IoT FIRE BOT

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "IoT Fire Bot", submitted by Showvik Datta Rudro, ID No: 183-15-2314 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 approved as to its style and contents. The presentation has been held on 04/02/2023

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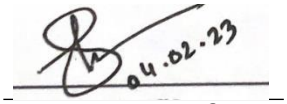

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I hereby declare that , this project has been done by us under the supervision of **Dr.S.M. Aminul Haque**, **Associate professor ,Department of CSE,** Daffodil International University.I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Finally, I must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

This paper describes the look of a "IoT Fire Bot". It will provide inflated flexibility in building vogue and increase the amount of fireside safety. Fire is a very necessary thing but when it gets out of control it can become dangerous,Many accidents happen around us due to fire,Many people become helpless due to fire,My project will help control the fire,which can save many lives,properties and also can save our very important times.Firefighting is a very important and dangerous job. A fire-fighter is in a position to extinguish fires quickly, avoid injury and minimize injury. Technology is joined to the gap between heat fighting and machine exploitation in many ways. the target of this project is to ascertain a system that may observe hearth in an exceedingly short amount of your time and extinguish it subject to a couple of unjust factors. during this case, the system aims to extend the security of homes, laboratories, offices, factories and buildings that are unit vital to human life by conclusion fires before they unfold. I even have developed an associate intelligent sensing element and camera system security system with a hearth conclusion system.I implement some malicious programs only to extinguish the fire. This system can recognize unusual and danger and alert us this document outlines the requirements, circumstances,issues, fixes, and future plans for the firefighting system's design. First, we create a system with an extinguisher that involves a structure, an obstruction to avoid,Fire detection, software development, and other things. We use a few computer software that just looks for fire. We put the mechanism into place, and if the fire accident is real, the fire Using the suggested strategy, an extinguisher system may identify the fire source and go to extinguisher to put out the fire utilizing the fire source.

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CHAPTER 1

INTRODUCTION

Fires have caused many deaths around the world. Many buildings has no fire detectors due to cost. The outdate detectors that are included into the gadgets make them unreliable due to false alerts, and the ones that are dependable cost a lot of money, so people tend to steer clear of them. On the wall are fixed fire detection sensors. The usage of fire detection modules in many households is not particularly practical. In the essay, I create a fire detection system for a fire extinguisher system.

1.1 Importance of Fire Helper System :

Safety of life

Automated fireplace extinction systems area unit the foremost effective means that of fireplace management. Properly put in, this method will be an awfully effective safeguard against loss of life and property .According to a report by the U.S. fireplace Administrations, forty six building and hotel ,fires area unit due to cookery,by electrical faults and heating every inflicting a further seven of fires. These fires primarily occur between 9 p.m. to 12 p.m. whereas seventy three gift of fires area unit confined to the purpose of origin, eighteen gift area unit confined to the area of origin and therefore the remaining nine gift extend on the far side the area of origin .With seventy three of those fires contained to the purpose of origin, it is easy to envision the completely essential role fire extinguisher play keep building safe. Extrapolating from distinguished studies, it indicates that quite twenty fireplaces area unit place out by fire extinguishers in hotels on a daily basis. However area unit risky once used on combustible liquid or cookery. Often a device to own within the room and front room, particularly if you're a smoker, however it will not helpful for the room.

Important materials safety:

All necessary documents, papers and alternative necessary materials get burnt because of fire in offices and academic establishments. Our system will stop these vital parts from burning by termination the fireplace.

Protection of Environment:

Fire Helper play an important role to controlling the situation by controlling the very primary determinants of fire.

Fig:1.1 Protection of Enviroment

Contrast with existing systems

I developed Fire-Helper, an IoT-based robot to rescue people from fires, more realistic in terms of its construction, price, and activity. Compared to other methods now in Bangladesh, this one is far more practical. In addition, it has a cheaper production cost than comparable products and the capacity to put out fires at their root causes, minimizing damage. We can observe that the substances employed as fireplace extinguishers, such as carbon dioxide, volatilized liquid, moist material, etc., are extremely expensive. We frequently find that not all materials can be used as extinguishers. because the appropriate materials to employ vary on the type of fireplace. Our system is equally efficient and time-consuming.

Damage Statistics

The damage statistics all over the world due to fire occurrence we can see a lot.

In Bangladesh

The area is especially susceptible to fires in massive urban centers. because of speedy unplanned urbanization and absence of adequate security.

Measures within the town system, capital of Bangladesh town is seriously facing this hazard at the moment. At present, capital of Bangladesh is serving the role of a metropolis with over forty four million(2022) individuals and conjointly serving the role of the urban center for 164.7 countless Bangladeshis (2020).

Dhaka is the most populous city, but it also leads in terms of economy, trade, commerce, and administrative infrastructure. The municipal amenities of Dhaka city have not yet been created in a proportionate way to the city's growing urbanization. One such phenomenon that currently results in significant economic loss as well as the tragedy of human death on a regular basis is fire risk. There were 7140, 7135, and 9642 reported fire incidents across Bangladesh from 2004 to 2006, compared to 803, 984, and 1161 incidents in Dhaka City, respectively.

Dhaka city saw 12% of the nation's fire accidents in 2006, compared to 13.79% and 11.2% in 2005 and 2004 respectively (BFSCDA, 2007). In addition to human fatalities and injuries, the annual average cost of property damage caused by fire accidents in Dhaka city was estimated to be more than Tk. 6 crore (Sayeed Uzzaman, 1990). However, as of right now, this number has significantly increased. The official record of the BFSCDA states that the financial loss as a result of fire incidents in Dhaka City was Tk. 48 crore in 2007, Tk. 80 crore in 2006, and Tk. 52 billion in 2005. Given that Dhaka City has the biggest concentration of economic activity in Bangladesh's urban areas, the annual monetary damage from fire accidents there is very substantial.

Fig:1.2- Firefighters in Savar

Fig:1.3- After a terrible fire at Aswad Composite Mills, a production hall was damaged,at Mauna

1.2 Motivation

According to the National fireplace Protection Association, there have been 29,130 injuries reportable where fighting with fire in 2015. These injuries also are including sixty eight on-duty deaths.The present fire ending system is functioning in keeping with our desires however we have a tendency to wished to determine an innovative plan and create a lot of possible and reliable system.

1.3 Objectives

1.To design easy use and simple firefighting system.
2. To design and implement cheap fire extinguish system.
3. To detect the fire and its location.
4. Easy to use.

1.4 Expected Outcomes

1.Automatically detect fire and spray water.
2.Required less money for this robot.
3.Due to small size, it can use for home safety.
4.This robot can carry very easily.
5.Robot also can carry water tank.

1.5 Report Layout

My project is divided by 2 parts–

1.Mobile Application

2.Hardware

Chapter 1: The project's introduction, goal, and expected outcomes have all been covered very first.

Chapter 2: This chapter shows background process **.**

Chapter 3: This chapter shows the Requirement items.

Chapter 4: In this chapter I discuss about Further Development.

Chapter 5: In this chapter I discuss about the cost and safety.

Chapter 6: In this chapter I discuss about the impact on the socity

Chapter 7: In this chapter I discuss about the Conclusion.

CHAPTER 2

BACKGROUND

2.1 Preliminaries/Terminologies

I try to make this robot with modern Technology ,I have tried to make the entire project responsive so that it can be used on any device and is very userfriendly.

2.2 Related Works

1. Daffodil Website
2. Brac University Website
3. Oxford University Website

2.3 Comparative Analysis

Athors of 01 have made a IOT base fire fighting robot, their robot can send a fire alert to the cloud which can be viewed through an android application and can show live steam to its users, also can release carbon offsets with sensors or extinguish fires with water.[1]

Athors of 02 have made "Monitoring and Controlling of Fire Fighthing Robot using IoT"

Their mechanism can detects and extinguishes the fireplace, it uses the flame device for detection, and also the extinguisher is employed to extinguish the detected hearth. The mechanism will rotate whereas actively scanning for the fireplace, this scanning is performed by the sensors placed on the perimeters,when the fireplace is detected, the mechanism will move within the direction of the fireplace and it stops ahead of it and trigger the asphyxiator to show out the fireplace.cts and extinguishes the fire. [2]

A remote-controlled robot that fights fires.The development of some distance has been successful. It has the capacity to locate a fire.In addition to having a small body and being lightweight structure. QRob is also capable of avoiding collisions with any owing to the supply of an obstruction or surrounding items The QRob robot may be

employed at a location that has an ultrasonic sensor.has a tiny entrance or fits in tiny areas because small design. The user may put out fires by utilizing operators can also use a longer-range remote control keep an eye on the environment while performing putting out a fire using the camera attached to the smartphone. Finally, it can be said that the project "Development of Fire Fighting Robot (QRob)" has succeeded in its goal. [3]

Their Firefighting robots are part of the house and building's security system.58 Applications of Mechatronic Systems security system, television, PC with remote control, GSM technology, wireless RF controller,Appliance control and security are both modular. The primary in charge of fire fighting Industry personal computer robot (IPC). they give command for the mobile robot to be controlled.to gather sensor data and use Visual Basic to program the remotely monitored system. The Robot may access wireless RS232 interface to acquire security data and create a generic user interface on the firefighting robot's control computer. In the findings of the experiment,Through a wireless RF controller and monitored computer, the user may operate the mobile robot.

and distantly supervised computation.[4]

Their outcome indicates that Using the embedded technology, efficiency is really increased system. These most recent platforms, which are all digital,Instruments will improve control flexibility,enable for expansion and operation; embed intelligence, in essence, promotes the adaptability of instruments, and ultimately provide the clients with enhanced services, dependability, and convenience. This essay illustrates the key characteristics and capabilities of the various detailing the ideas that may be applied in this area through several categories. Since this early work is unable to anything that falls under the planned structure and goal,It will need additional research and development work to completely collaborative effort to put the suggested framework into action of different entities. [5]

2.4 Scope Of The Problem

There has many complications in robotics world, but most of the Fire extinguisher robot is not perfect at work,My IoT Fire Bot will solve the drawback that others robot can solve that.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

We can see that it can detect fire automatically and it also has a camera which makes it work more perfectly.But it gives incorrect information in direct sunlight so it is not usable outdoors,It is for Indoor use only.

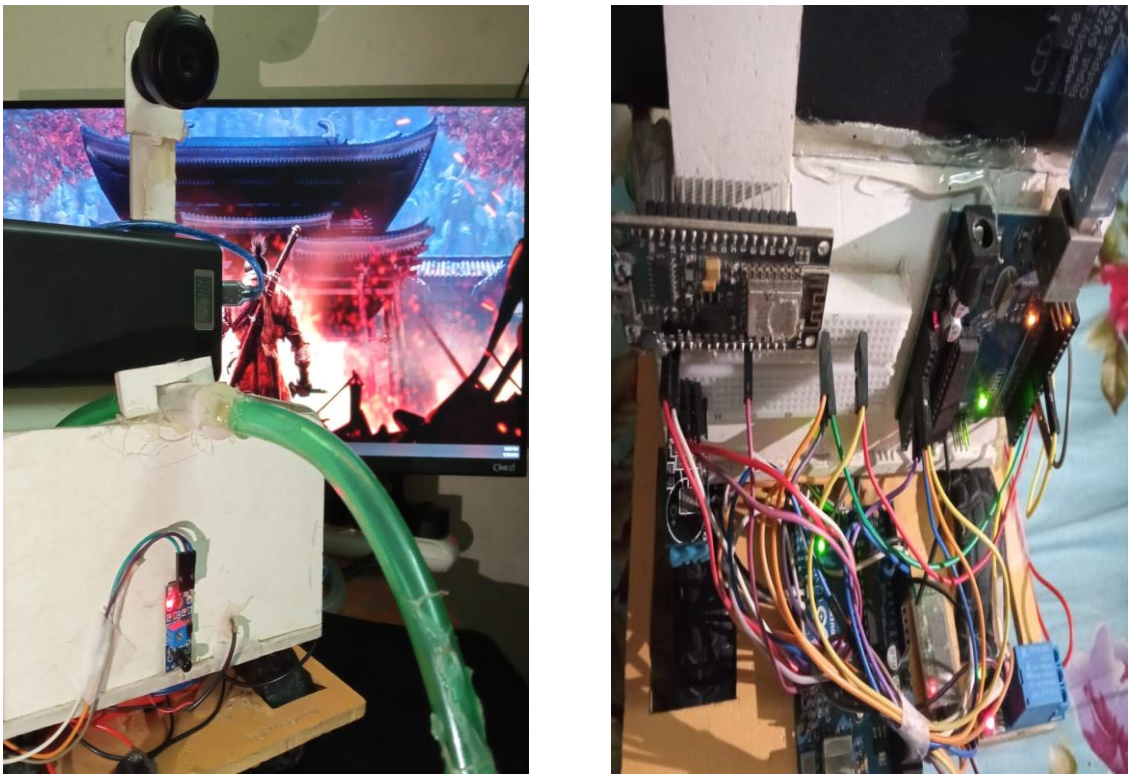

Fig:3.1-IoT Fire Bot

3.2 Requirement Collection And Analysis

Arduino Uno:

Two items of Arduino is used for this system.one is Arduino Uno,another one is Arduino nano,one for human action with the central station and one for driving and dominant the motors.

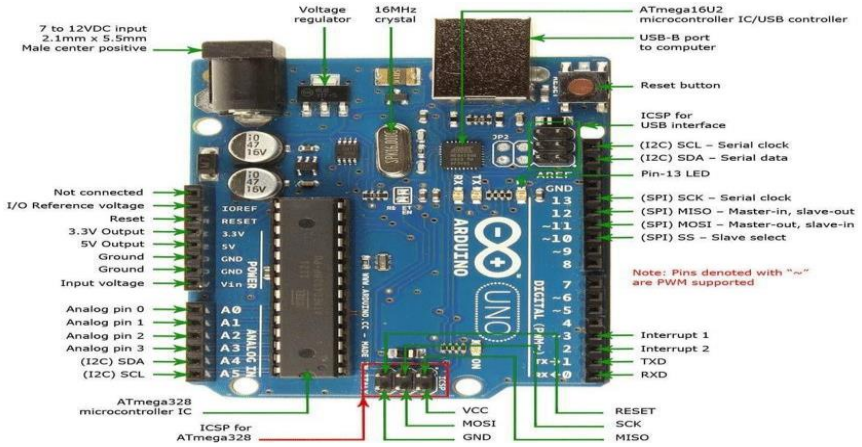

Fig:3.2- Arduino Uno

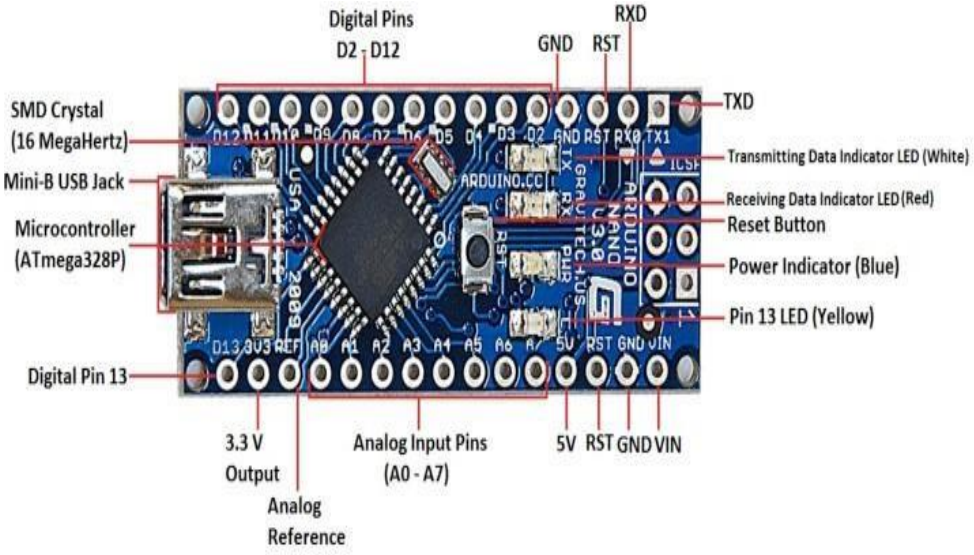

Fig:3.3- Arduino Nano

Motor Driver:

A Motor Driver in Arduino terms that fits with a Arduino board to serve a particular way. The motors is within the variety of servo or dc.

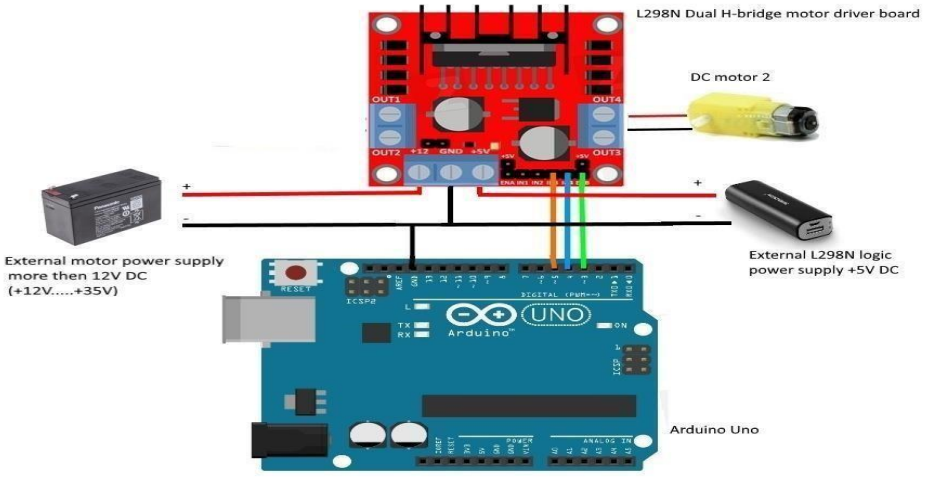

Fig:3.4.-Electronics Motor Driver

DC motor:

DC motor run with electrical energy. DC motor accommodates one set of coil, known as coil winding, within another set of coils or a group of permanent magnets (to maintain a set polarity), known as the stator coil.

Here are some components of a DC motor:

Stator:

The stator coil is that the fastened outside a part of a motor. The force field is formed by AN magnet.A DC coil (field winding) is wound around a magnetic material that forms a part of the stator coil.

Winding:

A winding is formed from series or parallel association of coils. Coil winding is that the winding through that a DC voltage is applied for the motor to perform.

Rotor:

The rotor is that the inner part that keeps in motion.The rotor consists of windings that area unit connected to the external circuit through a mechanical electric switch.

Fig:3.5 - DC motor

Servo motor:

A control circuit, potentiometer, and tiny DC motor are all found inside a servo motor. Gears link the control wheel to the motor. The potentiometer's resistance varies as the motor turns, allowing the control circuit to accurately determine how much movement there is and in which direction. In this project, the servo motor runs on 6 volts. Armature movement is the primary use for servo motors. The servo allows for precise vertical movement of the supporting structure. The servo motor's speed can be adjusted. Consecutive pauses can be used to modify the motor's speed. The motor was set to pause for 100 milliseconds after each degree of movement.

Fig:3.6- Servo motor

Relays:

The Relays is used in this system. The voltage ratings is 6V. Relays here are used as circuit breakers. Whenever a fire is detected both the relays open their terminals via a command from Arduino, rendering both the motors stationary at that particular point. This relay is normally open and only close once fire is detected.

Fig:3.7- Relay breakout board

Water pump:

This is a little pump DC 3V-5V,can be simply integrated into my water system project. The pump works by using a water suction system that pulls water through its recess and discharges it through the outlet.

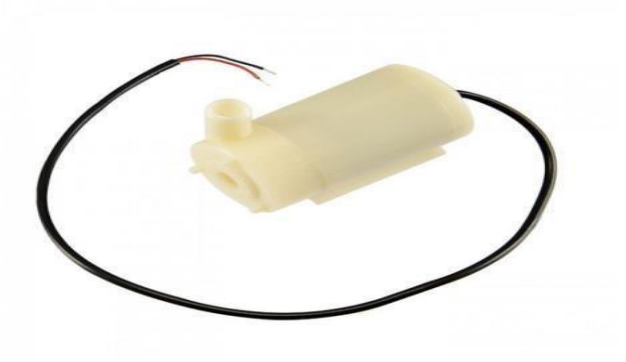

Fig:3.8-Water Pump

Motor control Diagram:

The motor control circuit's interlock contacts, which were set up in the previous section, are functional, but the motor will only operate when each push button switch is depressed.

We could modify the circuit in one of two ways if we wanted to keep the motor running even after the operator removes their hand from the control switch(es): we could swap the push button switches for toggle switches or we could add more relay logic to "latch" the control circuit with a single, momentary actuation of either switch.

Since the second strategy is frequently employed in industry, let's examine how it is put into practice:

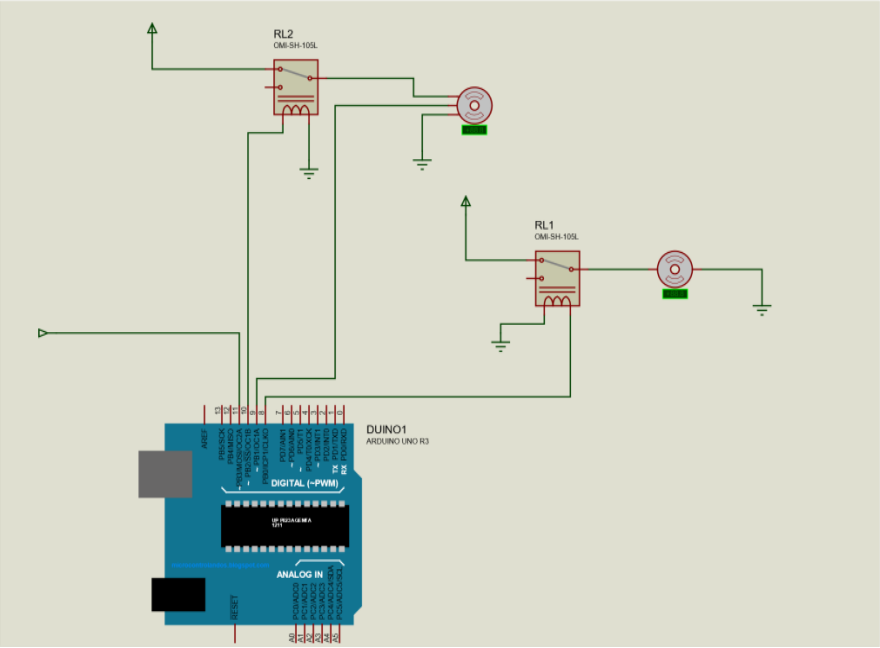

Fig:3.9-Motor Control Diagram

Flame Sensor:

Flame sensor can find hearth sources or different lightweight sources of the wavelength within the vary of 760nm-1100nm. it's supported the YG1006 sensing element that may be a high speed and high sensitive NPN element Phototransistor. thanks to its black epoxy , the sensing element is sensitive to infrared emission. during a hearth fighting golem, the sensing element plays a vary vital role, it will be used as a robot's eyes to search out the hearth sources.

Fig:3.10-Flame Sensor

Temperature Sensor:

The microcontrollers currently will be interfaced with variety of sensing elements mistreatment Arduino boards and by mistreatment totally different sensors with Arduino we will create a range of sensors accessible however we have a tendency to cannot use every type of temperature sensor as all aren't compatible with microcontrollers. So, we've announce an inventory of Arduino compatible temperature sensors.

List of temperature sensor –

LM35

DS18B20

DHT22

I using DHT22 Temperature sensor for this project. The DHT provides 2 kinds of temperature mensuration sensors one witch is DHT22,and it's the next accuracy and may conjointly live humidness yet. This sensing element comes with a temperature

mensuration vary of -40 to one hundred twenty five degrees uranologist and may live the temperature of larger areas like warehouses, offices, and homes.

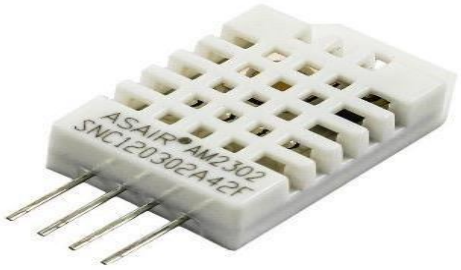

Fig:3.11- DHT22

Bluetooth Module:

A Bluetooth gadget called the HC-06 is utilized for wireless connection with other Bluetooth-enabled devices. Serial communication is used for communicating with microcontrollers. There is no need to change the TX voltage level of the HC-05 Bluetooth module because it provides a 3.3 V level for RX/TX and the microcontroller can detect that level. However, we must change the microcontroller's transmit voltage level to the HC-05 module's RX.

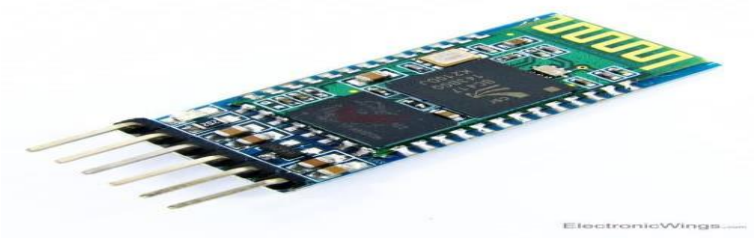

Fig :3.12-HC-06

Node MCU:

Node MCU is an open source IoT platform with a low cost. It came with firmware for the ESP8266 Wi-Fi So C from express if systems at first. The ESP-12 module serves as the basis for its hardware. Microcontroller Unit (MCU) is an Open-source prototyping boar designs are available for Node MCU, which is an open-source firmware. LUA is the scripting language used by the firmware. The most popular prototyping hardware is a circuit board. Table 1 shows D0 (GPIO16) can only be used for GPIO read/write.

3.3 Data Flow Diagram

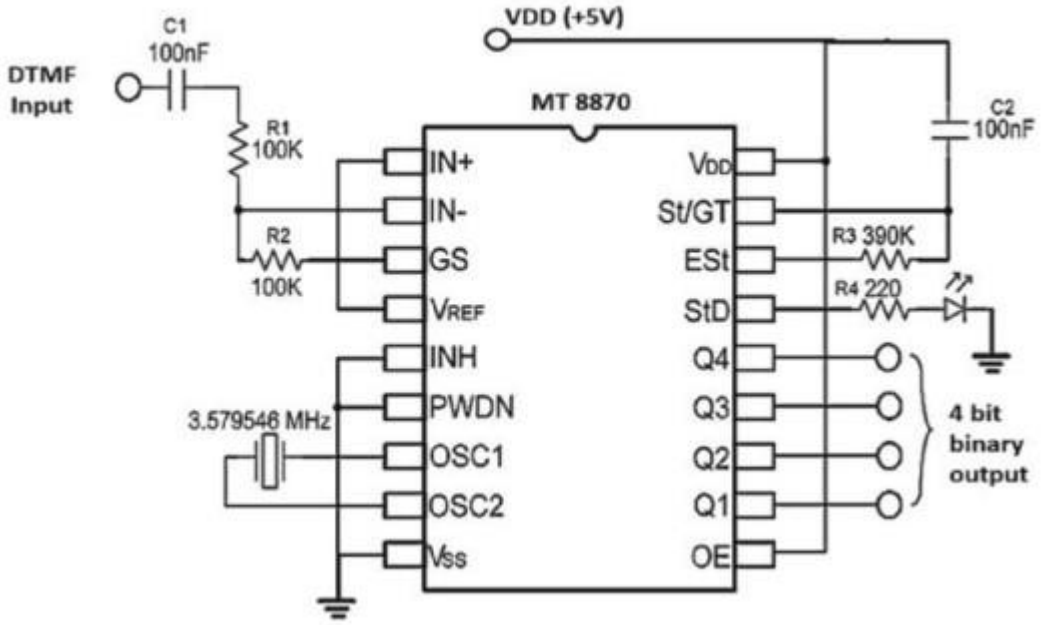

Fig: 3.13 Node MCU Block Diagram

Data Flow :

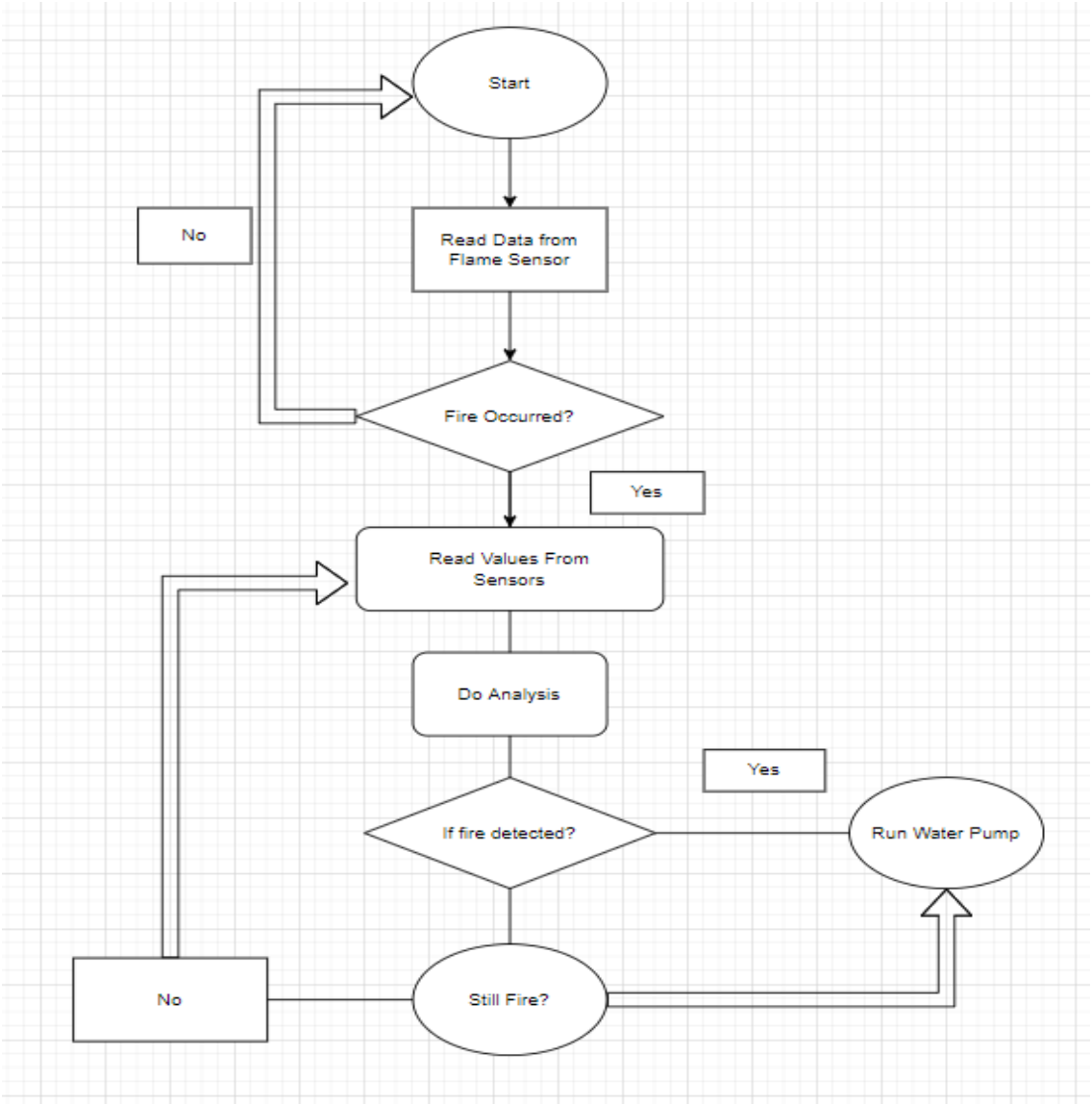

Fig:3.14 Data Flow Diagram

CHAPTER 4

Design Specification

4.1 Model ready for manufacture

In the future I want to manufacture our fire Helper system so that it can help the people from the fire. In fututre I will add more technology here where I can control it from several kilometers away and be able to control the situation in my house and put out the fire. I will install fire alarm here which will sound when fire is detected and some other technology where my mobile will send message immediately if fire is detected.

4.2 Efficient use of wires

First of all my models outlook is little bit complicated and it's tough to hold for the wires. therefore I would like to form a manufacturable model by decreasing the uses of wires. it'll offer the system a beautiful outlook and additionally build it straightforward to create.

4.3 Compact Size

The dimensions of my system is little in compare with different types of fire fighting systems, it has to be set on the top of a room so the size of the system should be more compacted and more lighter.

4.4 Outdoor durability

My next target is to set my system not just for indoor system however additionally for outside service. my system cannot differentiate the daylight with hearth. that's the most downside for victimization the system for outside purpose. to beat this downside I've got to switch the code used for running the system, so we are able to save the outside setting from hearth burnt.

CHAPTER 5

Implementation and Testing

The IoT Fire Bot system can move, therefore it's to be utilized in one corner of a space to sight the position of the hearth. it's enough to a house for protected. this technique is used not just for domestic purpose however additionally for industrial and industrial purpose. Unremarkably the quality length of Associate in Nursing trade is average one hundred meters. therefore for a one hundred meters length trade we've calculated that we'd like twenty four hearth fighting systems.

5.1 Implementation Cost:

Fire extinguishers area unit terribly high-priced within the whole world. My robot could be a less costly than others.So it is more economical than others fire extinguishers.

Product Name	Quantity	Cost per unit	Total Cost
Arduino Uno	2	850	1700
Gear motor	4	150	600
Acrylic Sheet	1	200	200
Jumper Wire	2	80	160
Node Mcu	1	350	350
Wheel	4	60	240
Camera	1	2000	2000
Relay	1	50	50
Temperature Sensor	2	70	140
Humanity Sensor	1	120	120

Bread Board	1	70	70
Battery	3	30	150
Power Bank	1	700	700
Water Pump	4	60	240
Motor Driver	1	130	130
		Total	6,850

Table 5.1 : COST ANALYSIS TABLE

5.2 Testing:

The fire Helper is too safe in compare with others extinguisher. we all know that fireside fighting may be a terribly risky occupations. many of us have become hurt by victimization extinguisher, however this robot will save us while not destroying anyone's life.

CHAPTER 6

IMPACT ON SOCITY, ENVIRONMENT ANDSUSTAINABLITY

I believe that my robot will greatly helpful to the socity because,

1. it easy to use and simple fire extinguisher designed procedure.
2. It's Design and implementation of fire extinguishers at low cost method
3. It can Identifying the fire and its location.

My project objective is to minimize fire damage to buildings .Human life is the most precious thing. Fire kills many people and injures many people My IoT Fire Bot can greatly reduce damage from fire.The hardware part is the main section of the development of a system or Robot. Different types of sensors like flame sensors for detecting fire.The robot can easily find the fire's location by the flame sensor, and it can avoid objects in its route by the ultrasonic sensor. All the equipment is connected to ESP-32, and it controls the movement of gear motors. The Robot can control manually as well as automatically with the help of an android device. Robots can effectively find the location of the fire automatically and sooth it.The operator can control and monitor the IoT Fire Bot by an android device. First, it has to connect via Wi-Fi, and ESP-32 already has this system. Fire mainly depends on the distance between the Robot and the location of the fire.

CHAPTER 7

Conclusion & Future Scope

My project “IoT Fire Bot” is completely different from others. IoT Fire Bot can notice fireplace once fire occurred near .IoT Fire Bot robot can destroyed fire by spray water. When a fire is occurred within a building Nothings can't be seen, but IoT Fire Bot is ready to indicate within state of affairs of that building. At a time it will spray water to Extinguish fire. There are many types of Robot.AI robots are tree types- General AI, Intermediate AI, Advanced AI. My project-"Fire-Helper” is general robot, even most of fire-fighting mechanism are general types of robot wherever used for developed, embedded c etc.. . IoT Fire Bot can be save lots of life and valuable properties. This kind of mechanism can be implement with very little quantity of cash and its elements are obtainable. Recently fireplace occurred numerous places in Bangladesh, countless died attributable to fireplace.” Fire-Helper “could facilitate to destroyed.

Efficient use of Future Scope:

First of all my models outlook is little bit complicated and it's tough to hold for the wires. therefore I would like to form a manufacturable model by decreasing the uses of wires. it'll offer the system a beautiful outlook and additionally build it straightforward to create. My next target is to set my system not just for indoor system however additionally for outside service. my system cannot differentiate the daylight with hearth. that's the most downside for victimization the system for outside purpose. to beat this downside I've got to switch the code used for running the system, so we are able to save the outside setting from hearth burnt

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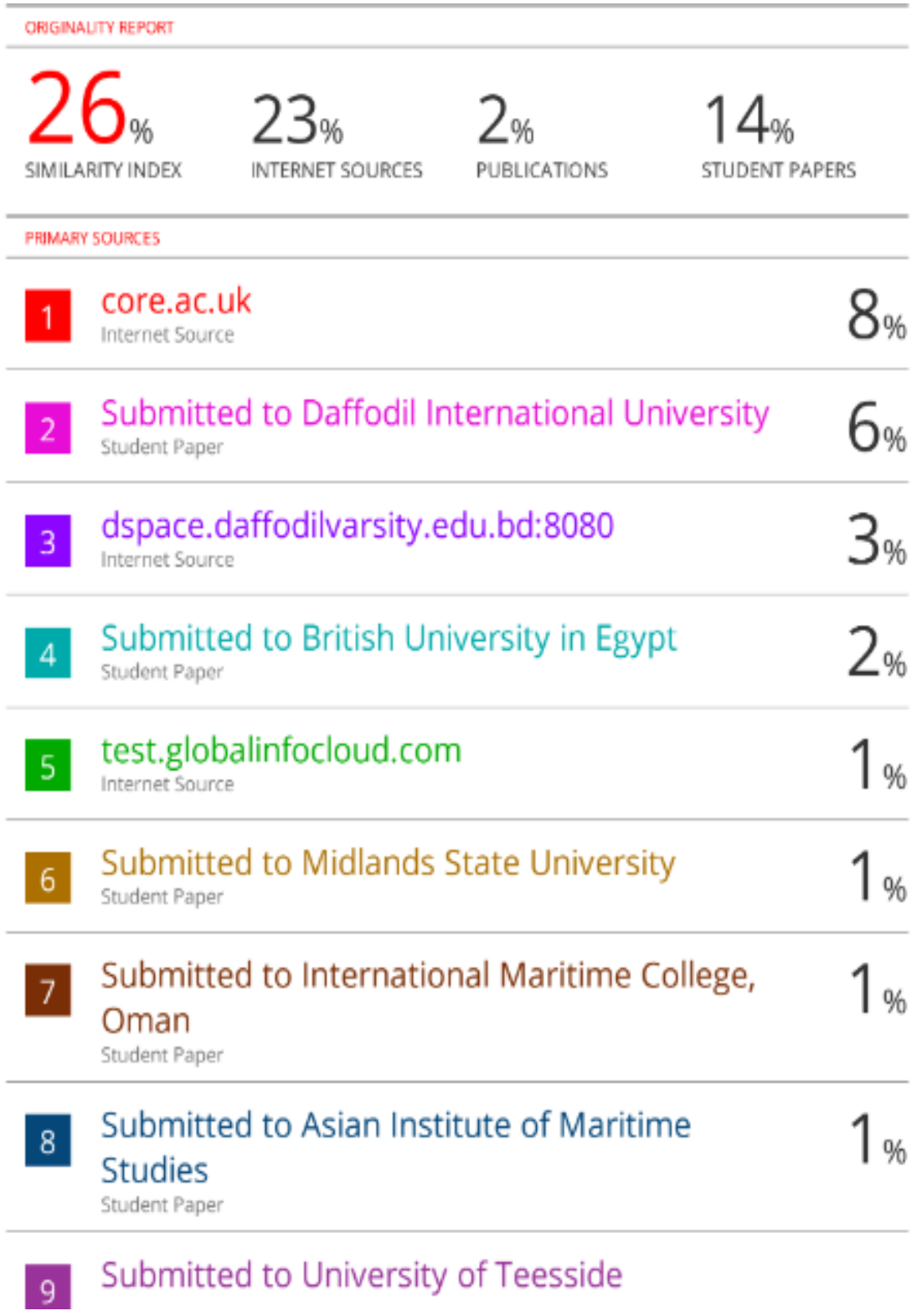

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