IoT Based Fire Alarm and Safety Security System

A reported submitted

By

SADIA NAHORE

DEPARTMENT OF SOFTWARE ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

DECEMBER 2021

IoT Based Fire Alarm and Safety Security System

A reported submitted

By

Sadia Nahore
Student No: 180112001
Session: 2018-19

Supervised by:

Submitted to the

DEPARTMENT OF SOFTWARE ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

In partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING

December 2021

APPROVAL

This Project titled **"IoT Based Fire Alarm and Safety Security System"**, submitted by **Sadia Nahore** (152-35-1215) to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Software Engineering and approved as to its style and content.

BORAD OF EXAMINERS

……………………………….. ….

Dr. Touhid Bhuiyan
Professor and Head.
Department of Software Engineering Chairman
Faculty of Science and Information
Technology Daffodil International University

………………………………...

Dr. Md Asraf Ali
Associate Professor
Department of Software Engineering Internal
Examiner 1
Faculty of Science and Information Technology
Daffodil International University

………………………………..

Md . Maruf Hasan
Assistant Professor
Department of Software Engineering Internal
Examiner 2
Faculty of Science and Information Technology
Daffodil International University

………………………………..

Assistant Professor
Department of Software Engineering External
Examiner
Faculty of Science and Information Technology
Daffodil International University

DECLARATION

I hereby declare that, this project has been done by me under the supervisor of **Ms. Syeda Sumbul Hossain**, Senior Lecturer, Department of Software Engineering, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree of diploma.

…………………………………..

Mazed Mourshed
ID: 152-35-1215
Batch: 17th
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University
Certified by:

…………………………………..

Ms. Syeda Sumbul Hossain
Senior Lecturer
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University

ACKNOWLEDGEMENT

ALL ABBREVIATION & MEANINGS

In this project we have used some shortcut keyword. For that reason all the abbreviation are given below.

1. **IoT Based** – Internet of Things based
2. **PHP** – Personal Home Page
3. **HTML** – Hypertext Markup Language
4. **MySQL**- My Structured Query Language (It is an Open-source relational data based system.
5. **WAMP** – Windows, Apache, MySQL and PHP (It is a variation of LAMP for windows)
6. **PC**- Personal Computer.
7. **OBD**- On-Board Diagnosis port
8. **OBD II** – On-Board Diagnosis 2 port
9. **EPA** – Environmental Protection Agency
10. **SAE** – Society of Automotive Engineers
11. **VEDAS** – Valcom Environmental Acquisition System. (It is a mobile data stream mining environment)
12. **Minefleet-** It is also a mobile data stream mining environment.
13. **PCA** – Principle Component Analysis.
14. **SAWUR**–Situation Awareness With Ubiquitous data mining for Road safety.
15. **NodeMCU** – Open source electronics Platform.
16. **LED** – Light Emitting Diode.
17. **PCB** – Printed Circuit Board.
18. **Arduino** – It's a open source electronic Platform.
19. **USB** – Universal Serial Bus.
20. **iOS**- Internetwork Operating System.
21. **APK** – Android Application Package
22. **GPS** – Global Positioning System
23. **Buzzer** – An electrical device that makes a buzzing noise & used for signaling.
24. **PVC Board** – Polyvinyl Chloride board.

ABSTRACT

Now a days, safety is considered a top priority due to its significance in safeguarding human lives and properties, especially in high-risk industrial sectors such as aviation, oil and gas, construction, transportation, steel manufacturing, and mining industries. In these industries, there face some problem such as different types of injuries, illness and fatalities because of the dangerous work environments. In addition to this we see various problem related to gas leakage and fire system in the house. It is important to establish and execute an effective safety management system to prevent the risks of irreversible accidents and security system. We present a view on the IoT based safety security. This project paper specializes in exploring the commonalities among protection and safety with each dealt with as at the same time complementary view of the identical problem. It follows with an in depth description of present and generally used protection overall performance size techniques. Several case research are used to provide an explanation for the techniques and discover the critical utility regions applicable to maximum commercial sectors. The strategies and equipment for protection statistics collection, analysis, and sharing are delivered collectively with their programs for protection control. Finally, mutual relationships of safety and security are discussed.

INTRODUCTION

1.1 Introduction

In this busy life, safety is an important factor. Some people directly attach with various types of industry. Especially workers directly connect with machine and machineries. The unsafe work surroundings function of commercial centers is obvious with inside the excessive quotes of workplace accidents and fatalities skilled regularly. These excessive-chance industries consist of construction, metal manufacturing, oil and gas, aviation, agriculture, forestry, fishing, and hunting, etc.

In our daily life or industry people exposed several types of accidents and illness. Every year core of people or employee are injured to mechanical, chemical, electrical and radiation and it results in partial or overall disablement. So in current years, more interest is given to fitness protection because of stress from government, exchange unions, hard work legal guidelines and recognition of employers.

In the conventional fire safety technique they did now no longer locate the root reason for the problem. The root reason for the fire injuries that arise with inside the fire crackers enterprise are mainly because of the friction and unbalanced chemical mixture. Thus in the proposed device via way of means of studying the ranges and ratio of the chemical compounds and the reason of friction the evolved sensor give the alert and save us the foremost injuries. The evolved wearable sensor video display units the running time and over exposure of chemical compounds and offers the alert to the employee with inside the enterprise. According to the measurements of National Crime Records Bureau (NCRB), fire represents around 5.9% (23,281) of the aggregate passing detailed because of normal and unnatural causes amid the year 2012.

The essential intention of measuring protection overall performance is to create and put into effect intervention techniques for capacity avoidance of destiny accidents. Recognizing indicators earlier than a twist of fate happens gives the capacity for enhancing protection; many businesses have sought to broaden packages to pick out and advantage

from alerts, indicators, and earlier indicators. Traditional measures of protection overall performance depend upon a few shape of twist of fate or harm statistics, with movements being taken in reaction to negative traits in injuries. Many organizations depend closely on failure statistics to screen overall performance. The outcome of this method is that enhancements or adjustments are handiest decided after something has long gone wrong. In maximum cases, the distinction among whether or not a device failure effects in a minor or catastrophic final results is purely a matter of chance.

There are some methods to prevent this type of accident and the most effective method is to develop the automation base IOT system and real time monitoring during working time, conducting behavioral based study to reduce the accident rates to improve the safe environment in our daily life and industry. From the various studies, we can clearly say that, one of the causes for initiation of accident is poor management system such as policy, safety systems etc. For improving the safety sensor base monitoring system should applied in industry. We use different types of sensors as fire sensor, smoke sensor, gas sensor, and motion sensor etc. for this project. For global monitoring system a microcontroller implement here which is collecting data through internet. This system monitor from any place of the world. So that authority easily monitor their industries.

Having an effective employees health and safety program should be part of an organization top priority , this is because it ensures less injury and safeguard life , improves workers productivity and the cost of solving and treating injuries resulting from non-

implementation of health and safety program. Thus, as suggested by health and safety should focus on employees' involvement, continuous monitoring and wellness component. The essence of this is to make sure safe and good work condition and ensure people are fit to perform their work without much risk to life.

So, the aim of this project is industrial safety and monitoring system develop with the help of IoT.

1.2 Objective of the Study

- To design and fabrication system of an automatic safety security.
- To identify the accidents occurred in the industry and get signal from the accidents spot to the authority.
- To comparative study in terms of performance and cost analysis.

1.3 Outline of the Thesis:

- ## Chapter-1 Introduction:

  We have developed a system with IoT Based Fire Alarm and Safety Security System. It provides real monitoring system. Different types of sensor and equipment use to build this infrastructure. We used gas sensor of MQ (MQ-2, MQ-5) series. [8] Fire sensor uses to detect presence of fire. We used firebase as a database in our system. All sensor data store in firebase. This project guarantees much less damage and protect life, improves employees productiveness.

- ## Chapter-2 Literature Review:

  For developing this system, we read some thesis and research paper. It discusses the different ways of Industrial safety security and prevent accidents. From this information, we got different way to develop our project. This type of research paper are useful for improving safety system and provide a peaceful environment in industry.

- Chapter-3 Methodology:

  The methodology is the general research strategy that outlines the way in which research is to be undertaken and among other things, identifies the methods to be used in it. In this chapter, we discussed how to complete our project step by step. For developing this system, we divided our working plan in different portion. Follow this working path, we are finally built our project.

- Chapter-4 Design and Implementation:

  Hardware and combination system are used to build this project. For hardware, we used microcontroller, sensor, pump, motor, pocket router etc. For software section, we develop our coding at Arduino platform. Arduino use C/C++ as programming languages. Power supply has been used to keep the microcontroller running. For monitoring this whole system, we have developed an android application.

- Chapter-5 Result and Discussions:

  In this chapter, we discussed about performance of microcontroller. We also discussed legacy of microcontroller and also discussed limitation of our project. Finally, we suggest how to improve this system. We also discussed this project how to benefit our industry.

- Chapter-6 Conclusion:

  Our primary goal was to extend a solution that would allow authority to monitor any place in industry and provide safety to worker using an IoT based infrastructure. It is cost effective project and authority also benefits using this system.

CHAPTER 2

LITERATURE REVIEW

Here has some IoT based fire alarm and safety security system developed. Discussion is going to review those papers.

A safety work environment is an environment free of trouble and risk to workers .The concept of industrial safety security system is essential in reinforcing occupational health. However, work place environment is not totally free of risks and danger thus providing an enabling environment that promotes wellbeing of workers is very necessary for employees' performance. This paper discusses in brief the problem of health and safety issues of worker at garment industries in Bangladesh based upon the industry environment, their residential environment, working condition, age, problem of health, causes of diseases, causes of fire accident and their medical facilities.

Fire causes tremendous loss of lives and properties consistently in Bangladesh. Breaking down past flame episodes, realities are uncovered. A few industries has inadequate fire safeguard materials, electric cut off broken electrical wiring, nearness of inflammable materials, infringement of flame security and absence of sufficient mindfulness and so forth. Fire detection system proposed in this paper. From the survey taken most of the fire detection method detects fire after it is triggered. In this paper, we are proposed system the fire safety practices is going to implement for the fire crackers industry. In that the root cause for the fire is to be analyzed and prevent from the fire before it is triggered. Through this hazardous fire accidents can be avoided and many lives can be saved.

Gas detections are vital issues for all spheres of lives where precautions are very important. To ensure safety condition a system has been developed which is reliable in detecting gas leakage and can even detect the specific room or floor in which the fault is present. Moreover, the system can send an alert message regarding the information of gas leakage to the nearest fire service station. We present a detailed overview on gas leakage localization and tracking problem from the view of precision, robustness, and energy consumption issues. This paper also presents the research directions for existing and future gas leakage and provide safety in our industry.

This system developed for industrial safety management. It follows with an extensive description of existing and commonly used safety performance measurement methods. Several case studies are used to explain the methods and explore the important application areas relevant to most industrial sectors. The techniques and tools for safety data collection, analysis, and sharing are introduced together with their applications for safety management while the use of emerging technologies for enhancing safety management in most industries is discussed in the last section.

This system operated by indicating an increase temperature above the safe limit in the room where it was fixed. In the proposed system, a smoke detector upon senses smoke activates its alarm, sends a low voltage signal to all other smoke detectors in the vicinity. This low voltage signal activates the individual pins of our controller. In this system the transmitter and receiver are installed in a unit and the need for a base is eliminated. The individual smoke detectors are equipped with all the electronics required to both send and receive signals. It also provide security of our system and detect accident before occurring fire. These sensors can be used to detect combustion gases at very low concentration levels.

This system developed which deals with causes of accident and from these causes, we may to find out solutions and it tends to increase the performance of safety culture, safety performance and behavior of the employee. Training, education meeting and communication also plays a major role in accident because the performance of communication from top level to low level management is very poor.

This system specially designed issue of health and safety of employees. It was concluded that employees' low performance can be attributed to both low health and safety practices and lack of personal protecting equipment (PPE) and management commitment to health and safety programs. The four independent measures of industrial health and safety as was used in the study were found to be influencing employee's performance. It was recommended among others that there should be constant health and safety training for both top, middle and low level staff. As this will equip the employees with health and safety culture, as no one is above accident.

We studied each paper very carefully. Then we have developed app based industrial safety security system IoT Based Fire Alarm and Safety Security System. The processing sensor analysis of fire sensor, smoke sensor, gas sensor based sector analysis and identification. Any problem occurring in industries (Fire, gas sensor etc.) and any object identification indicate and sent through the system. The microcontroller use to controlling. A WiFi mod connect with controller. Here all input signal send to firebase. Through this database, whole system will be monitored by an android app. In this system, a submersible pump was placed to provide water so fire extinguishing. And also placed servo motor to open our industries gate.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. Actually Methodology is some theoretical step or work schedule that flowed by any project. It helps us to complete our project at right time. Whole project has been divided some section. We have followed step by step. Through methodology, we have collected all possible requirements which are very well documented there are no ambiguous requirements. All requirements are clear and fixed. Our project work has completed by following some strategy, which are given below:
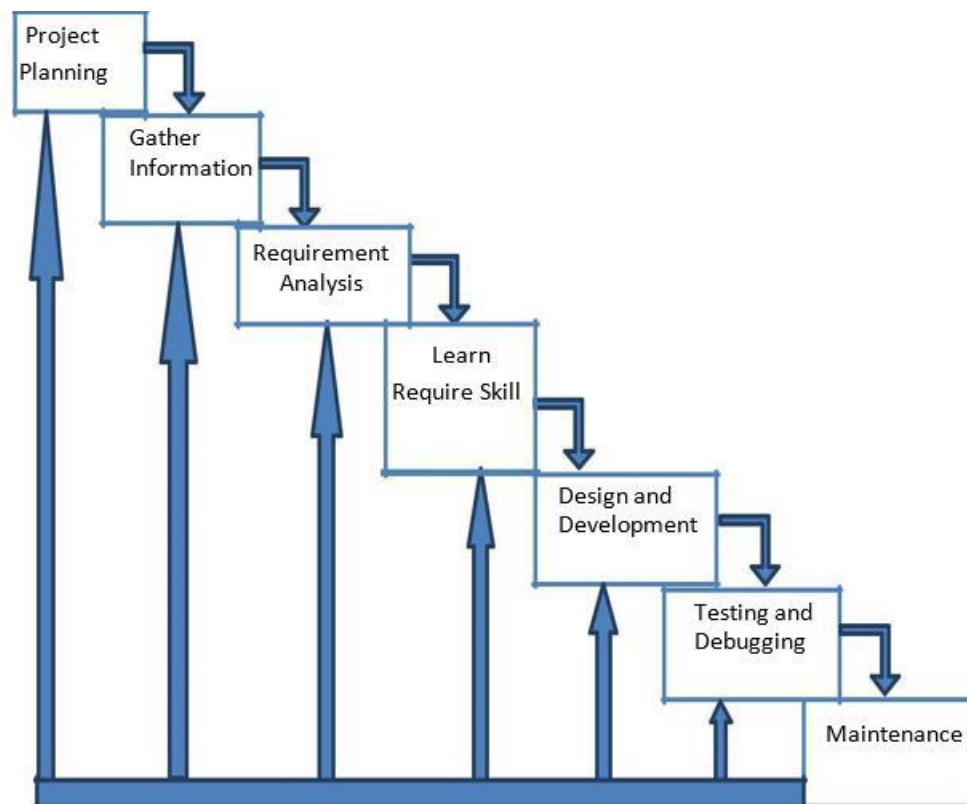

Figure 3.1: Diagram of Methodology

3.2 Project Planning

Project planning is a discipline for stating how to complete a project within a certain timeframe, usually with defined stages, and with designated resources. First of all we found some regular problems in our real life. Then find this problem and think to solve it by some smart way within a certain timeframe. We discussed with our team members and teachers. In order to overcome this problem, we have taken plan a smart system which can send data to nodeMCU etc. The device will help operator with some useful information which support them to controlling every equipment.

3.3 Gather Information

After finding problem we gathered some information about this problem that how to solve it in smartly. We read some research paper about this problem. We have collected data from our daily life and industry which is based on security. Then we have found out some major problem as gas leakage, fire security, smoke detection and. We search in internet to find the solutions.

3.4 Project Analysis

The project analyst provides critical data support to a technical team. Research and analysis functions may include budget tracking and financial forecasting, project evaluation and monitoring, maintaining compliance with corporate and public regulations, and performing any data analysis relevant to project tasks. We have analyzed which type of sensor used in this system. After detect fire, we should prevent this fire automatically. So we have also used submersible pump for this project. We Also we have analyzed whether this plan is possible after it is planning and its requirements in the society and how it can be applied easily.

3.5 Requirement Analysis:

Requirements analysis encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product or project. We have used different types of components. For hardware section, we have used nodeMCU as a controller, gas sensor, fire sensor, smoke sensor and pump etc. For coding section, we have used Arduino platform which based on C/C^{++}. We have developed an android app for monitoring this whole system. We have analyzed all processing data from input device and how much take time send this data into database.

3.6 Learn Required Skill:

For developing this project, we have learned about basic electronics, basic programming, Arduino control, IoT system and android application. We have also studied on PCB design. For programing part, we have gained lots of knowledge on C/C^{++}. We have learned basic working system of loop, function, conditions and algorithm. For Arduino section, we have known how connect with computer and also known Arduino language.

3.7 Design and Development:

System design is the process of defining the components, modules, interfaces, and data for a system to satisfy specified requirements. System development is the process of creating or altering systems, along with the processes, practices, models, and methodologies used to develop them.

We have designed system architecture using NodeMCU and power supply also web interface server, Android app. We have develop the system used a Methodology here maintenance some stage.

3.8 Testing and Debugging:

A device under test (DUT), also known as equipment under test (EUT) and unit under test (UUT), is a manufactured product undergoing testing, either at first manufacture or later during its life cycle as part of ongoing functional testing and calibration checks.

We have tested whole system in real time. We got some results and it works well. We have seen a few problem for lagging of internet.

3.9 Maintenance:

There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

The main methodology of this entire project is depends on IoT based embedded system so inter facing of all hardware with Wi-Fi and internet is very important part in its functioning. An IoT based monitoring system used for accident detection. We place different types of sensor in industry at suitable place. All the sensors data give value through the microcontroller. For using smoke sensor and fire sensor, we can easily detect the present of fire. When fire sensor active, it gives the in microcontroller. Beside, different series of gas is also implemented so that we can find any kind of gas linkage. It gives another level of security. Then motion sensor is also placed here. It gives safety security in our industry. All the data store in global database which is connected our mobile application. From this mobile application, we can monitor and observe whole system.

CHAPTER 4

DESIGN AND IMPLEMENTATION

Requirement Analysis: Requirement analysis is the technical analysis of a system project that is critical to success or failure. There are two Requirement analysis process.
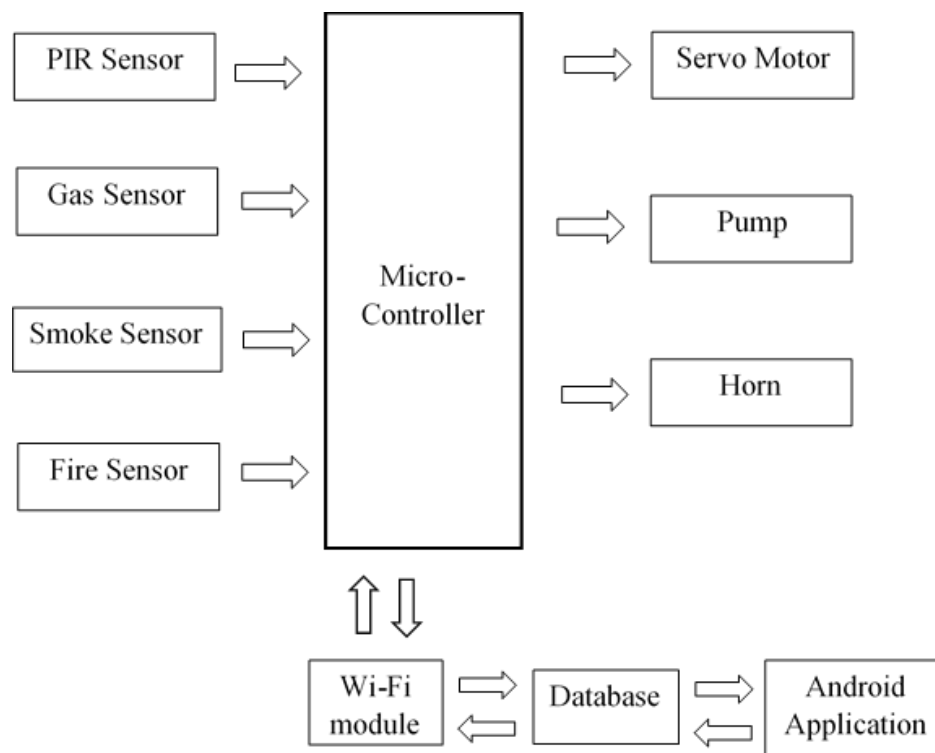
- • Hardware
- • Software

Figure 4.1: Block Diagram of Project

➢ Hardware Requirements

- • NodeMCU - NodeMCU is an open hardware development board through which a device is designed. It acts as a microcontroller and wi-fi device.
- • Power Supply- 12v DC.

- MicroUSB Cable
- Fire Sensor
- Gas Sensor
- Smoke Sensor
- Pocket Router
- Pump
- Buzzer

4.1 NodeMCU

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. ESP 8266mod is used as a Wi-Fi module. It is attached with microcontroller. ESP8266 is Wi-Fi enabled system on chip module developed by Espressif system. It is mostly used for development of IoT (Internet of Things). This WiFi module send all the signal of our base station like a Pocket router. All the data has to be stored in a standard database. So, we are used firebase as database. First, all the input data or signal send through the Wi-Fi module. Then this data store in firebase for real time monitoring. This firebase is directly connected to our mobile application.
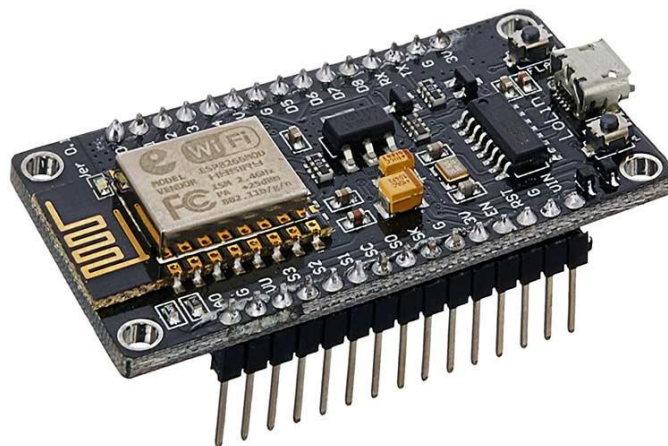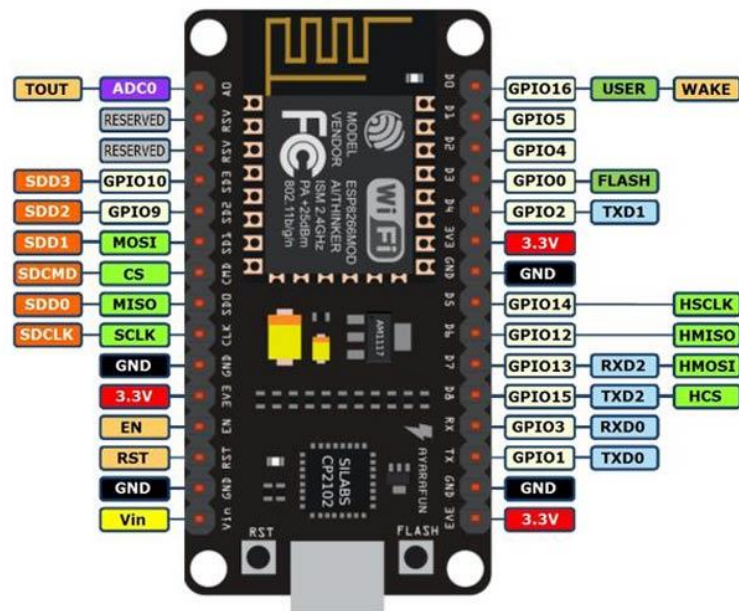
Figure 4.2: NodeMCU

Figure 4.3: NodeMCU Pinout Diagram

Working System:

NodeMCU is the microcontroller of this object. It has some digital pin, one Rx Tx pin and one analog pin etc. This pin is also used to control input and output devices. For analog input signal, we have only used A0 pin. For digital input signal, we have used D0-D8 pins. These pins is also used as digital output. We have connected an external power supply for activating this controller. Here, positive point of power supply connect with Vin pin and negative point connect with GND pin. All the input and output devices connect with between D0 to D8. For input signal, we have declared this pin as input and for output signal we have also declared this as output.

Pin Configuration:

- Reset Button – This will restart any code that is loaded to the Arduino board
- Ground Pin – There are a few ground pins on the Arduino and they all work the same
- Digital Input/Output – Pins 0-13 can be used for digital input or output
- USB Port – Used for powering up our Arduino and uploading sketches

- TX/RX – Transmit and receive data indication LEDs
- ATmega Microcontroller – This is the brains and is where the programs are stored
- Power LED Indicator – This LED lights up anytime the board is plugged in a power source
- Voltage Regulator – This controls the amount of voltage going into the Arduino board
- 3.3V Pin – This pin supplies 3.3 volts of power to our projects.
- 5V Pin – This pin supplies 5 volts of power to our projects.
- Analog Pins – These pins can read the signal from an analog sensor and convert it to digital signal.

4.2 Power Supply-12v DC

Plug Adapter AC 100-240V to DC 12V 2A Power Supply

Working System:

It is an external power supply for this project. This is an AC to DC converted power supply. Here DC is purified by bridge rectifier system. This power source is connected with microcontroller, input devices and output devices. All the sensor (gas sensor, PIR motion sensor, fire sensor etc.) are activated by this power supply.

Fig 4.4: Power Supply 5v

4.3 Fire Sensor:

A flame/fire detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame. We are used flame sensor fire detection module for this project. It is a comparator chip LM393. We have used two fire sensor. One is placed at power house and another one is placed at production room in our project. First one is connected with D5 pin and second one is connected with is D1 pin. This sensor provide digital input value.

Figure 4.5: Fire Sensor

4.4 Gas Sensor:

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Most home based smoke detection systems are oxide based sensors. MQ5 is one of the commonly used gas sensors in MQ sensor series. Different types MCQ series of gas sensor are used for project. This sensor is placed at production house. It is connected with D1 pin. This sensor also provide digital input value. When the gas exist, the sensor's conductivity gets higher value along with the gas concentration rising. Other it gives lower value absence of gas. It also gives high (1) or

low (0) value in microcontroller. From this high or low value we can easily identify gas leakage.

Figure 4.6: Gas Sensor

4.5 Smoke Sensor:

Figure 4.7: Smoke Sensor

Smoke sensor is the important portion in our industry. MQ2 is one of the commonly used gas sensors in MQ sensor series. MQ2 Gas sensor works on 5V DC and draws around 800mW. It can detect flammable gas in a range of 300 – 10000ppm. It's most common use is domestic gas leakage alarms and detectors with a high sensitivity to propane and smoke. Concentrations of gas in the gas is measured using a voltage divider network present in the sensor. This sensor activated on 5V DC voltage. This

sensor is connected D2 pin. It is also placed at production sensor for detecting smoke. It also provides digital input value. A variable resistor placed in this gas sensor module. Through this resistor serves to adjust the sensor's sensitivity and accuracy.

4.6 Pump:

This is a brushless submersible pump can work at 3.5V to 9V voltage, low noise, and low power consumption. This is a brushless submersible pump with USB connector, can work at 3.5V to 9V voltage, low noise, and low power consumption. It can be easily integrate to our safety security system project. The water pump works using water suction method which drain the water through its inlet and released it through the outlet. This pump is used as an output device. Positive side of this pump is connected with D7 pin. When fire will occurred in industry, it is automatically activated and provide water for extinguishing the fire.

Figure 4.8: Pump 5v

4.7 Pocket Router:

A Pocket Wi-Fi works just like any internet connection device only that it is a lot smaller and portable than our traditional home Wi-Fi router. The device then omits a Wi-Fi signal just like your home Wi-Fi does, allowing any of our internet capable devices to connect via Wi-Fi. It works just like any internet connection device only thait is a lot smaller and portable than your traditional home WiFi router. Unlike the

latter the mobile WiFi is designed for use without location constraint, allowing you to stay connected to the web wherever we may find ourselves.

Figure 4.9: Pocket Router

4.8 Buzzer:

This is a Small PCB Mountable 12V Active Electromagnetic Buzzer. It is great to add Audio Alert to your electronic designs. It operates on 12V supply, uses a coil element to generate an audible tone. It is also used as output device. Basically it is an alarm system. When fire occur in industry, then it will activate. It is connected with D6 pin of microcontroller.

Fig 4.10: Buzzer 12v

➢ Software Requirements:

Our whole system are controlled by Arduino. Different types of logic develop through Arduino platform. All sensors and output device controlled this language. Developing this language, we are used Arduino IDE software.

4.9 Programming on Arduino:

After completing our circuit design and built our hardware section, we developing coding or programming on Arduino. This Arduino software is easy-to-use for beginning level, yet flexible enough for advanced users. Once the circuit has been created on the breadboard, we'll need to upload the program to the Arduino.
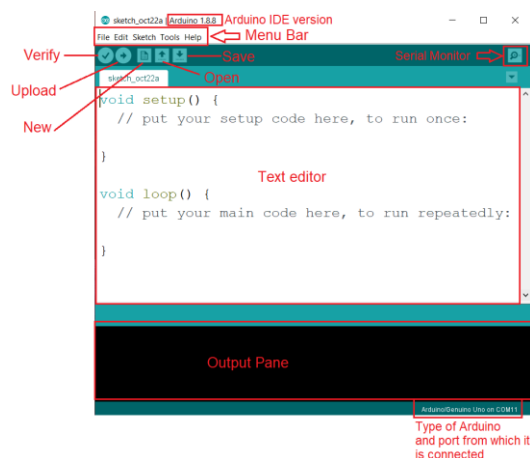

Figure 4.11: Opening Arduino IDE

Figure 4.12: Sketch of Arduino IDE

When we opened this software, we see this format. From this menu bar, we see that this is Arduino 1.8.1 version. We are also seen different types of such as file, sketch, tools etc.

• Menu Bar: Gives us access to the tools needed for creating and saving Arduino sketches.

• Verify Button: Compiles our code and checks for errors in spelling or syntax.

• Upload Button: Sends the code to the board that's connected such as Arduino Uno in this case. Lights on the board will blink rapidly when uploading.

• New Sketch: Opens up a new window containing a blank sketch.

• Sketch Name: When the sketch is saved, the name of the sketch is displayed here.

• Open Existing Sketch: Allows us to open a saved sketch or one from the stored examples.

• Save Sketch: This saves the sketch we have currently opened.

• Serial Monitor: When the board is connected, this will display the serial information of our Arduino

• Message Area: This area tells us the status on saving, code compiling, errors and more.

• Text Console: Shows the details of an error messages, size of the program that was compiled and additional info.

• Board and Serial Port: Tells us what board is being used and what serial port it's connected to.

• Code Area: This area is where compose the code of the sketch that tells the board what to do. There has two portion void setup () and void loop (). The code that we put inside void setup () will only run once, and that will be at the beginning of our program. One example is when we want to turn our robot on that does not happen multiple times! In void loop (), our code will repeat over and over again.

4.10 Board and port selection of Arduino:

Once the software has been installed on our computer, go ahead and open it up. This is the Arduino IDE and is the place where all the programming will happen. Take some time to look around and get comfortable with it.
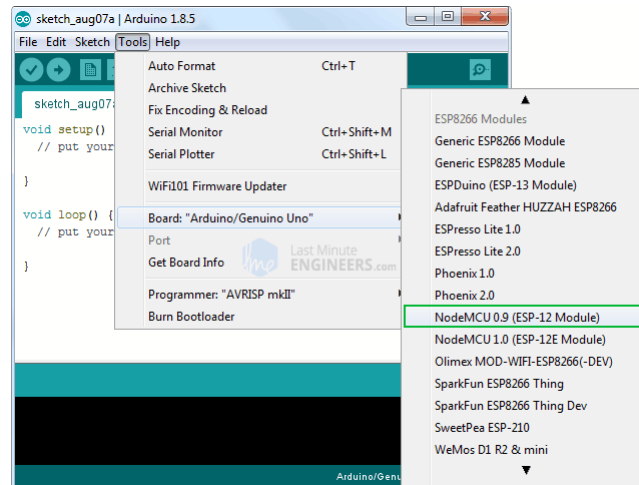

Figure 4.13: Arduino Board Selection

At this point we are ready to connect our Arduino to our computer. Plug one end of the USB cable connect to the nodeMCU and then the other end of the USB to our computer's USB port. Once the board is connected, we will need to go to Tools then Board then finally select nodeMCU.

Next, we have to tell the Arduino which port we are using on our computer. To select the port, go to Tools then Port then select the port that says Arduino.
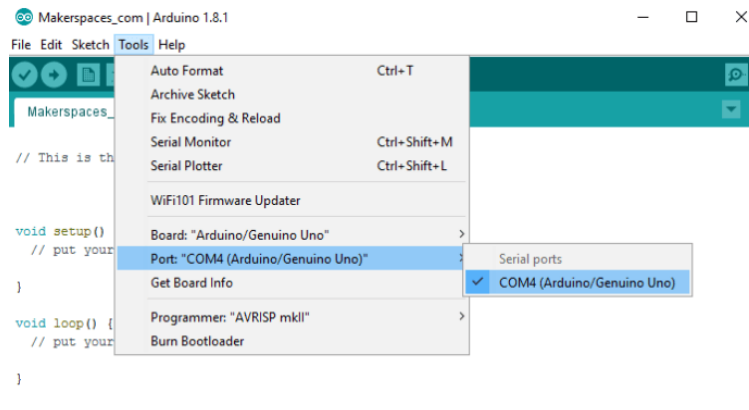

Figure 4.14: Arduino Port Selection

4.11 Connect the Parts:

We can build our Arduino circuit. We are connected our input and output with nodeMCU. DC power supply also connect with nodeMCU to activate this controller. For input device, we declare D0, D1, D2, D3 and D5 as INPUT_PULLUP. D0 and D5 pin connected with fire sensor which located with power house and production house. D1 and D2 pin connected with gas sensor and smoke sensor. For output device, we declare D6, D7 and D8 as OUTPUT. D6 and D7 pin connected with buzzer and pump. And D8 pin attach with servo motor.

4.12 Compiling and Uploading System of Arduino:

Next, we need to click on the verify button (check mark) that's located in the top left of the IDE box. This will compile the sketch and look for errors. Once it says "Done Compiling" we are ready to upload it. Click the upload button (forward arrow) to send the program to the Arduino board.

```
File Edit Sketch Tools Help

sketch_nov17a §

void setup() {
  pinMode(D4,OUTPUT);
  pinMode(Pump,OUTPUT);
  pinMode(Buzzer,OUTPUT);
  pinMode(FireProduction,INPUT_PULLUP);
  pinMode(GasProduction,INPUT_PULLUP);
  pinMode(SmokeProduction,INPUT_PULLUP);
  pinMode(PIR,INPUT_PULLUP);
  pinMode(FirePower,INPUT_PULLUP);
  myservo.attach(D8);


  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
```

Fig 4.15: Pin Mode Setup

```
void setup() {
  pinMode(D4,OUTPUT);
  pinMode(Pump,OUTPUT);
  pinMode(Buzzer,OUTPUT);
  pinMode(FireProduction,INPUT_PULLUP);
  pinMode(GasProduction,INPUT_PULLUP);
  pinMode(SmokeProduction,INPUT_PULLUP);
  pinMode(PIR,INPUT_PULLUP);
  pinMode(FirePower,INPUT_PULLUP);
  myservo.attach(D8);


  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
```

Figure 4.16: Verify & Upload Button

If we don't select our port and board in right way, there has shown in some error. This error show in output pane. So at first we should check this output pane. Then fixed this error.
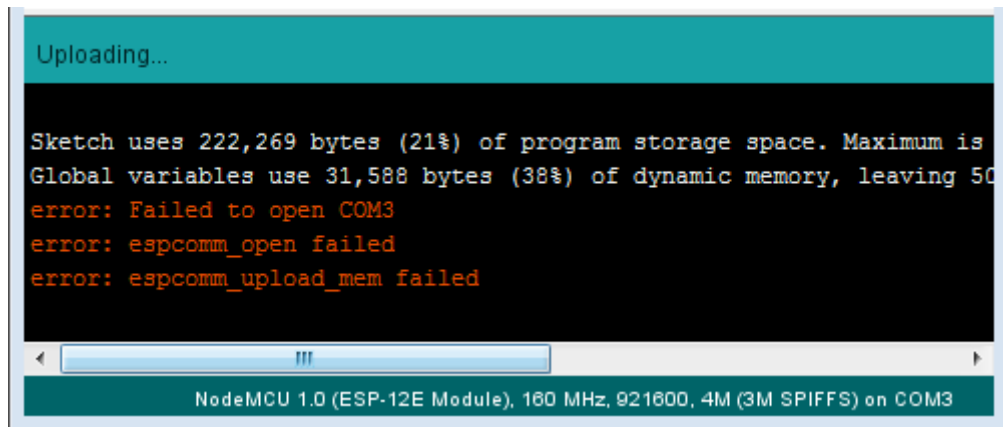

Figure 4.17: Error Show in Output Pane.

CHAPTER 5

RESULT & DISCUSSION

5.1 Result:

After analyzing this project, we were found different types of result.

- **Time:** We knew that microcontroller took some time for processing the signal. Here all this data is worked through the internet. So, processing time depended on the Internet speed. When Wi-Fi module crossed the High internet speed zone or connected with high band width, it took time 3sec to 5sec. Otherwise, it took 5sec to 12sec. Sometimes controller disconnected with our database for poor connection.

- **Accuracy:** Accuracy of the project was so good. In our observation time, it was performed accurately. But few times it was failed for poor connection.

- **Limitations:** There was different kind of limitations.

  ➢ We could detect the leakage of gas. But we don't identify the actual leakage point in industry. So this time we need some time to prevent this problem.

  ➢ Here, we only detect the fire after something burned. If we know reason of fire before burning, then it will be more applicable for our industry.

  ➢ Using smoke sensor, we identify the presence of smoke. But sometime it creates troubles in monitoring system.

- **Future Work:** We can more accurate and valuable by adding this type of future work.

  ➢ We can attach camera in our house and industry. Doing image processing, we can observe every movement of people. When something will wrong, it will gives a signal in controller. So authority easily know everything.

  ➢ This image processing system also benefit to detect fire system. Applying this system, authority will easily can get an idea of the movement of fire and the magnitude of the fire

  ➢ Applying this system, authority will identify the actual gas leakage point. It will decrease our accident. From this technology, unconscious worker will also find. Then we will give message for his/her unconscious behavior.

5.2 Discussion:

We have developed industrial security system and accident monitoring. This project can develop with help of our supervisor. He guide us proper way. Withed the co-operation of microelectronics technology, we can apply electronics and programmable related device within an automobiles several systems where it could increase the efficiency, security and longevity of an automobile as well as providing digitalize service for consumers. Doing this project, we can gain electronics knowledge and work hardware software combination. We learned programing C and also Arduino programing. Within this project we have tried to show gas detection, fire detection, flame detection. Each output data authority can know all of it through mobile application. We optimize, the mobile application and the systems would be more beneficial for authority. As commercially we can get scopes for attaching or installing our project, it will must secure our industry, reduce maintenance cost and look after from wherever wants. Each system of this project is customer demands from the field study we have abled to understand. So we have inspired to develop this project. These safety concepts a better safe work environment can be provided to the workers and the productivity will automatically get improved.