A9-%D8%A7%D8%B3%D8%AA%D8%B4%D8%B9%D8%A7%D8%B1%D8%AF%D8%B1%D8%AC%D8%A9-%D8%A7%D9%84%D8%AD%D8%B1%D8%A7%D8%B1%D9%87-%D9%88%D8%A7%D9%84%D8%B1%D8%B7%D9%88%D8%A8%D9%87

[50] Pressure sensor gy-68: https://www.uruktech.com/product/pressure-sensor-module-gy-68/

[51] Arduino IDE:https://botsolvers.com/what-is-arduino-ide-and-its-different-functions/

[52] Tutorials for Arduino by Funduino Service Team(april 2016).

[53] LCD screen: http://www.us.diigiit.com/lcd-screen-16x2-characters

[54] GSM module:
https://www.factoryforward.com/product/sim800l-gsm-gprs-module-micro-sim-quad-band/

# APPENDIX A

## CODE OF PROJECT

```
// This lines for including important libraries

#define REMOTEXY_MODE__ESP8266WIFI_LIB_CLOUD

#include &lt;ESP8266WiFi.h&gt;

#include &lt;RemoteXY.h&gt;

#include &lt;Wire.h&gt;

#include &lt;Adafruit_BMP085.h&gt;

#include &lt;LiquidCrystal_I2C.h&gt;

#include &lt;SoftwareSerial.h&gt;

//This lines to configure Wi-Fi and Server connection for RemoteXY App

#define REMOTEXY_WIFI_SSID &quot;Wi-Fi SSID&quot;

#define REMOTEXY_WIFI_PASSWORD &quot;Password&quot;

#define REMOTEXY_CLOUD_SERVER &quot;cloud.remotexy.com&quot;

#define REMOTEXY_CLOUD_PORT 6376

#define REMOTEXY_CLOUD_TOKEN &quot;5378a117d6d1876e76fc2c27deee6434&quot;

#pragma pack(push, 1)

Adafruit_BMP085 bmp; //for define Preusser sensor variable

LiquidCrystal_I2C lcd(0x27,20,4); //for define Preusser sensor variable

SoftwareSerial mySerial(D5,D2);// for define GSM Module variable

//This lines to configuration RemoteXY Server

uint8_t RemoteXY_CONF[] = // 62 bytes

{ 255,0,0,34,0,55,0,16,178,2,70,26,70,6,9,9,25,9,13,9,

121,37,0,67,4,22,38,20,5,16,65,33,8,2,26,11,67,4,19,52,

20,5,16,78,33,8,2,26,11,67,4,21,18,20,5,20,20,23,6,2,
```

```
26,11 };
//This lines to define RemoteXY Variables
struct {
uint8_t led_4;
char text_1[11];
char text_2[11];
char text_3[11];
uint8_t connect_flag;
} RemoteXY;
#pragma pack(pop)
float temp; //for define temperature variable
float pru; //for define Preusser variable
String tempStr; //for define temperature variable as string
String pruStr; //for define Preusser variable as string
String corner; //for define corner of fire variable as string
char tempChar[11]; //for define temperature variable as char
char pruChar[11]; //for define Preusser variable as char
//This lines for define variables for reading flame sensor data
int f1=0;
int f2=0;
int f3=0;
int f4=0;

int ft=0; // when message sent at first one this variable will be 1 and no more sending
        messages
void setup()
```

```
{
// This lines for Initializing libraries
RemoteXY_Init ();
lcd.init();
lcd.clear();
lcd.backlight();
mySerial.begin(9600);
Serial.println(&quot;Initializing...&quot;);
delay(1000);
// This lines for setting pins connected to flame sensors in input mode
pinMode(D12,INPUT);
pinMode(D7,INPUT);
pinMode(D10,INPUT);
pinMode(D13,INPUT);
testsim();// for checking GSM connection
// for checking BMP180 pressure sensor
if (!bmp.begin()) {
Serial.println(&quot;Could not find a valid BMP085 sensor, check wiring!&quot;);
while (1) {}
}
}
void loop()
{
lcd.clear();
RemoteXY_Handler ();
// This lines for reading flame sensors data
```

```
f1 = digitalRead(D7);

f2 = digitalRead(D10);

f3 = digitalRead(D12);

f4 = digitalRead(D13);

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

temp = bmp.readTemperature(); //for reading temperature

pru = bmp.readPressure(); //for reading Preusser

tempStr = temp; //converting temperature into string

pruStr = pru; //converting pressure into string

tempStr= String(tempStr+&quot;C&quot;); //Adding temperature unit (C) to string

pruStr= String(pruStr+&quot;Pa&quot;); //Adding Pressure unit (Pa) to string

tempStr.toCharArray(RemoteXY.text_1,11); //Sending temperature string to RemoteXY App

pruStr.toCharArray(RemoteXY.text_2,11); //Sending Preusser string to RemoteXY App

//Printing Temperature and Preusser string on LCD screen

lcd.setCursor(0,0);

lcd.print(tempStr);

lcd.setCursor(0,1);

lcd.print(pruStr);

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


if (f1 == 1){ //This function send messages to house owner and Fire station if fire happen in corner 1 and print

warning on screen and turn on red led on RemoteXY App with writing the corner where fire is happening

RemoteXY.led_4=1;

corner = &quot;Corner1&quot;;
```

```
corner.toCharArray(RemoteXY.text_3,11);

lcd.setCursor(10,2);

lcd.print(&quot;fire in&quot;);

lcd.setCursor(10,3);

lcd.print(&quot;Corner1&quot;);

if (ft == 0){

send_sms1();

send_sms2();

}

}

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

else if (f2 == 1){ //This function send messages to house owner and Fire station if fire happen
        in corner 2 and print

warning on screen and turn on red led on RemoteXY App with writing the corner where fire
        is happening

RemoteXY.led_4=1;

corner = &quot;Corner2&quot;;

corner.toCharArray(RemoteXY.text_3,11);

lcd.setCursor(10,2);

lcd.print(&quot;fire in&quot;);

lcd.setCursor(10,3);

lcd.print(&quot;Corner2&quot;);

if (ft == 0){

send_sms1();

send_sms2();

}
```

```
}

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

else if (f3 == 1){ //This function send messages to house owner and Fire station if fire happen
        in corner 3 and print

warning on screen and turn on red led on RemoteXY App with writing the corner where fire
        is happening

RemoteXY.led_4=1;

corner = &quot;Corner3&quot;;

corner.toCharArray(RemoteXY.text_3,11);

lcd.setCursor(10,2);

lcd.print(&quot;fire in&quot;);

lcd.setCursor(10,3);

lcd.print(&quot;Corner3&quot;);

if (ft == 0){

send_sms1();

send_sms2();

}

}

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

else if (f4 == 1){ //This function send messages to house owner and Fire station if fire happen
        in corner 4 and print

warning on screen and turn on red led on RemoteXY App with writing the corner where fire
        is happening

RemoteXY.led_4=1;

corner = &quot;Corner4&quot;;

corner.toCharArray(RemoteXY.text_3,11);

lcd.setCursor(10,2);
```

```
lcd.print(&quot;fire in&quot;);


lcd.setCursor(10,3);
lcd.print(&quot;Corner4&quot;);
if (ft == 0){
send_sms1();
send_sms2();
}
}
else {//This function to clean RemoteXY App after ending of fire
RemoteXY.led_4=0;
corner = &quot;&quot;;
corner.toCharArray(RemoteXY.text_3,11);
}
delay(500);
//////////////////////////////////////////
}
void send_sms1(){ {//This function for sending sms to owner
mySerial.println(&quot;AT+CMGF=1&quot;); // Configuring TEXT mod
updateSerial();
mySerial.println(&quot;AT+CMGS//change ZZZ with country code and xxxx xxx xxxx
        with phone number to sms=\&quot;+ZZZ
xxxx xxx xxxx\&quot;&quot;);
updateSerial();
mySerial.println(&quot;Ther is a fire in yor home&quot;); //text content
updateSerial();
```

```
mySerial.write(26);

updateSerial();

delay(500);

}

void send_sms2(){//This function for sending sms to Fire station

mySerial.println(&quot;AT+CMGF=1&quot;); // Configuring TEXT mode

updateSerial();

mySerial.println(&quot;AT+CMGS=\&quot;+ZZZ xxxx xxx xxxx\&quot;&quot;);
        //change ZZ with country code and xxxx xxx xxxx with phone

number to sms

updateSerial();

mySerial.print(&quot;Ther is a fire in this locatin xxxxxx&quot;); //text content

updateSerial();

mySerial.write(26);

updateSerial();

ft=1;

}

void testsim(){//This function for testing GSM

mySerial.println(&quot;AT&quot;); //Once the handshake test is successful, it will back to
        OK

updateSerial();

mySerial.println(&quot;AT+CSQ&quot;); //Signal quality test, value range is 0-31 , 31 is
        the best

updateSerial();

mySerial.println(&quot;AT+CCID&quot;); //Read SIM information to confirm whether the
        SIM is plugged

updateSerial();
```

```
mySerial.println(&quot;AT+CREG?&quot;); //Check whether it has registered in the
        network

updateSerial();

}

void updateSerial(){(){//This function transform data between mySerial and Serial monitor

delay(500);

while (Serial.available())


{

mySerial.write(Serial.read());//Forward what Serial received to Software Serial Port

}

while(mySerial.available())

{

Serial.write(mySerial.read());//Forward what Software Serial received to Serial Port

}

}
```