

IOT BASED CHILD SAFETY LOCATOR FROM WATER AND FIRE

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for the Degree of Bachelor of Science in Computer Science and
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APPROVAL

This Project titled “IoT Based Child Safety Locator From Water and Fire”, submitted by Md. Minhajul Islam Rony, ID: 163-15-8519, Sanjida Khanam, ID: 171-15-8568, Sagar Gosh, ID: 163-15-8518 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and affirmed concerning its style and substance. The presentation has been held on 25 April 2021.

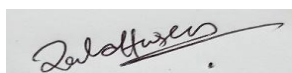
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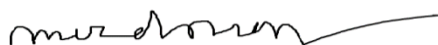
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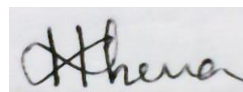
We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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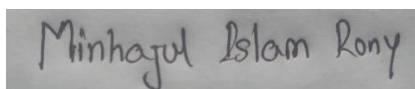
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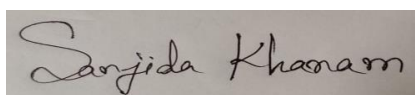


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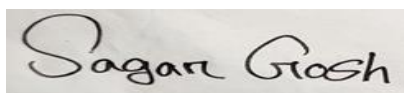
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ABSTRACT

This project is an IoT based development project titled “**IoT Based Child Safety Locator from Water and Fire**”. For the past few years, the child death rate has been a major concern, particularly in our country. This IoT based development project is designed & built for general people who don't need any depth knowledge of using digital technology. This project is mainly focused to reduce the child death rate. Also, this can ensure the awareness of parents for the children. In this system we used node MCU, GPS module and many other components but these two components executes the most vital role in this project. Node MCU is mainly working for connecting the system to the internet. For this it's an excellent choice for a variety of Internet of Things (IoT) projects. GPS module is used for tracking location. It is easy to acquire for anyone because they can track through GPS satellite. This project aims at detecting fire and water by giving notification to the parents of the exact location. The location automatically send via short message service (SMS) to the parents through an android based smartphone even if they are out of their workplace. This system is more effective than many IoT based system by detecting the temperature and measuring the water humidity. To demonstrate the feasibility and effectiveness of this system, both water and fire sensor is worked for warm and cold environment.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Internet of Things is an idea where every gadget is allocated to an IP address and through that IP address, anybody makes that gadget recognizable on the internet. Fundamentally, it began as the "Internet of Things." Research examines have gauge touchy development in the quantity of "things" or gadgets that will be associated with the Internet. The resulting association is known as the "Internet of Things" (IoT). Child safety locator is a device through which you can know the location of your children. It is very important to know the location of your children when you go to unknown place. Somehow you lost your child in an unknown place and your children go to a nearest pond and you don't know, then the system give you a notification of your children's location. A water monitoring system is critical in the event of a flood emergency, as it will provide advance warning to local people, allowing them to take steps such as evacuation, crisis preparation, and so on. In this article, they introduce a real-time IoT-based water monitoring method [1]. Nowadays, infant mortality rate is much higher all over the world including Bangladesh. The death rate is much higher, especially in water and in fires. Fire warning systems are critical for alerting residents when a fire spreads in their homes. Fire alarm systems, on the other hand, today take a lot of wiring and effort to install. Users are discouraged from installing them in their homes as a result of this. As a result, they propose a simple-to-install IoT-based wireless fire alarm system [2]. Moreover, it also happens due to the negligence of father and mother. This accident usually happens when the father is out of the house for work. The accident also happened when the mother was busy cooking after leaving the baby. The children go to play, come to the pond, pass by and finally the children die later in the pond. It is normal because parents are busy with different activities. For example, when someone from the city comes to visit the village, everyone is busy talking to everyone, not paying attention to where the children are playing, falling into the water, causing the children to fall into the water and die. Internet of Things (IoT) based child safety locator give the notification to the parents and parents will be able to save their child.

1.2 Objectives

Only a mother can tell you how difficult it is to give birth to a child. If that child dies in front of the mother it is very painful which cannot be explained. These accidents are a matter of great concern not only for the parents but also for the society. We know the every child is our future. If that child dies first then what will be our future. We need to reduce this child mortality rate to save our future generations.

1.3 Motivation

For our project, we get motivated by many reasons. Describing below:

Child accident by drowning river and burning on fire is a big tragedy for people. The absence of care and attention from the parents this accidents causes. So far prevention children death and get more awareness about parents we want to do this. And also when we see that in front of us children's are death drowning water after that we decide to create a device which give important information about children and parents can save their child. In rural area parents are work in a fire related factory and when they are busy to their work and somehow children are go to the fire place and parents don't know. Their children are death burn by fire which is shown in Figure 1.1. Bangladesh has one of the highest drowning rates in the world for children under the age of five, according to the World Health Organization [3]. Basically these are the main reason to do this project.

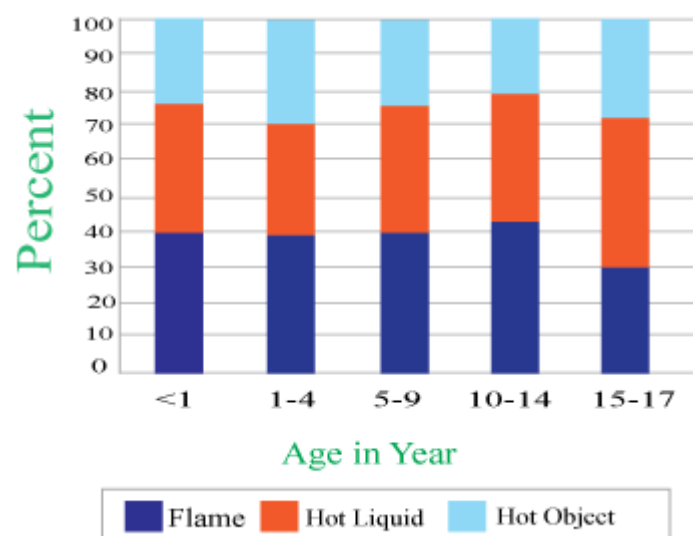


Figure 1.1: Statistics death rate of child burning

We can see the death rate in our country over the years by looking at this graph. Between the ages of 10 and 14, the highest rate of death due to flame is approximately 40%. However, between the ages of 10-15, this rate is much lower. We can see that the death rate for children aged 1 to 9 years is similar [4].

Due to the extreme hot liquid, children under the age of one are at greater risk. When compared to other years of childhood, the rate is higher.

When a child under the age of one year is exposed to a hot object, the risk of death is minimal when compared to death from a hot liquid. Unfortunately, the rate rises dramatically between the ages of one and four years old.

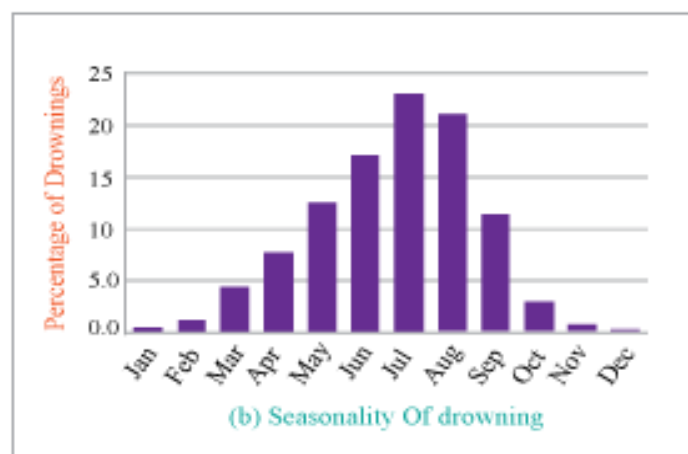
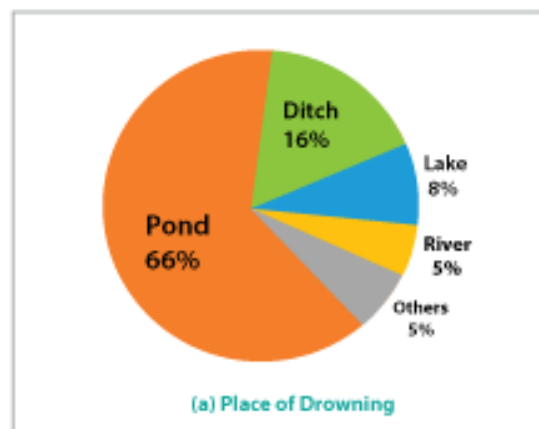


Figure 1.2: Statistics death rate of child drowning

The percentage death rate and seasonality of drowning are presented in the graph which is shown in Figure 1.2. More than 60% of children drown in ponds, while less than 40% drown in rivers, ditches, and lakes. We all know that June, July, and August are the wettest months of the year. During this time, the pond's water level rises, resulting in child death [5].

1.4 Expected Output

- ❖ To reduce mother anxiety.
- ❖ To reduce infant mortality rate.
- ❖ To keeping parents worry-free.
- ❖ To give it to everyone at a low price.
- ❖ To preference safety of our most used appliances.

1.5 Report Layout

Chapter 1: In this chapter we discussed about the motivation, objectives and expected outcome of the project.

Chapter 2: This chapter we have described the background, related work which has similar works with this project and also provide challenges that we faced.

Chapter 3: Contains basically discuss about BPM (Business process modeling) and use case Diagram. Use case is the main part of this chapter.

Chapter 4: In this chapter all about the design of the website and implementation requirement and its related works.

Chapter 5: This chapter contains the whole testing, analysis and results.

Chapter 6: Contains conclusion, advantages, limitations, applications, and future work for the development of this project.

CHAPTER 2

BACKGROUND

2.1 Introduction

This chapter describes the background of **IoT Based Child Safety Locator from Water and Fire** and also discusses a few similar related works. The perfect outcome of the project has been discussed here effectively.

In the recent world, technology is becoming very smarter than before. Peoples are doing so much impossible work which they thought in past time. They are researching for inventing new things with a greater output. So which country has the most investment in a project they have the greater output. Because when an authority invests in a project then the output must be very smarter because they invest the big amount for the latest equipment. Thus they can get the most advanced systems which make their work so simple. So IoT is an advanced form of technology that can be used for doing such inventions. So there are many things which have already invented before by many researchers and developers. So as we are working on some kind of this project so we need to know some of these works. By which we can compare our work as our need that it's actually can fulfill our target and how much our work standard like other works. So the concept of this project is to safe the children's live from drowning water and burning by fire.

2.2 Related Works

In this part discussed about some similar related works with this project.

1. Mahgoub ET. Al. focused on their paper to use IoT for fire alarm system. The project had mainly worked for giving notification to the users and fire workers using Wi-Fi. They used Raspberry pi as a server system. Moreover they used smoke sensor for sensing the surrounding environment. [6].
2. Swarnadeep Majumder ET. Al. focused on their paper to notify occupants and emergency personnel of the fire's location and provide a secure evacuation route in real time. To have these critical services, it suggests using a mesh network of smart fire alarms and route planning algorithms [7].

3. Ravi Kishore Kodali ET. Al. The use of an IoT modular framework to construct an emergency response system for fire hazards is presented in this paper. A low-cost wi-fi module ESP-32 and smoke detection sensor. By sending the danger position to the cloud-service to which all are connected, the sensors detect the hazard and notify local emergency rescue agencies such as fire departments and police departments [8].
4. Aziz Alotaibi ET. Al. To avoid drowning accidents, this paper presents an efficient and accurate detection system that uses a single image to identify and recognize drowning objects. The proposed framework employs the Internet of Things (IoT) and transfer learning to provide an intelligent and automated solution for off-hours pool safety monitoring [9].
5. Muhammad Ramdhan ET. Al. An Early Drowning Detection System (EDDS) is a system that notifies guardians (parents and lifeguards) if the detector detects an irregular heartbeat and the victims are submerged in water for an extended period of time. Using an internet connection, the access point serves as a data forwarder to the server [10].
6. Farid Zakwan ET. Al. They suggested to prevent this accidental death from occurring, as well as to assist parents in caring for their children in the pool. The Child Drowning Warning System was created to help parents keep an eye on their children in the water. This machine consists of a heart rate sensor and a NodeMCU. The heart rate sensor is used to detect the heart rate of children in the water, while the code is implemented in NodeMCU to create an algorithm to distinguish between normal heart rate and drowning heart rate [11].

2.3 Comparative Studies

From the previous discussion, we saw that all the research and project has done on IoT in many sectors. But they cannot do this together either they detect fire and give alarm or either the detect water and give alarm in a home but not the other area. They detect together but it is only in a home or office and any kind of factory. But they cannot do this outside. This is the main difference about their project or our project. In our project we detect water and fire from a wristband which were the children in hand. And if it detect water and fire then this device give notification in parents phone and parents can

check their children's location. Any other device can give location about their child but they cannot detect the water or fire. This is the main part that sets our project apart from other projects.

2.4 Scope of the problem

Already mentioned the scope of the problem above. Mainly this project is one of the valuable projects all over the world. But every project has a problem. Our project's scope of problem is if somehow our device cannot give notification in a particular time then it's a big issue to save children's life. Somehow the network is slow then this device gives notification too late. For this late parents cannot save their child. One more problem is battery backup. Obviously it's an electrical device so it needs a battery to run. If the battery is dead then it cannot give the notification to the parents. If parents check the battery properly then it will be okay because it's rechargeable.

2.5 Challenges

For developing the project many challenges and problems have been faced by us. The main challenges are the design and implementation of this system. We tried our best to create this project which would be more user-friendly for common people.

We know that getting an internet connection is still now more costly for the purpose of our country. In Bangladesh still, now many places haven't a good internet connection. But if users do not have good connection then they can only know that their child is in a danger but they cannot know their location. If the user almost downloads their location on Google map then they can also see the location offline.

As we have studied the embedded system in the final year so that we have not so much professional knowledge to make a top-level project. So that at the beginning of the working we have faced many problems to set up the whole system. Sometimes many parts are lost in working time by testing. Sometimes we have some loose connection issue for which we faced many occurrences like getting shocked by touching the parts. Sometimes some parts are invented which are broken or not working. Another problem is the financial investment. This is the first invested project by us which successfully developed with great motivation. Sometimes there is a waste of money for purchasing twice a time for one part because of broken or not working items. If we can produce this project as a business then it will be a great prototype for a new invention.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Flowchart Diagram of Proposed System

In the flowchart diagram, we can see our system will run and at first it will find the internet connection for our system and also mobile phone, because it will need two separate connections for doing the further process. If the internet connection is found successfully then it will connect to the GPS which is connected with our system which is shown in Figure 3.1.

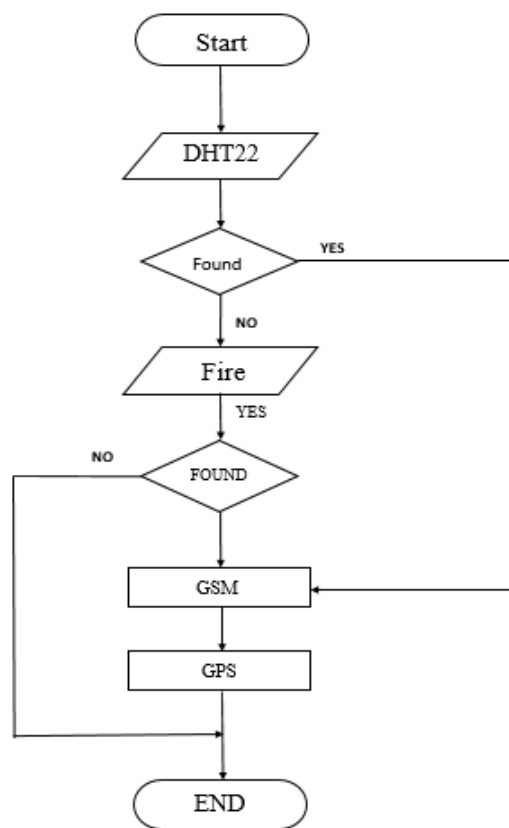


Figure 3.1: Flowchart Diagram of Our System

If it finds our system then it will go for the decision section or if not connected then it will end the process. If the sensor give input successfully then it will go for further procedures like it make the sound after finish sound it execute the location with GPS then it will send message then end the process .

3.2 Block Diagram of Proposed System

We can see the main block diagram of our system. So we will overview the whole system because in the next section we have discussed the full working procedure of the system.

In our system, there are two important parts. One is the NODE MCU and the other is the GPS. At first, we need to switch on then to run NODE MCU, and GPS. The temperature sensor and fire sensor is attached to measure the temperature which is shown in Figure 3.2.

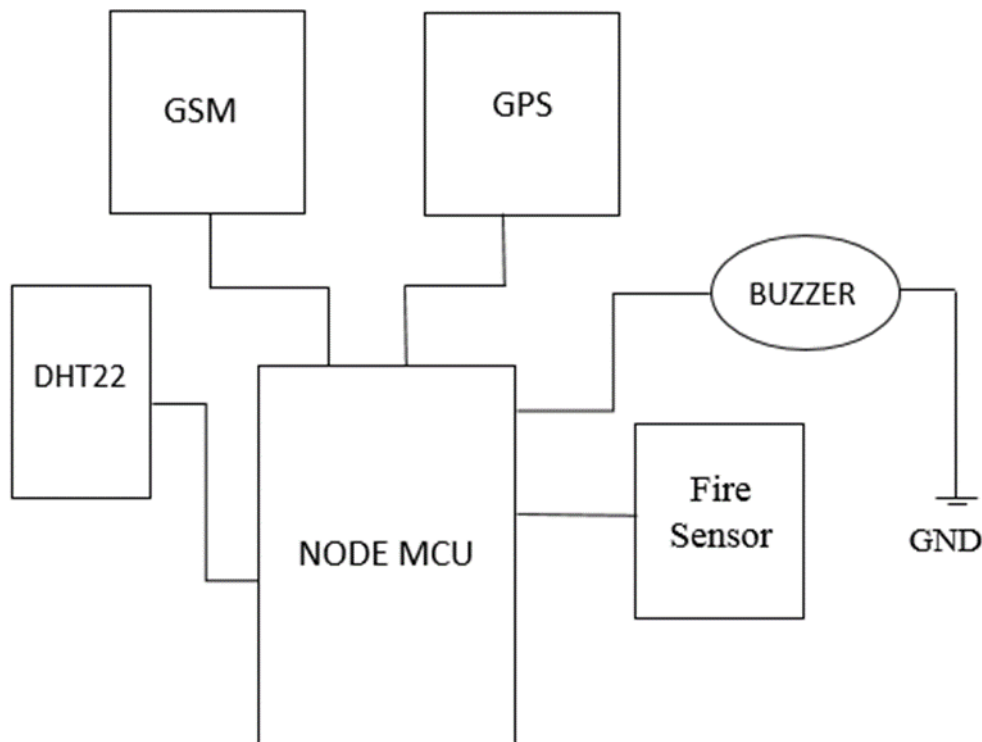


Figure 3.2: Block Diagram of Our System

Also, there is a signal equipment which is Buzzer that is attached. GPS and GSM is also attached on the relay board. The NODE MCU is attached to a relay board so that can control internet connection. NODE MCU will receive the command from the sensor and do the further procedure.

3.3 Circuit Diagram and Explanation

In this circuit diagram the connection is very simple.

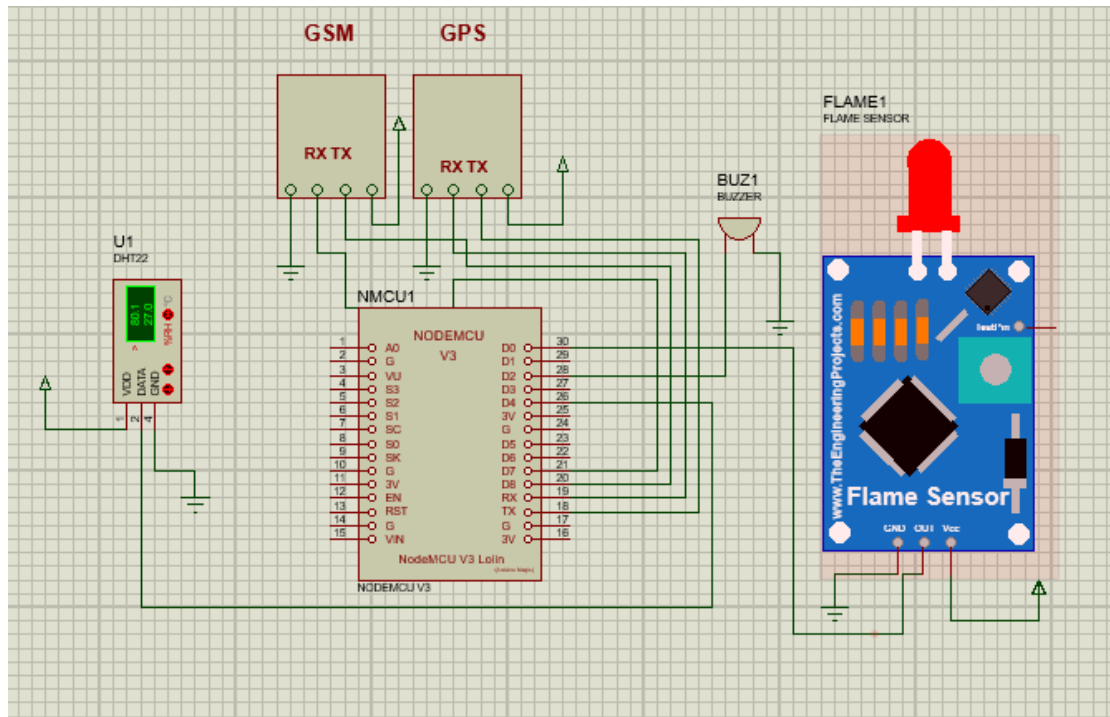


Figure 3.3: Circuit Diagram of Our System

As you can see in the circuit diagram given above, there are no complicated connections. Node MCU, DHT22, fire sensor, GPS is connected with each other so lightly. In the diagram we can see the data pin of dht22 is connecting with D4 pin of node mcu. The pin RX and TX of GPS is connect with then pin of NODE MCU RX and TX accordingly. The one pin of fire sensor is connected with D0 pin of NODE MCU. The Buzzer pin is connected with D2 pin and GND pin is connected to the Vero board. Also all equipment of VCC and GND pin is connected on the Vero board. We can change the wire if some connection not work properly. We can interchange the wire with the components. As a beginner, we use our laptop to power up the Nodemcu module and check the coding, for further process. Then completed all the connections as per the circuit diagram which is already explained. Now it was ready for the programming which is shown in Figure 3.3.

3.4 Requirement Collection and Analysis

The previous discussion already described the similar works from which we had to gather some idea about the requirements. In here it deeply described requirements.

Requirements analysis is an important part of IOT based application requirement analysis is an important part of project management. We know that there are two types of requirements such as functional and other one is nonfunctional. A functional requirement is a process the IOT application how can perform. And Nonfunctional requirements define is behaviors, performance, the efficiency of an IOT application.

To use this system main user which is child use a band that can sense the accident. Then another user have to keep a mobile phone for knowing the location. The actual module model which he has to choose for creating the system which is Arduino Uno and the model is NODE MCU.

When the band make sense that there is danger that will give a danger message with actual location. After getting the message the second user will found the danger location and can save the child. The second user can easily control the whole system.

To develop this control system we needed a development method. To develop this IOT based control system we used the agile development method. This method helped us for making this control system properly. We followed some rules of the agile development method such as requirement analysis, plan, design, development, test, and then release. After release, we tracking and monitoring some of the issues and solving them. We followed this method because we have some unclear requirements. At first, we just planned the voltage regulation with the voltage step button. But this was not so a good implementation. So after that, we decided to make that regulation with a slider that will look smarter than before. After making this slider method we include the cooling system with a value input system which has some button for doing this in the app. So till then, we have unclear requirements. So this is the actual reason for making the whole system step by step which is the agile development method.

3.5 Design Requirements

In this section, we will describe the design requirements of this system which will be hardware requirements and software requirements.

In this system, the hardware requirements are the most essential part of the main implementation of this project. Because of the hardware, we developed the whole system. The hardware requirement list has given below.

Hardware Requirements:

- 1) ESP8266 Node MCU Wi-Fi Module
- 2) Vero Board
- 3) NEO 6M GPS Module
- 4) DHT22 (Temperature and Humidity Sensor module)
- 5) Fire Flame Sensor Module
- 6) SIM800L
- 7) Power Switch
- 8) Buzzer
- 9) Jumper Wires
- 10) Charging Module

In this system, the software requirements are the second most essential part of developing the project. By the software, we designed the system process and its working process. Also, the execution of the project has been designing by the software. The software requirement list has given below:

Software requirements:

- Arduino IDE

In this part we just discussed about the requirement list of the hardware and software requirements. Next we will discuss about the whole system briefly.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-End Design

In previous discussion we described about the requirement of the system and its list. So in this section we will discuss about the all requirements.

4.1.1 Hardware Equipment

In this discussion we are going to discuss about the hardware equipment which will need for making the project prototype.

1. **ESP8266 Node MCU:** Node MCU is an open-source Lua-based firmware and development board with a strong emphasis on Internet of Things (IoT) applications. It includes firmware that responds to sudden spikes in demand for Expressive Systems' ESP8266 Wi-Fi SOC, as well as equipment that relies on the ESP-12 module, as shown in Figure 4.1.



Figure 4.1: ESP8266 Node MCU Wi-Fi Module

2. **Vero Board:** Vero board is a type of strip-board, which is a pre-formed circuit board material consisting of copper strips on an insulating bonded paper board that was produced in the early 1960s. It began as a general-purpose material for use in designing electronic circuits, differing from purpose-designed printed circuit boards (PCBs) in that a regular wiring board, as shown in Figure 4.2 can be used to design a variety of electronic circuits.

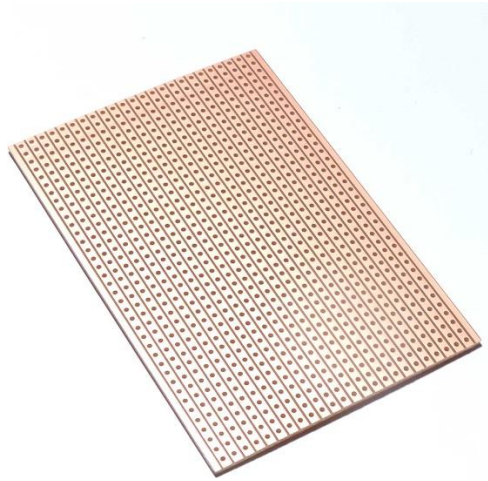


Figure 4.2 Vero Board

3. **NEO 6M GPS Module:** On these modules, the NEO-6M GPS engine is very fine, and it also has a high sensitivity for indoor applications. There's also a rechargeable MS621FE battery for backup and an EEPROM for saving configuration settings. Figure 4.3 shows how the module operates with a DC input in the 3.3- to 5-V range.

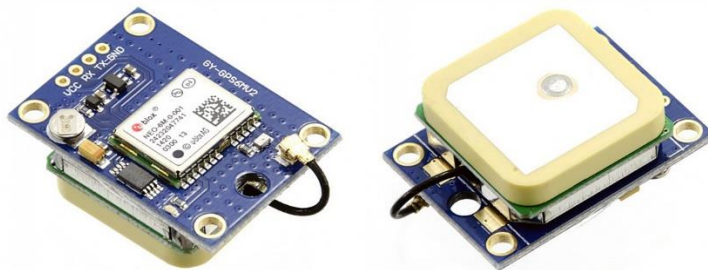


Figure 4.3: NEO 6M GPS Module

4. **DHT22 (Temperature and Humidity Sensor module):** The DHT22 is a simple digital temperature and humidity sensor with a low price tag. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal on the data pin (no analog input pins needed). It's easy to use, but data collection necessitates careful scheduling. The sensor has a temperature range of -40°C to 80°C and a humidity range of 0% to 100%, with an accuracy of 1°C and 1%, as shown in Figure 4.4.

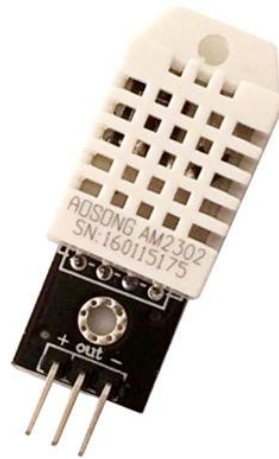


Figure 4.4: DHT22

5. **Fire Flame Sensor Module:** A flame detector is a sensor that detects the presence of a flame or fire and reacts accordingly. Depending on the installation, responses to a detected flame can include sounding an alarm, deactivating a fuel line, and triggering a fire suppression device. The main purpose of this is to verify whether or not the boiler is operating properly. Because of the mechanism used to detect the flame (shown in Figure 4.5) the response of these sensors is quicker and more precise than that of a heat/smoke detector.

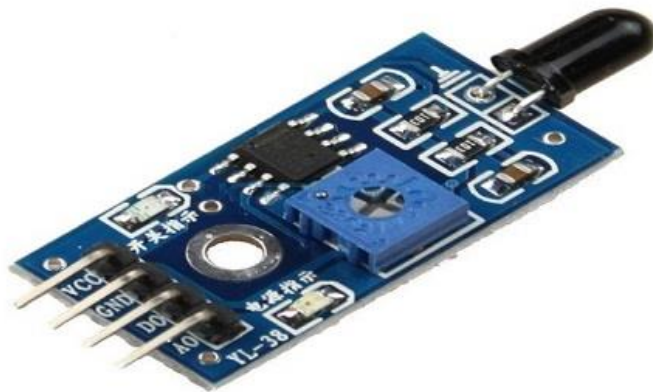


Figure 4.5: Fire Flame Sensor Module

6. **SIM800L:** The SIM800L is a small cellular module that can send and receive GPRS data, send and receive SMS, and make and receive voice calls. This module's low cost, small footprint, and quad band frequency support make it an ideal choice for any project requiring long-range connectivity. After connecting

power module boots up, searches for cellular network and login automatically which is shown in Figure 4.6.

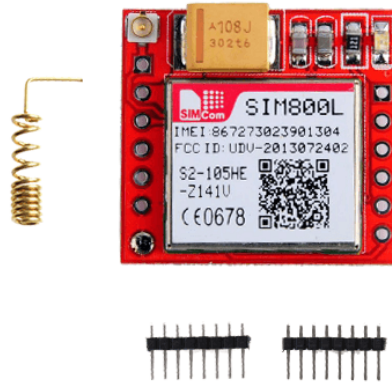


Figure 4.6: SIM800L

7. **Mini Power Switch:** A Power Switch connects a voltage source or ground to a heap with an electrical connection. It conserves energy across multiple voltage rails and protects subsystems from damage. It also provides improved segment assurance, inrush current insurance, and restricts the size of the printed-circuit board (PCB), as shown in Figure 4.7.



Figure 4.7: Mini Power Switch

8. **Buzzer:** A signal, also known as a beeper, is a sound-generating system. Chimes and beepers are commonly used to combine warning systems, timekeepers, and

assertion of customer data, such as a mouse click or keystroke. This system is primarily used to receive notification notifications, as shown in Figure 4.8.



Figure 4.8: Buzzer

- 9. Jumper Wires:** A jumper wire is mostly a wire which is electrical. These wires are used to make small project works. These wires have pins for easy use and anyone can use these wires on a breadboard. Also, these have more alternative usage which is shown in Figure 4.9.



Figure 4.9: Jumper Wires

- 10. Charging Module:** The module can charge a single lithium battery or multiple lithium batteries in parallel, and the charging port can be powered by a USB port. It works with 18650 cells as well as other 3.7V batteries. It guards against overcharging and discharging the battery. A USB cable can be used to link it to any USB port. The max output current of the module is 1A which is shown in Figure 4.10.

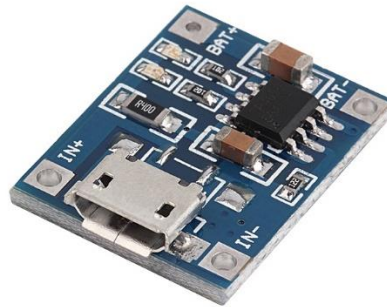


Figure 4.10: Charging Module

4.1.1.1 NODE MCU Architecture and Comparison

In this section we are going to discuss about the architecture and documentation of NODE MCU. We can have a look the architecture of NODE MCU.

MCU - ESP8266 has been chosen as the regulator for this framework because of its reduced size, similarity, simple interfacing of more than a few different kinds of regulators including (PIC which is Programmable Integrated Circuit), (PLC which is Programmable Logic Controller), and others which is shown in Figure 4.11.

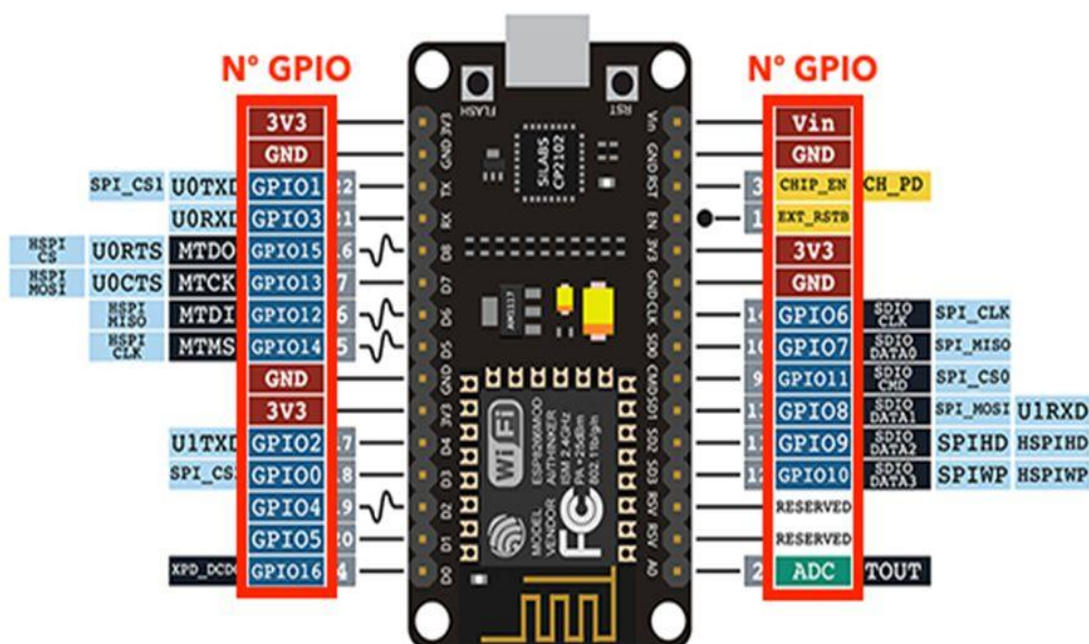


Figure 4.11: Architecture of NODE MCU

ESP8266 is an open-source firmware that is based on top of the chip maker's exclusive SDK. The firmware gives a basic programming climate, which is an exceptionally straightforward and quick scripting language. The ESP8266 chip joins on a standard circuit board. The board has an underlying USB port that is now wired up with the chip, an equipment reset button, Wi-Fi radio wire, LED lights, and standard-sized GPIO (General Purpose Input Output) sticks that can plug into a breadboard. It has a Processor called the L106 32bit RISC chip center dependent on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz and has a memory of 32 Kbit guidance RAM, 32 Kbit guidance reserve RAM, 80 Kbit client information RAM & 16 Kbit ETS framework information RAM. It has an inbuilt Wi-Fi module of IEEE 802.11 b/g/n Wi-Fi.

Also, we can take a look in a data table where we can find a major difference in comparison between many types of communication modules which is shown in Table 4.1.

Table 4.1: Many types of communication module comparison

All Technology	Module IEEE Standard	Module Network Topology	Module Maximum Power Consumption (in mW)	Module Data Rate	Module Maximum Range (in meter)	Module Cost
Bluetooth	802.15.1	One to Many Network	About 100mW	Between 1-3Mbps	About 10m	Medium Cost
Zigbee	802.14.5	Cluster, Mesh and Star Network	About 3mW	Between 20-250Kbps	About 100m	High Cost
Esp8266	802.11	Mesh and Star Network	About 100mW	Between 1-11Mbps	About 150m	Low Cost

From Table 4.1, it is seen that Esp8266 deals with the 802.11 b/g/n conventions while Zigbee utilizes the 802.14.5 convention. Zigbee devours minimal force as 3mW through Wi-Fi and Bluetooth burns-through almost 100mW. In any case, in the event

that we analyze the speed of Esp8266 has a greatest accelerate to 11mbps yet Zigbee has just 250kbps. Plainly, esp8266 vanquished Zigbee and Bluetooth in expense as well as in speed.

4.1.1.2 NEO 6M GPS PIN Architecture

In Figure 4.12. NEO-6M GPS modules is a good one and well performing GPS receiver that is built with patch antenna it has strong capability for satellite search. The chip from U-blox can track highest level of sensitivity. In this module there is led which point out the status of fix position. Its blinking status explain what status it is ,like- if it is no blink that mean it search for satellites and if it is blinking every 1s that mean position fix is found. The module is built in EEPROM to save configuration parameter data. It has signal indicator lights and data backup battery. The battery take automatically charged when power is applied and it keeps data for up to two weeks without power. Power supply: 3-5V; Default baud rate: 9600bps. The module supports baud rates ranging from 4800bps to 230400bps, with 9600 being the default. The NEO-6M GPS module has total 4 pins for connected to the outside.

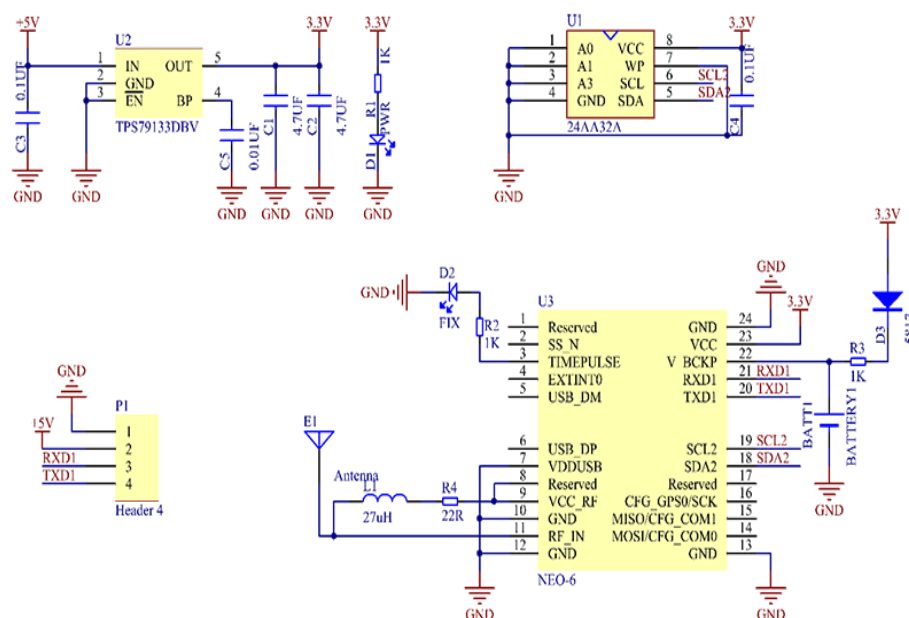


Figure 4.12: NEO 6M GPS PIN Architecture

GND is the Ground Pin and needs to be connected to GND pin on the board. TXD (Transmitter) pin is used for serial communication. RXD (Receiver) pin is also used for serial communication. VCC supplies power for the module. So we can directly connect it to the 5V pin on the Arduino.

4.1.2 Software Requirement

In this discussion we are going to discuss about the software requirements which will need for making the main interaction of both hardware and software of this project.

1. **Arduino IDE:** Arduino IDE stands for Arduino Integrated Development Environment or it's a software that has an amazing code composing feature and many more toolbar for designing code for IOT projects. These codes are mostly useful for the connection between the hardware and software of the projects. It's supported on Windows, Mac OS, and Linux. Supported languages are C, Java, and C++. We designed our project with C language. We can take a look the interface of ARDUINO IDE in Figure 4.13.



Figure 4.13: Arduino IDE interface

4.2 Back-End Development

In our system we did not use any app application so we don't have any back end development in our project we use only text messaging system which can give the warning message with location.

4.3 Interaction Design and UX

Interaction Design is a technique via using that developers are designing their apps and systems interface more user friendly. Interaction Design has many types that can easily find. Which is Visual portrayal, Words, Time, and conduct. In this system, we have tried our best to build it with the above Interaction. Below we described various types of Interaction.

Visual representation is an important part of any apps and system. Basically we want a smooth interface of its own. In the user interface we displayed a text with location which is helpful for any user to use this system.

In the event of a fire or water users receive a text message notifying them about the fire and water situation and send with location in the text which is shown in Figure 4.14

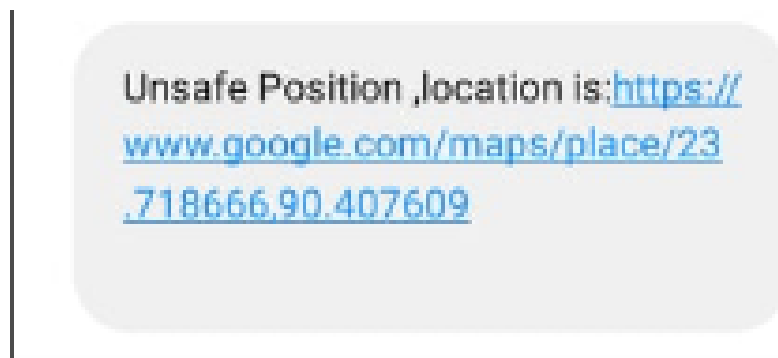


Figure 4.14: Text Message

By means of utilizing this framework, any client can improve the client experience. And get good behavior from the system.

UX or User experience is a big part of any system. We ran some surveys in online and

Real-life and get feedback from them about their user experience from these types of systems which is made before. After that, we ran some tests by many common people. They had the best experience of using this system which is so smooth and comfortable.

4.4 Implementation Requirement

In a previous discussion, I mentioned this project is an IOT based system. To build this project. We used C language to design the system architecture. We compose a code in Arduino IDE. By following this code our whole project is work. At first, we need something hot things then sensor can sensed and it makes a sound with buzzer. After finishing the sound it will track GPS and give a SMS via mobile. More we need the logical all condition implementing code which will work behind the system. The main implementation will need the hardware equipment with a good arrangement which will make the implementation look so smarter.

CHAPTER 5

TESTING AND RESULT DISCUSSION

5.1 Installation Arduino IDE

In this part first we explained about the installation of Arduino. After installing ide icon will displayed on the screen. Then by clicking on the icon it will open the Arduino window. Which is shown in Figure 5.1.

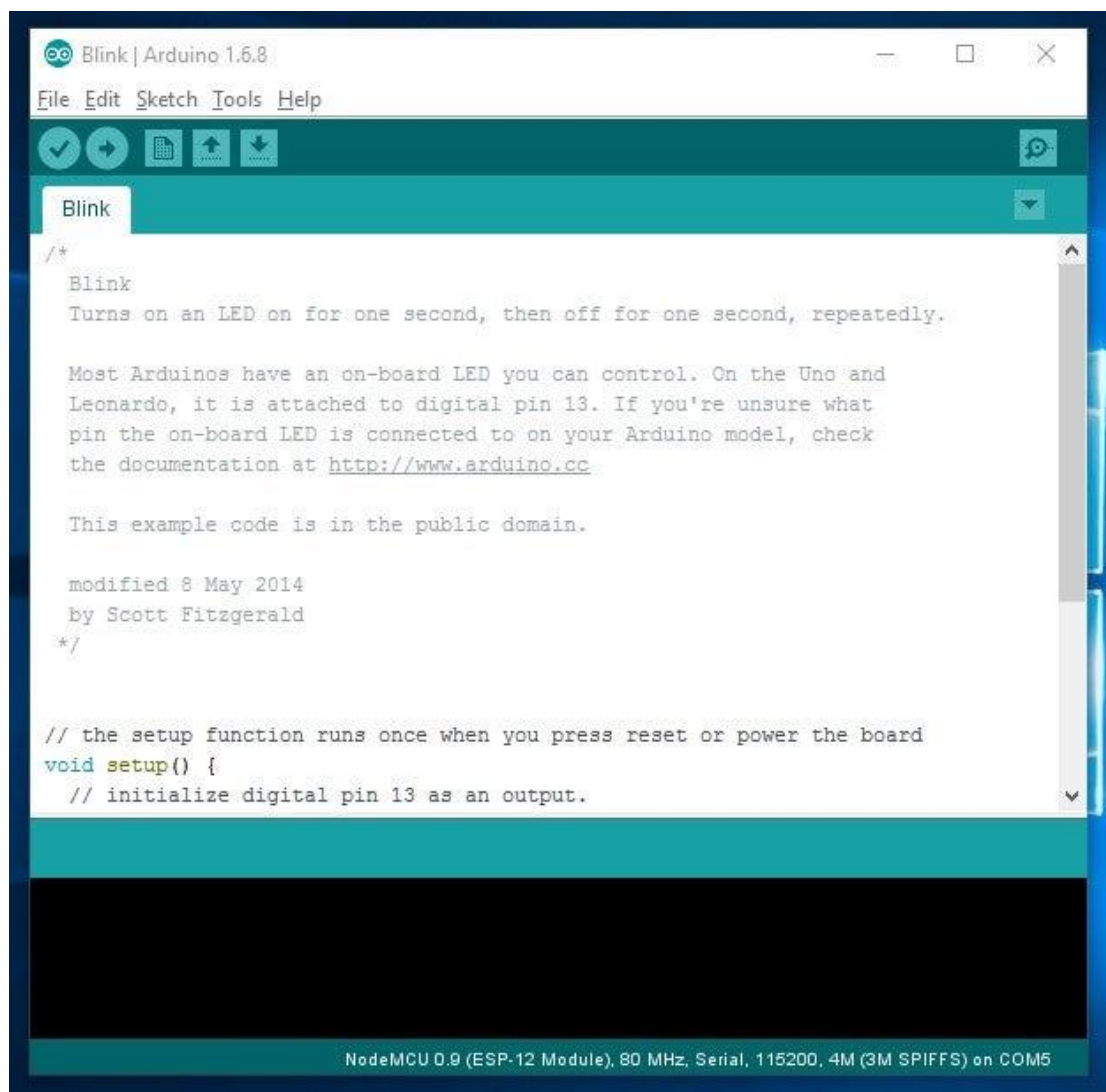


Figure 5.1: Opening Arduino IDE

Then open the file and click on the preference. Now open the tools in that select **board** and click on the **Boards manager** which is shown in Figure 5.2.

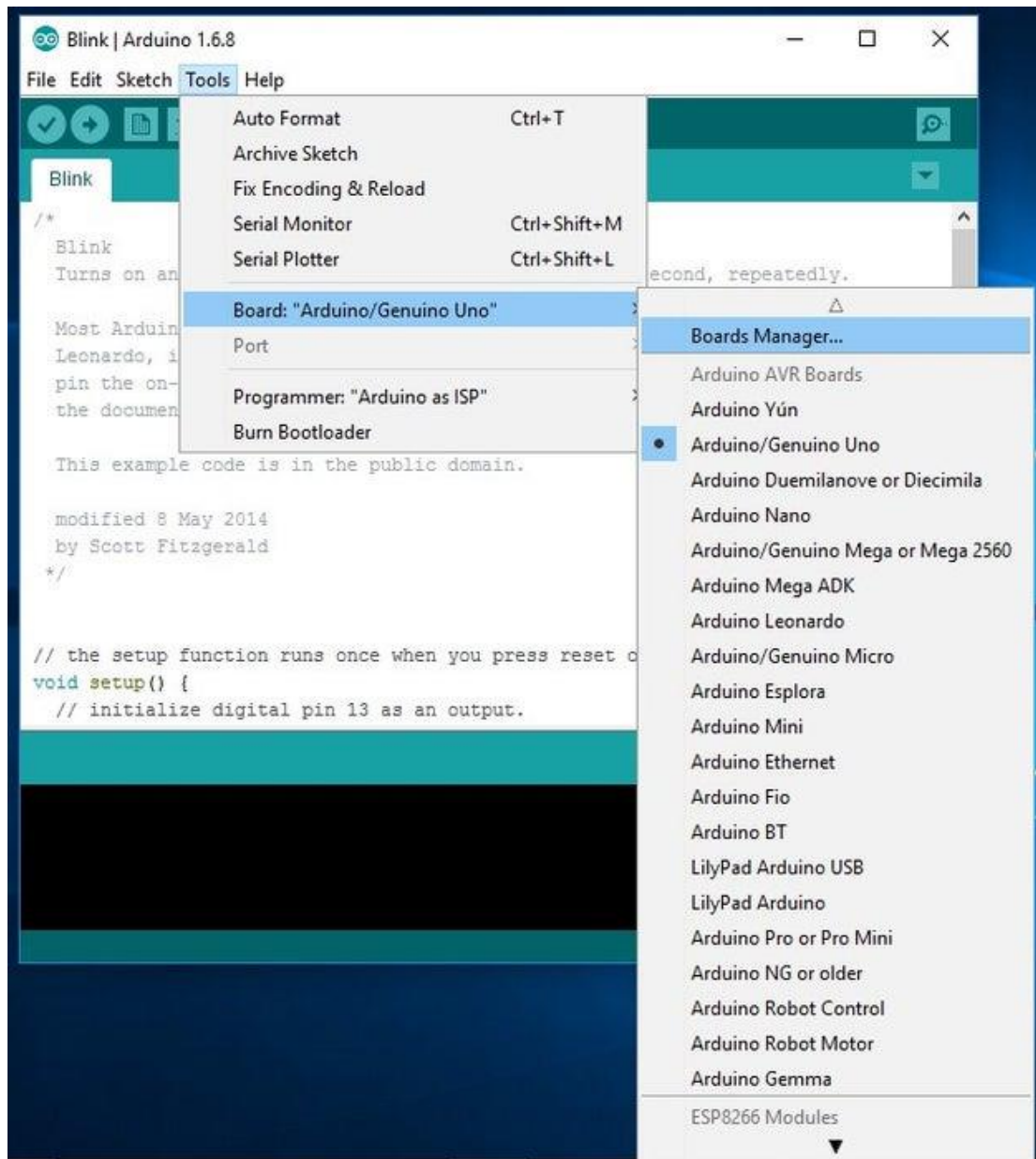


Figure 5.2: Selecting Board

After boards manager window opens, the page to bottom will see the module with the name ESP8266. Then click on install button When it is installed it shows Installed in the module as shown in the figure and then close the window shown in Figure 5.3.

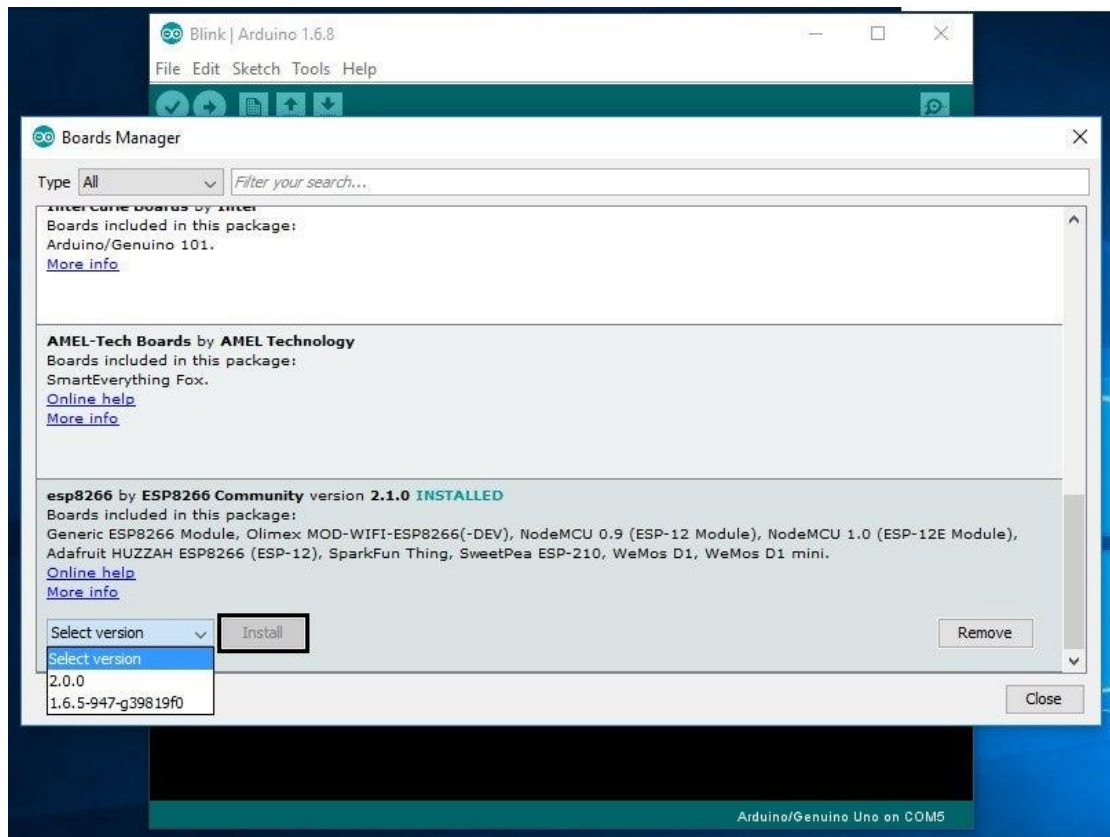


Figure 5.3: ESP8266 Board Package

Select the Board: “Arduino/Genuino Uno” and then NodeMCU 1.0 (ESP-12E Module) or another ESP8266 to operate the ESP8266 with Arduino.. Then connecting the ESP8266 module in the computer through USB cable as shown the Figure 5.4.



Figure 5.4: Connecting ESP8266 to the PC

At last we have to add the libraries to the Arduino.

5.2 Fire Sensor Test

In this part we will discuss about the fire sensor input test. How our system temperature sensor is receive the temperature in time gap and changes.

A temperature sensor is a circuit that is integrated and works in the range between 4V to 20V DC. It has precision for a one-Celsius degree at 10m V and impedance low output 1mA at 0.1 ohms. So its model is LM35. It's a built-in TO-92 package that has three pins VCC, output, and ground. We can look at the pin's output in Figure 5.5.

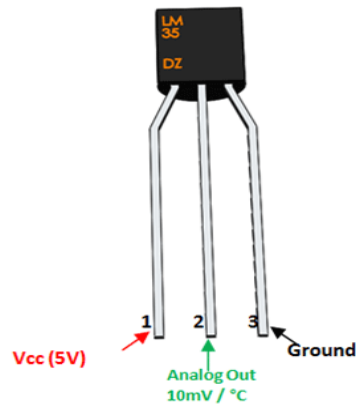


Figure 5.5: Temperature Sensor PIN Output

Temperature Sensor testing is done by measuring the records of changes in temperature every minute. When the system is turned on it shows its default value temperature. If the internet connection has a bad signal it's also hampered its performance. So we can manually set the temperature in several minutes of testing with a temperature sensor. A sample of time and temperature changes is shown in Table 5.1.

Table 5.1: Temperature Changing with Time

Minute	Current Temperature
1	24°C
2	25°C
3	25°C
4	26°C
5	25°C
6	24°C
7	25°C
8	26°C
9	25°C
10	25°C

5.3 Water Humidity Sensor Test

In this part we will discuss about the fire sensor input test. How our system temperature sensor is receive the temperature in time gap and changes During conversion, a humidity sensor is a circuit that is integrated and operates in the range of 3 to 5V power and I/O 2.5mA max current usage (while requesting data) With a 2-5 percent accuracy, it can measure humidity from 0 to 100%. Temperature readings from -40 to 80°C are accurate to within 0.5°C. A sampling rate of no more than 0.5 Hz is needed (once every 2 seconds) Scale of body: 27mm x 59mm x 13.5mm (1.05" x 2.32" x 0.53") 4 pins, 0.1" spacing Weight: 2.4g. Which is shown in Figure 5.6.

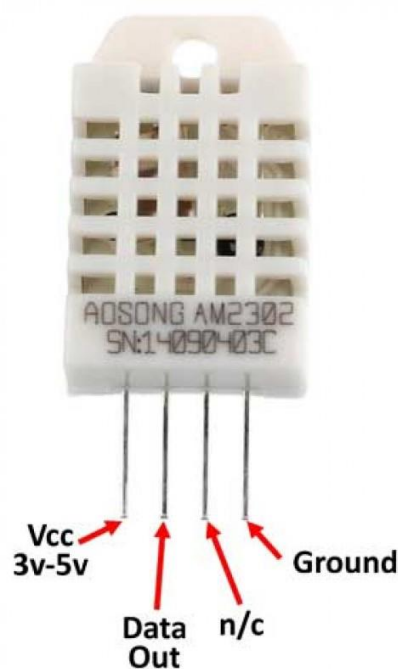


Figure 5.6: Humidity Sensor PIN Output

If the internet connection again have a bad signal it's also hampered its performance. So we can manually set the temperature in several minutes of testing with a temperature sensor. A sample of time and humidity changes is shown in Table 5.2.

Table 5.2: Humidity Changing with Time

Minute	First Value	Current value
1	78	82
2	81	83
3	85	87
4	90	93
5	92	94

5.4 Final Project Demonstration Step by Step

In this part we have discussed about the whole project demonstration how the project run and how it gives the output as the user input.

At first our project will in a normal situation when its turn off. So we can see the status in Figure 5.7.

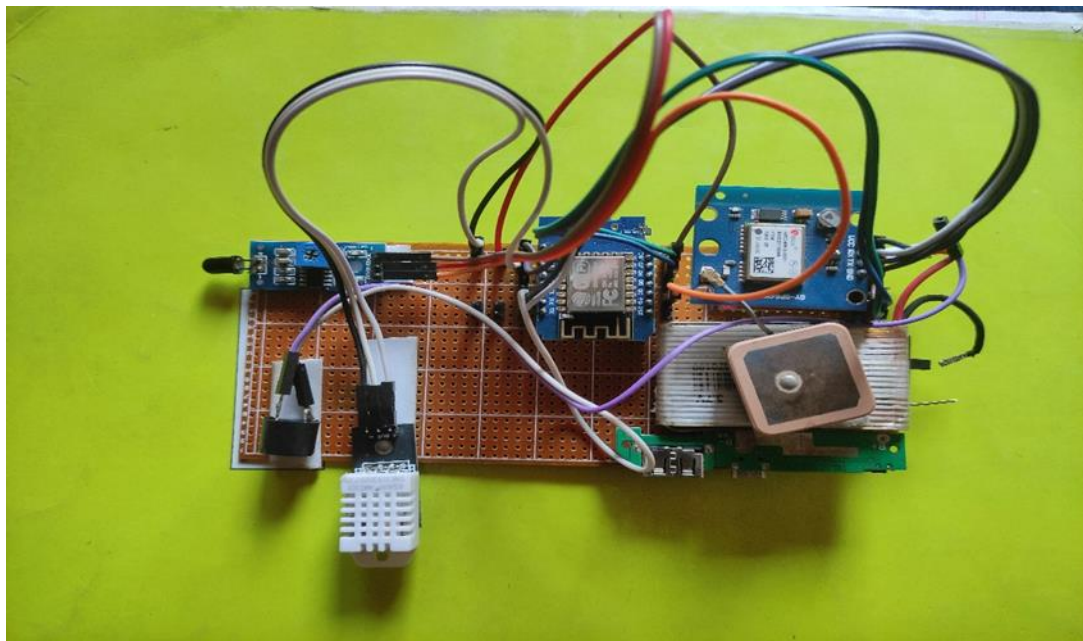


Figure 5.7: Physical Project View

When we turn on switch in the system it will display the blinking of red light in every 1s which we can see in Figure 5.8.

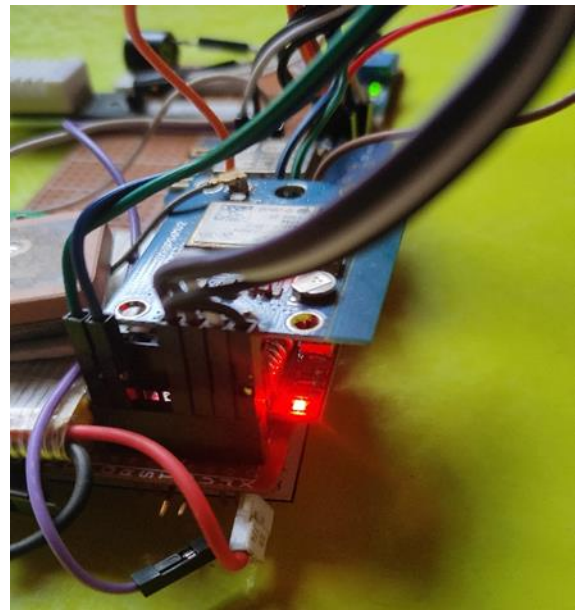


Figure 5.8: Switch on and blinking the red light

After 20 times blinking of red light the wi-fi module is connect with internet connection and also connect with wi-fi module then it shows blinking with yellow light which we can see in Figure 5.9.

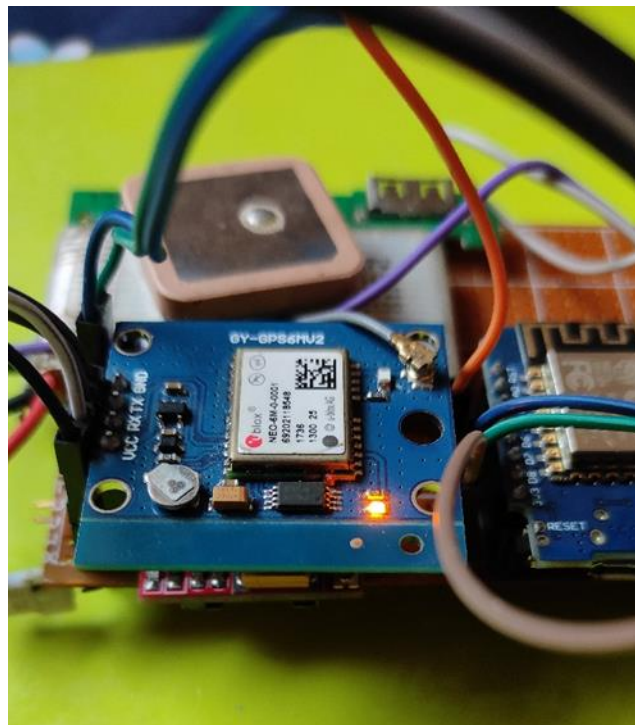


Figure 5.9: Showing yellow light on the GPS module

Then if we take an object around the fire or water humidity sensor it will sense the thing which is shown in Figure 5.10.

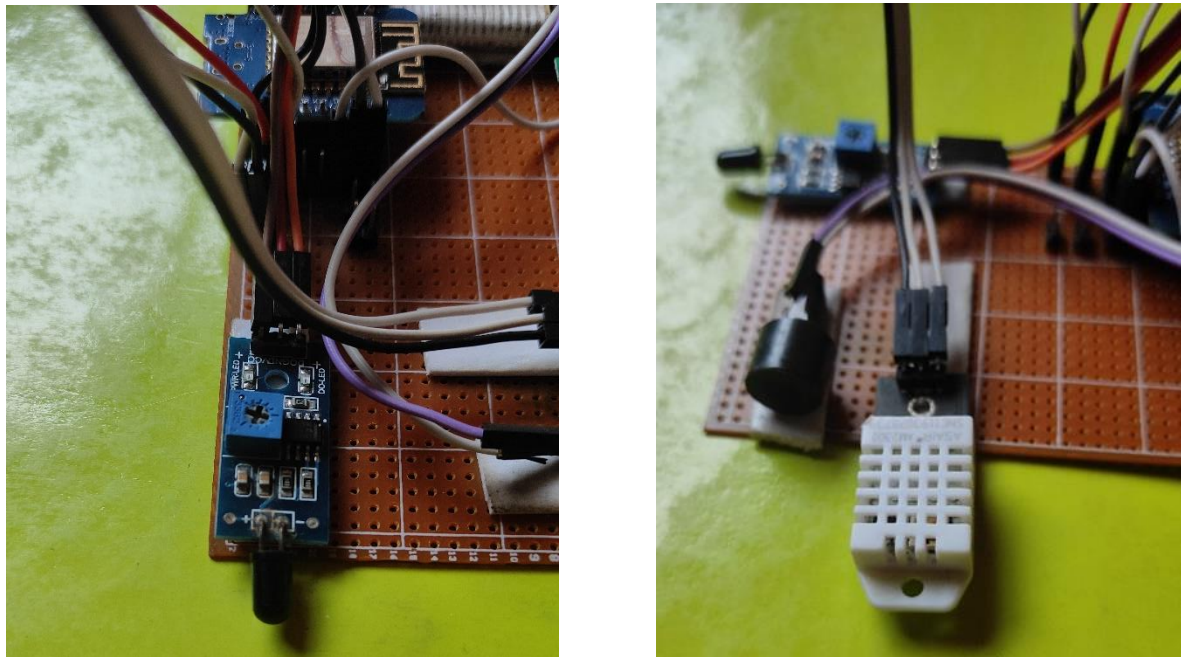


Figure 5.10: Fire and water sensor

After sensing the object the buzzer will make sound for few seconds, then finishing the sound instant it will give a SMS to the user which is shown in figure 5.11.

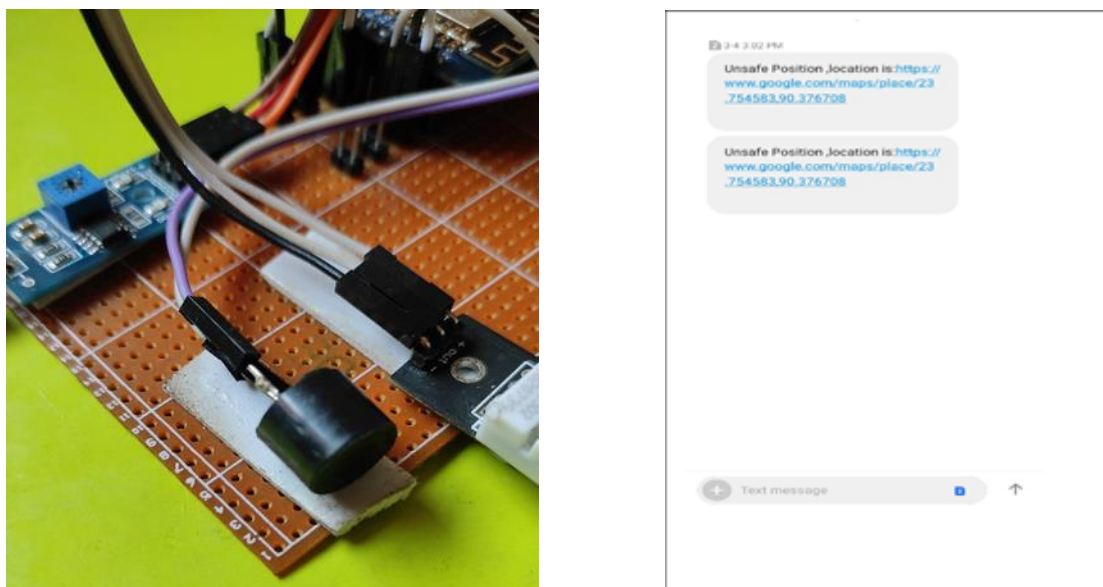


Figure 5.11: Get notification SMS through buzzer

After receiving the SMS of our project we need to click the URL to see the location of the child. Which is shown in figure 5.12.

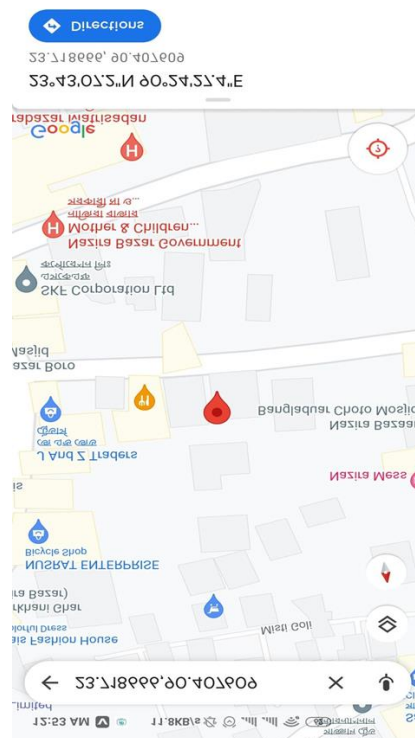


Figure 5.12: Tracking location

5.5 Final System Analysis and Result

From testing the whole system continuously we have faced a great output with quick response. This faster system can be easily installed with any focused area where we will need the automation system. Comparison of the previous work we can say we have to make a good system with our hard work as we have no previous professional knowledge about this work. Also, we have a very small team of work by which we suffered many problems to make this project. Our main focused was to use the Node MCU and GPS module hardware which is so important at this time for making good projects. So we have successfully worked our hundred percent and get success. Because we have tested our project several times with several types of area. So everyone has appreciated our work that it's very useful and very easy to operate. Also, the analysis of the project and the result have very much good as we planned.

CHAPTER 6

CONCLUSION AND FUTURE DEVELOPMENT

6.1 Advantages

In this section we want to discuss about the advantage of our development project:

1. It is easy to use for child and parents, because the device interface are very simple and easy to grab for its small size.
2. It will save children's life by alerting parents that children's are in danger position which can causes death.
3. It will reduce child death rate.

6.2 Limitations

In this section we want to discuss about the limitations of our development project:

1. Depending on the situation that device sometime would not be able to work efficiently.
2. It will completely depending on the internet connection.
3. The battery need to be chargeable every time that it can be worked in emergency situation.
4. The GPS tracker need to be performed effectively. Otherwise it will not show the exact location.

6.3 Future work

The proposed system can be enhanced via

1. Reshaping the device into smart wristband.
2. Making notification alerts for the over-temperature situation.
3. Adding an alternative power supply for continuous working.
4. Making a safety system for the device by installing a camera for visualizing.
5. Develop the system with more clean and compact work for business purposes for getting a great market value that majority of people can buy it.

6.4 Conclusion

Interconnected Internet-of-Things devices are making everyday life safer, healthier, and more effective. We assume that technologies such as S.A.F.E. will help with this transition. The having fact of a fire may be sufficient to help minimize child deaths as a result of fires, and it may motivate people to pay more attention to their children.

The proposed project's goal is to prevent drowning in rivers and lakes. The concept focuses on saving children under the age of five who are on the risk of dying while droning to the pond. With a higher response time, combining the sensor and controller with the recovery set would be extremely beneficial. Since the model was implemented on basic hardware, the proposed work's response time can be as fast as a minute. The project is helping in the saving of children's lives, while other methods are only used for forecasting.

Finally, our proposed system was capable of achieving its primary objective. Building and IoT-based water and fire alarm systems were the most popular. It is capable of detecting the presence of fire and sensing the water humidity before to any kind of danger situation, and it can send an SMS alert to the user. Instead of relying on a power supply, the sensing nodes may focus on a rechargeable battery source. One of the project's main goals was to show that smart fire evacuation can be accomplished with well-developed, low-cost, and well-understood technologies like those described. The prototype successfully demonstrated this claim on a small scale while this is far from a complete implementation, it provides a clear idea of how a larger, more practical system might work. We hope that in the future, scientific and engineering communities will investigate and test innovations like these in order to create a more suitable fire protection system.

REFERENCES

- [1] T. Perumal, M. N. Sulaiman, C. Y. Leong in 2015 IEEE 4th Global Conference on Consumer Electronics (GCCE), IEEE, 2015, pp. 86– 87.
- [2] A. Mahgoub, N. Tarrad, R. Elsherif, A. Al-Ali, L. Ismail in 2019 Third World Conference on Smart Trends in Systems Security and Sustainability (WorldS4), IEEE, 2019, pp. 162–166.
- [3] Children in flood-affected areas constitute most drowning deaths, available at << <https://www.dhakatribune.com/bangladesh/nation/2020/07/29/children-in-flood-affected-areas-constitute-most-of-all-drowning-deaths>>>, last accessed on 18.03.2021 at 10:25 AM.
- [4] Epidemiology of childhood burn: yield of largest community based injury survey in Bangladesh, available at << <https://pubmed.ncbi.nlm.nih.gov/18242869/>>>, last accessed on 24.03.2021 at 12:25 PM.
- [5] Epidemiolog of Drowning in Bangladesh, available at<<<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5451939/>>>, last accessed on 28.03.2021 at 7:45 PM.
- [6] S. Majumder, S. O’Neil, R. Kennedy in 2017 IEEE MIT Undergraduate Research Technology Conference (URTC), IEEE, 2017, pp. 1– 4.
- [7] R. K. Kodali, S. Yerroju in 2017 3rd International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), IEEE, 2017, pp. 194–199.
- [8] A. Alotaibi, “Automated and Intelligent System for Monitoring Swimming Pool Safety Based on the IoT and Transfer Learning”, Electronics 2020, 9, 2082.
- [9] M. R. MS, M. Ali, S. Ali, M. Kamaludin, et al., “An Early Drowning Detection System for Internet of Things (IoT) Applications.”, Telkomnika 2018, 16.
- [10] F. Z. N. Anhar, Z. Ayop, I. Roslan, S. Anawar, N. F. Othman, N. Harum, “Developing Child Drowning Alert Prototype System using IoT PPG Sensor.

Appendix

Appendix: Project Arduino IDE Code Documentation Reflection

This is the documentation of Arduino code. We will need to install the proper library for doing this code section. After that we have to follow the format of code. So by following the code format we can design our desire code in Arduino IDE and upload it in NODE MCU.

This example runs directly on NodeMCU.

Note: This requires the ESP8266 support package:

<https://github.com/esp8266/Arduino>

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include <Wire.h>
#include <ESP8266WiFi.h>
void displayInfo()
{
  Serial.print(F("Location: "));
  if (gps.location.isValid())
  {
    latt = (gps.location.lat());
    Serial.print(latt);
    Serial.print(F(", "));
    lann = (gps.location.lng());
    Serial.print(lann);
  }
  else
  {
    Serial.print(F("INVALID"));
  }
  Serial.println();
}
```

IoT Based Child Safety Locator from Water and Fire

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