AN ANDRIOD CONTROLLED FIRE FIGHTER ROBOT

A PROJECT REPORT

Submitted by

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Madhuben and Bhanubhai Patel Institute of Technology

New Vallabh Vidyanagar, Anand

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Android Controlled Fire Fighter Robot** has been carried out by **Vidhi S. Patel** and **Selviben H. Prajapati** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Computer Engineering, 8th Semester of Gujarat Technological University, Ahmedabad, during the academic year 2021-22.

Nirav Raja	Nirav Raja
Internal Guide	Head of the Department

Madhuben and Bhanubhai Patel Institute of Technology

New Vidhiyanagar, Anand

DECLARATION

We hereby declare that the Internship/Project report submitted along with the Internship/Project entitled **Android Controlled Fire Fighter Robot** submitted in partial fulfillment for the degree of Bachelor of Engineering in Computer Engineering to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by us at Madhuben and Bhanubhai Patel Institute of Technology under the supervision of Prof. Nirav Raja and that no part of this report has been directly copied from any student's reports or taken from any other source, without providing due reference.

	Name of the Student	Sign of Student
1	Vidhi S. Patel	
2	Selviben H. Prajapati	

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Vidhi S. Patel

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M.B.I.T.

ABSTRACT

The project is to develop a robotic vehicle capable of detecting the presence of fire and extinguishing it automatically. It is a movable robot that consists of fire sensor for detecting the fire BO motor driver for the movement of the robot, relay driver for pump control and a Node MCU which are used for the detecting and extinguishing the fire.

Usually, the robot moves at a steady speed. When the fire sensor detects the fire in the environment, the signal indicating the presence of fire will be sent to the Node MCU through which the extinguishing is done. In the extinguishing process, whenever the detection of fire is positive the robot will be move towards it. Through the android mobile and stop at the place of fire occurred and starts the pump and sprinkle water through a sprinkler until the smoke is put off. The entire control is achieved using Node MCU which is interfaced with the android mobile via WI-FI, so that the control of the robot can be made from an android mobile.

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Abbreviations

IOT	**Internet of Things**
ESP	**Espressif modules**
WI-FI	**Wireless Fidelity**
IEEE	**Institute of Electrical and Electronic Engineers**
MHZ	**Megahertz**
MB	**Megabyte**
Nm	**Nanometer**
LI-ion cell	**lithium-ion cell**
OS	**Operating System**
GPS	**Global Positioning System**
BO motor	**Battery Operated motor**
Node MCU	**Node Micro Controller Unit**

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1.0 INTRODUCTION

1.1 PROJECT SUMMARY AND INTRODUCTION

As the robotic discipline is evolved a lot, human interaction is made much less and the robots are broadly used for the cause of safety. Fire accidents have end up commonplace in our everyday lifestyles and sometimes it may result in risky issues in order to be harder for the firemen for protecting the human life.

In order to avoid those instances, this robot is used to protect human lives, environment and wealth from the fire injuries. An android controlled fire fighter robot that can be used to extinguish fires through remote handling. The vehicle consists of a water tank along with a pump which can throw water when needed.

The firefighting robot helps to stop fire immediately and safely extinguish fire and rescue the people from dangerous fire & and move to the safer area. And the firefighting robot issued to locate and find the fire before it gets out of control. This firefighting robot is a replacement of fire fighters as it is not at a risk of getting injured. It is also useful for industrial, domestic and military area.

Therefore, the firefighting robot is designed to control fireplace via a robotic vehicle. In our project, we can move the robot upward, backward, right and left properly by using android application. The robot has water spray which is capable of sprinkling water. The sprinkler can be moved in all directions. Node MCU, Wi-Fi transceiver modules are principle controlling devices of the entire system. Water spray, DC motor, relay module, motor driver shield is interfaced to Node MCU.

1.2 PURPOSE AND OBJECTIVE OF PROJECT

The purpose of this project is to design, build, and test a robot capable of extinguishing building and basement fires and effectively replacing a firefighter in highly dangerous situations. The robot will allow for firefighters to not only put out a fire remotely, but allow rescuers to scout a burning building before sending any firefighters inside. The implementation of this robot will increase the safety of firefighters and therefore help mitigate deaths from unsafe conditions.

The main objective of this work is to design and implement a prototype robotic system, which has the ability to help firefighters in accomplishing their duties. The objective is to advance the capabilities of robotic firefighting robots. Sprinkler systems are effective but extremely costly and have safety limitations. By designing and implementing a firefighting robot capable of detecting and extinguishing flames, disasters can be avoided with minimal risk to human life.

1.3 SCOPE OF THE PROJECT

The "Android controlled firefighting robot" can be used easily in everyday life such as in homes, laboratories, parking lots, supermarkets, stores, shops etc. The fire extinguishing was done with the help of water through the pumping mechanism.

1.4 LITERATURE REVIEW

A Survey on Fire Fighting Robot Controlled Using Android Application

Detecting fire and extinguishing it is a dangerous job that puts life of a fire fighter at risk. There are many fire accidents which fire fighter had to lose their lives in the line of duty each year throughout the world.

The research and development in the field of an Artificial Intelligence has given rise to Robotics. Robots are implemented in various areas like Industries, Manufacturing and Medicines etc.

Hence, Robotics can be used to assist fire fighters to perform this task of fire fighting and thus reduce the risk of their lives. Fire Fighter is a robot designed to use in such extreme conditions. It can be operated and controlled by remote user and has the ability to extinguish fire after locating the source of fire. It is equipped with a monitoring system and operates through a wireless communication system.

The fire detection system is designed using the sensors mounted on the fire fighter robot. The robot is controlled autonomously using Android application. Android mobile phone platform developed by Google has gained popularity among software developers due to its powerful capabilities and open platform. Therefore, Android is a great platform to control a Robotic system. Android provides many resources and already integrates lot of sensors.

This concept helps to generate interest as well as innovation in field of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

1.5 PROJECT PLANNING

1.5.1 Project Effort and Time, Cost Estimation

The project did get started on 1st January 2022 and got completed on 30th April 2022. It took 4 months of work (approx. 120 days).

Cost estimation: -

Table 1.5.1 Cost Estimation Table

S.N.	Item	Qty	Rate*	Amount
1	Arduino UNO + Cable	1 Pieces	560	560.00
2	BO Motor Wheel	4 Pieces	30	120.00
3	Flame Sensor	3 Pieces	40	120.00
4	L293 Shield	1 Pieces	120	120.00
5	HC-05	1 Pieces	220	220.00
6	1 Channel Relay module	1 Pieces	35	35.00
7	Mini Water Pump	1 Pieces	55	55.00
8	LI-ion Cell 3.7V	4 Pieces	70	280.00
9	Male-Male Jumper	20 Pieces	1.2	24.00
10	Node MCU	1 Pieces	330	330.00
11	Servo Motor	1 Pieces	100	100.00
	Total			1,964
		SGST @9.0%: 131.76		
		CGST @9.0%: 131.76		
		Total:		**2,230**

* Rate may vary

1.5.2 Roles and Responsibilities

The roles and responsibilities of each individual includes research, analysing components, hardware assemblies, designing the android application, connecting it with firebase, testing the model etc.

1.6 PROJECT SCHEDULING

Project is divided into 2 phases.

Phase 1 consists of learning different components, analyzing dataset, learning specification of components, studying and finalizing algorithms used. Setting the basic module and testing of that module.

Phase 2 consists of preparation of android application, setting up advanced version of the project and testing of advanced version.

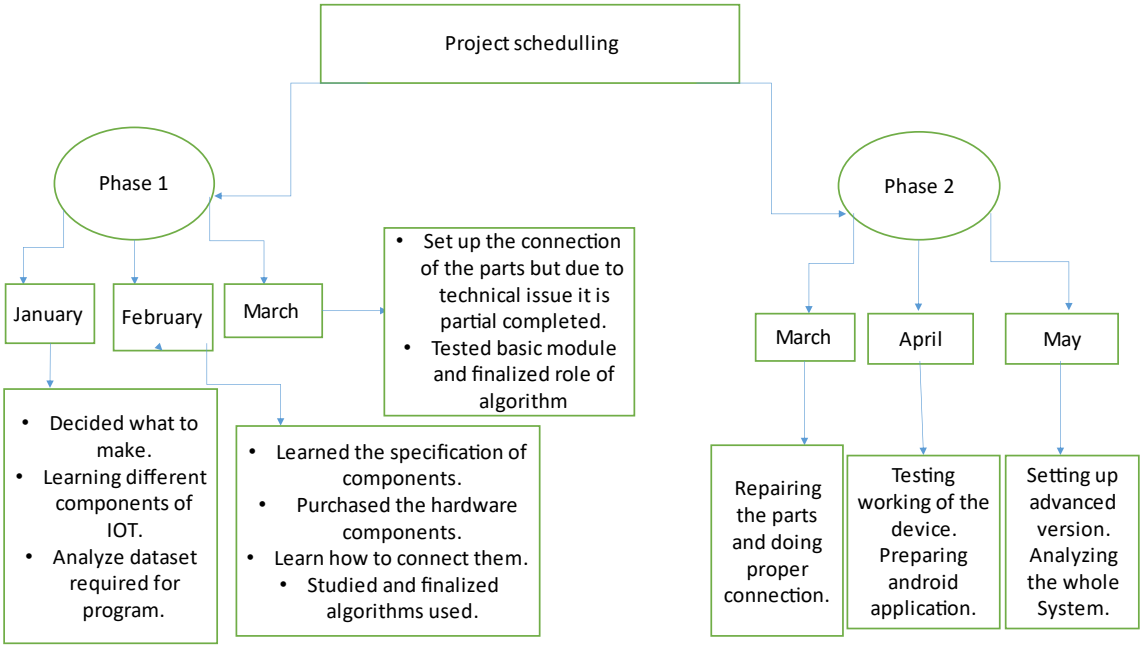

Fig 1.6.1 Project Scheduling

2.0 SYSTEM ANALYSIS

2.1 STUDY OF CURRENT SYSTEM

The common conventional firefighting methods involve fire brigades, portable fire extinguisher (hand held) and sprinklers. These conventional methods consume lot of time to reach the place of the mishap like the fire brigade must be deployed from the fire station and should get through the traffic and reach the fire struck area, the portable extinguisher is also no gift because it is generally place at one off the corners of the building which may be difficult to reach and it needs constant maintenance.

On the other hand, the sprinkler and smoke detector set up is very non reliable method because the sprinkler pipes have any defect may not provide enough pressure and it is suited to cover large areas.

2.2 PROBLEM AND WEAKNESS OF CURRENT SYSTEM

The problem with existing system is that exposure to the hazardous and chaotic fire environment, rather than to the fire itself, is the most significant cause of injury and death in fires. The reachability of precise information in real-time on the conditions directly at the center of the fire ground is a crucial factor in the guidance of rescue actions together with feasible counter-plans.

Unfortunately, the firefighting environments are normally hard to reach and restricted in accessibility by obstacles, tumbledown architectures and visibility by smoke, dangerous gases or dust. Therefore, the fire scene is an information-poor environment due to lack of information on location of fire, firefighters and victims, and the search and rescue opportunities are previously unimaginable due to lack of situational conditions and real-time information for targeted decision making.to this the accidents occurs.

Additionally, the current methods applied in firefighting are inadequate and inefficient relying heavily on humans who are prone to error, no matter how extensively they have been trained.

2.3 SYSTEM FEASIBILITY

2.3.1 Does the system contribute to the overall objectives of the organization?

Yes, the system contributes to overall objectives of the organization. It helps the fire person to extinguish fire in safer way. It reduces the risk of health hazards to human life.

Also, as it is operated through android application it is user-friendly and provide remote controlling of fire fighter robot.

2.3.2 Can the system be implemented using the current technology and within the given cost and schedule constraints?

Yes, the system can be implemented using the current technology. Android Studio and Google firebase both are freely available to prepare android application. Also, hardware components are easily available so one can easily implement it.

The system can also be implemented in given cost as components which are required are of low cost and it is easy to scale them with other components in constricted time.

2.3.3 Can the system be integrated with other systems which are already in place?

Yes, the system can be integrated with other systems which are already in place. As it uses Wi-Fi which is readily available and can be connected anywhere at any time.

Also, the android application can be integrated with modules of other system and can be connected via Google firebase.

2.4 PROPOSED SYSTEM

The proposed model is able to detect presence of fire using flame sensor and an android application is used which consists of buttons which are used to move robot by sending the commands to the Arduino system by pressing the buttons of the android application. Android application provide option to configure the appropriate command for the operation of the robot.

Advantages of proposed system –

➢ Robot will be used at places where it is dangerous for humans to enter.

➢ Capability of sensing accurately with increased flexibility.

➢ Reliable and economical.

➢ Reduce the errors and the limitations that are faced by human fire fighters.

➢ Sensors have long life time and less cost.

2.5 LIST OF MAIN MODULES/COMPONENTS

1. Node MCU

Node MCU is an open source IOT platform and low-cost device. It is used to make prototype and also to build IOT applications. Node MCU has ESP32 microcontroller along with WI-FI, Bluetooth and Ethernet. The Wi-Fi module uses IEEE 802.11 wireless network having clock speed of 240 MHz and flash memory of 4MB.The data sensed by the sensors on the sensor module is received by Node MCU and send it to robot. According to that action will be taken by the robot.

Fig 2.5.1 Node MCU

2. Flame Sensor

Flame sensor is used to detect occurrence of fire. This sensor is most sensitive to normal light hence known as flame sensor. This sensor detects fire in the range of 760nm to 1100nm.the output of sensor is digital. This sensor is used in robot like alarm. This sensor is easy to use and also it has very fast response time.

Specification:

- Operating Voltage -2 – 36V
- Temperature - -25 to 85C

Fig 2.5.2 Flame Sensor

3. Motor Driver Shield

L293D is a typical 16-pin Motor driver IC which allows the DC motor to drive on either direction. It can control a set of DC motors in any direction simultaneously i.e. it can control two DC motor with a single IC of L293D by the Dual H-bridge Motor Driver integrated circuit(IC).This IC can drive small and as well as big motors. Its working is based on the concept of H-bridge. It is a circuit that allowing the voltage to be flows in either direction.

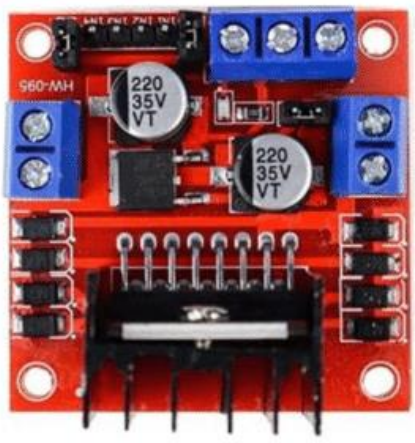

Fig 2.5.3 Motor Driver Shield

4. Servo Motor

Servo implies an error sensing feedback control which is utilized to correct the performance of a system. It also requires a generally sophisticated controller, often a dedicated module designed particularly for use with servo motors. Servo motors are the DC motors which allow for precise control over angular position. They are actually DC motors whose speed is slowly lowered by the gears. The servo motors usually have a revolution cutoff from 90° to 180°. A few servo motors also have revolution cutoff of 360° or more. But servo motors do not rotate constantly. The rotation is limited in between the fixed angles.

Fig 2.5.4 Servo Motor

5. Mini Submersible Water Pump

A mini submersible water pump is a centrifugal water pump, which means that it uses a motor to power an impeller that is designed to rotate and push water outwards. A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy. This is done by the water being pulled into the pump: first in the intake, where the rotation of the impeller pushes the water through the diffuser. From there, it goes to the surface.

Fig 2.5.5 Mini Submersible Water Pump

6. Relay Module

Relay module is an electrically operated device which has a control system and controlled system. A control system is also called as input circuit or input contactor and the controlled system is also called as output circuit or output contactor that are frequently used in automatic control of a circuit. It is an automatic switch that controls a high-current circuit with a low-current signal. Some advantages of a relay are its lower moving inertia, stability, high reliability and small volume. It has wider application in power protection device, automation technology, sports, remote control, reconnaissance and communication and in electro mechanics and power electronics devices. A relay consists of an induction part that is capable of reflecting the input variable like current, voltage, temperature, pressure, speed, light, power, resistance and frequency etc.

Fig 2.5.6 Relay Module

7. BO Motor with Wheels

Bo motor (Battery Operated) lightweight DC geared motor which gives good torque and rpm at lower voltages. This motor can run at approximately 200 rpm when driven by a single Li-Ion cell. Great for battery operated lightweight robots. It is used for movement of wheels in various robotic devices.

Fig 2.5.7 BO Motor with Wheels

8. Rechargeable Batteries

A rechargeable battery, storage battery, or secondary cell, is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It potentially consists of reversible cell reactions that allow them to recharge, or regain their cell potential, through the work done by passing currents of electricity.

Fig 2.5.8 Rechargeable batteries

2.6 SELECTION OF HARDWARE, SOFTWARE

The methodology is divided into three parts. The first part is on the electronic schematics, followed by hardware description and the finally on the programming design. All parts were assembled together and experiments were then performed to determine the optimal distance of firefighting robot to extinguish the fire were carried out.

The electronic part is one of the important parts in building the Fire Fighting robot. It includes different sensors, push button, power supply, DC motor driver, DC motor and the most important in the autonomous robot is the Node MCU. These entire components are connected together to become a system.

Software selection is core part as main logic of the project is written here. Smart Phone Wi-Fi is connected to the Wi-Fi Module of System. Android Application name “Firefighter robo” is the application which is act as an interface between the Android Smartphone and the System.

For software part following software are used:

1. **Android Studio**

   Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured

code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

Fig 2.6.1 Android Studio

2. **Google Firebase**

Firebase is a platform developed by Google for creating mobile and web applications. It was originally an independent company founded in 2011. In 2014, Google acquired the platform and it is now their flagship offering for app development.

Fig 2.6.2 Google Firebase

3. **Arduino IDE**

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++.

Fig 2.6.3 Arduino IDE

3.0 SYSTEM DESIGN

3.1 SYSTEM DESIGN AND METHODOLOGY

The sensor module is placed in where there is a possibility of a fire mishap. The module consists of flame sensor, dc motor, relay module and Node MCU which performs the transmission of data. Once the fire is detected, Node MCU will send data to firebase. The receiver consists of two parts, the first part constitutes a motor driver shield and other is android application.

Android application consists of a WI-FI module that is used to establish connection between the robot and android application. Commands to move forward, left, right and to extinguish fire are sent to the robot through the android application.

Block diagram

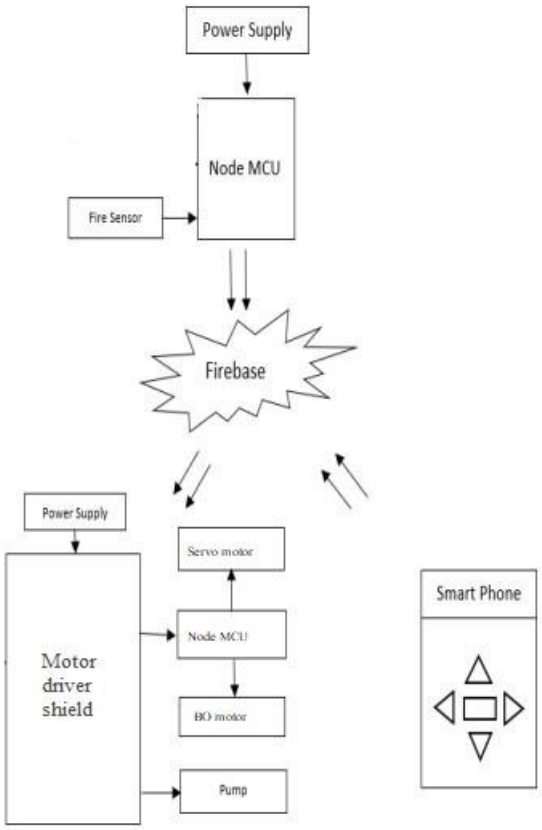

Fig 3.1.1 Block Diagram

The robotic vehicle is loaded with water tanker and a pump which is controlled over wireless communication to throw water. The transmitting end using android application device, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc.

At the receiving end five motors are interfaced to the motor driver shield where four of them are used for the movement of the vehicle and the remaining one to position the arm of the robot. Remote operation is achieved by any smart-phone.

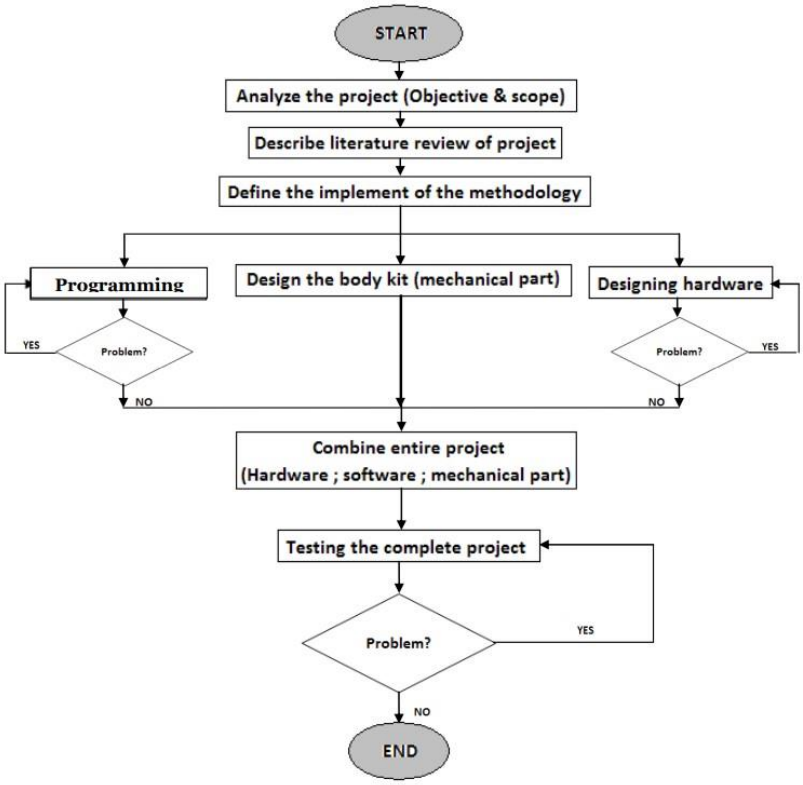

Fig 3.1.2 Flow Chart Methodology

The methodology flow chart of project depends the objective and scope of project. It describes the literature review of the project and defines the implement of the methodology part. The system can be categorized into three parts at the methodology.

First part mechanical part, second part is hardware part and last part the system is software part. Then combine the three of part and then testing for the complete flow system

3.2 CIRCUIT DESIGN

The circuit design shows the connection between different hardware components. The 4 BO motor with wheels are connected to Motor Driver shield. The motor driver shield is connected to Node MCU. Node MCU serves as main component. The three flame sensors are connected to pin D0, D1, and D2 of Node MCU. Mini Submersible water pump is connected to relay module and Node MCU. Servo motor is connected to both Node MCU and relay module

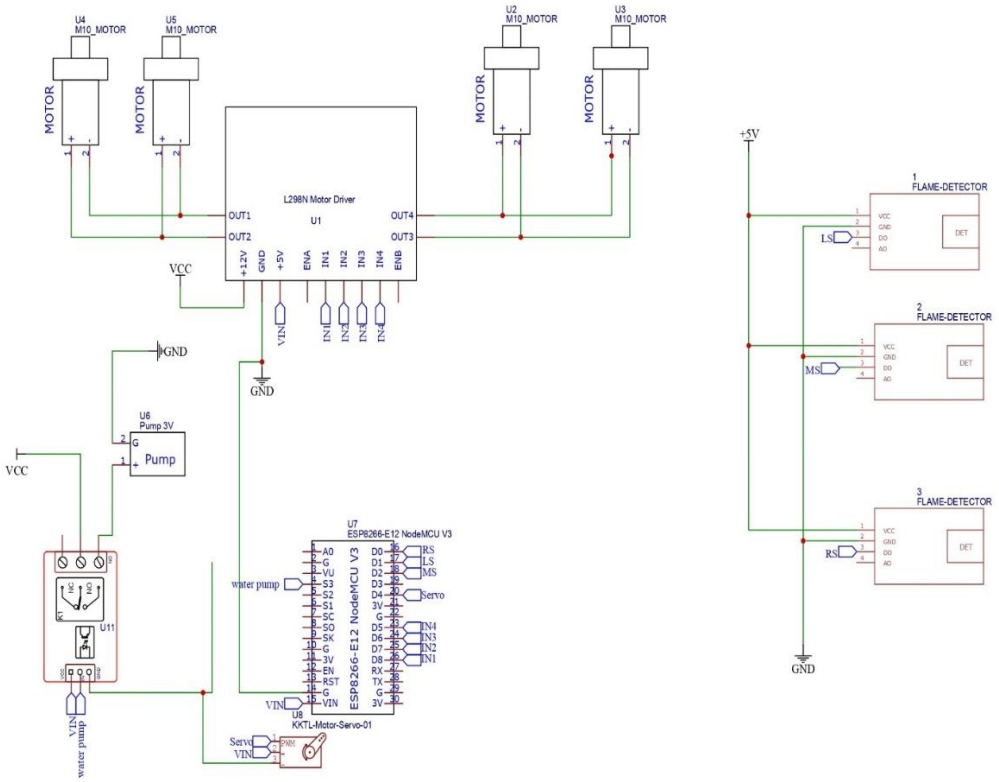

Fig 3.2 Circuit Diagram of Robot

3.3 INTERFACE DESIGN

The Android Controlled Fire Fighter Robot Comprises of mainly three interfaces-Iot, Android Application, and Google Firebase. The interface design of the project system can be understood through the below figure.

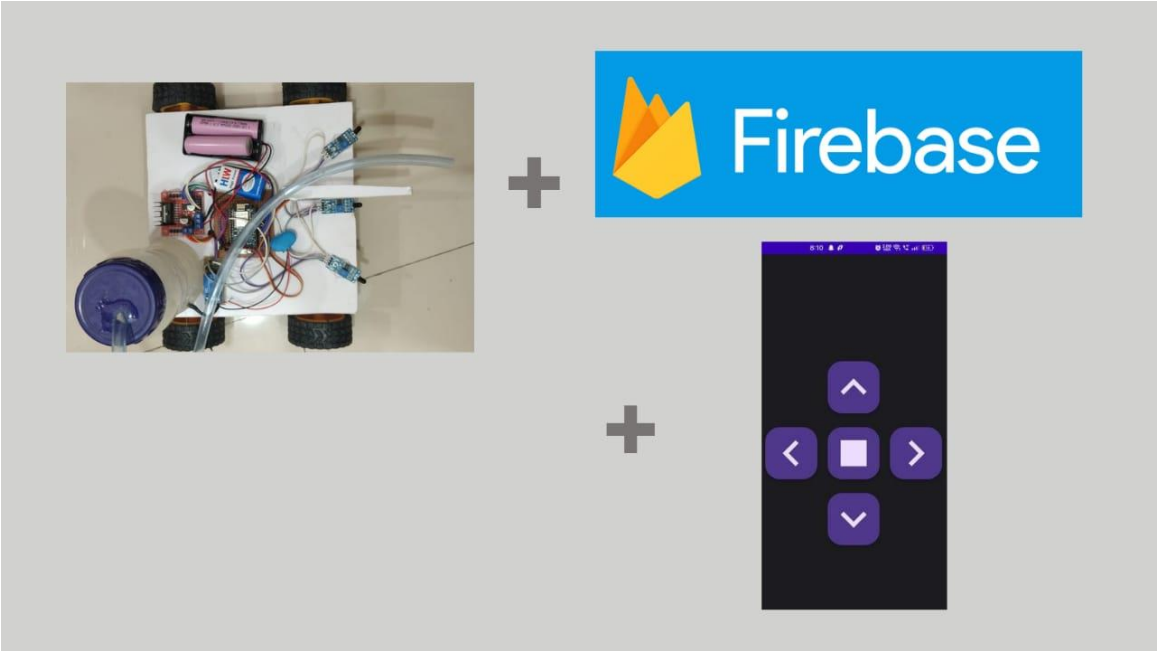

Fig 3.3.1 Interface design of project

4.0 IMPLEMENTATION

4.1 IMPLEMENTATION PLATFORM/ ENVIRONMENT

Android Studio

Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

Our application ‘Fire fighter robo’ is built in android studio.

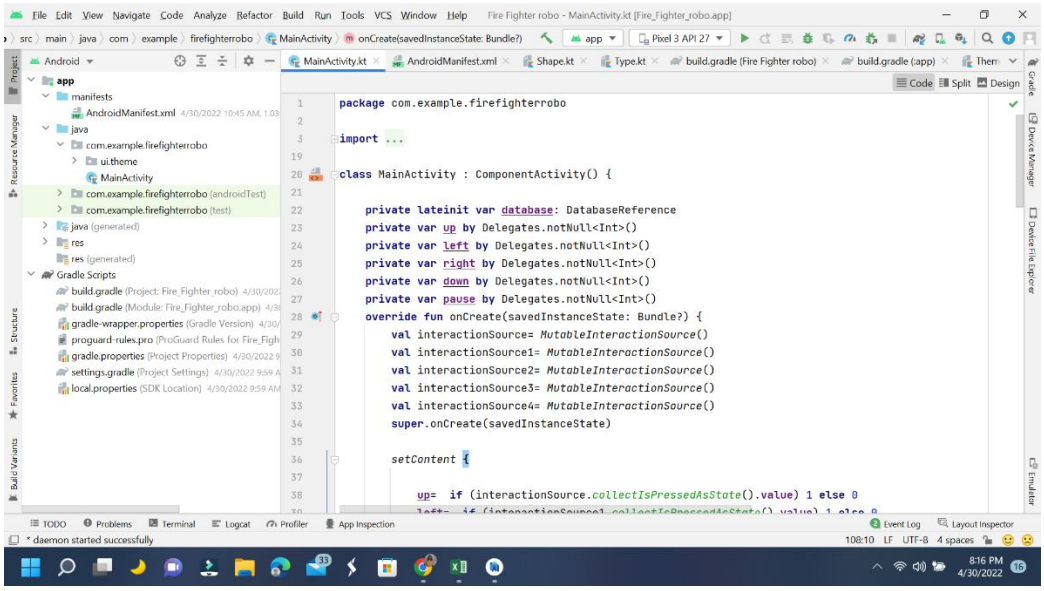

Fig 4.1.1 Android Studio Console

Google Firebase

Firebase is a platform developed by Google for creating mobile and web applications. It was originally an independent company founded in 2011. In 2014, Google acquired the platform and it is now their flagship offering for app development.

The connection of application ’Fire fighter robo’ to the programmed Node MCU is given through firebase. As the project involves real- time data, Google firebase provides fast and easy connection facility of it.

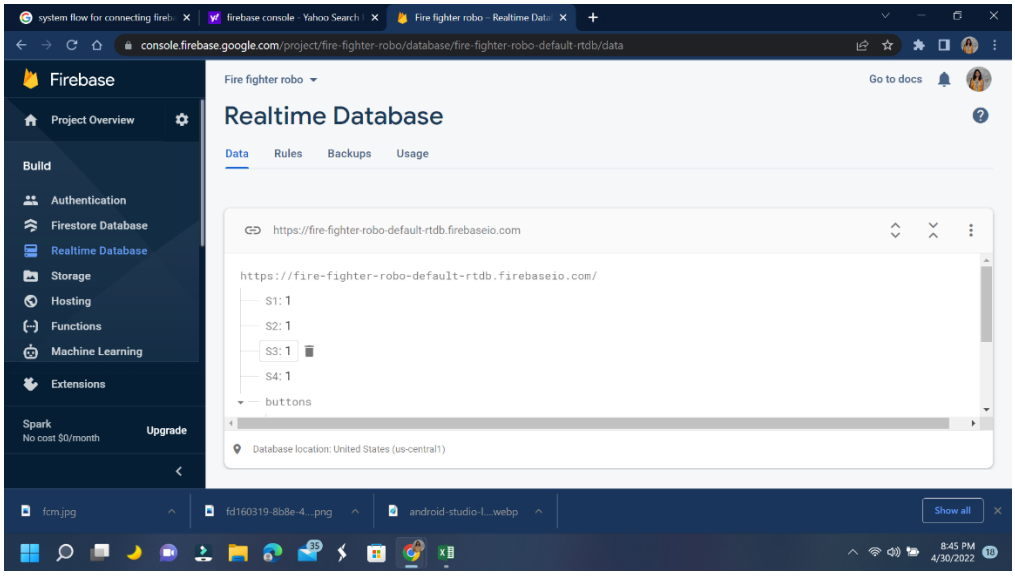

Fig 4.1.2 Firebase Console

4.2 PROGRAM

The Arduino IDE is used to program Node MCU. The fire sensor will output a HIGH when there is fire and will output a LOW when there is no fire. We have to keep checking these sensors if any fire has occurred. If there is any fire, we can ask the robot to move in that direction by giving commands through android application.

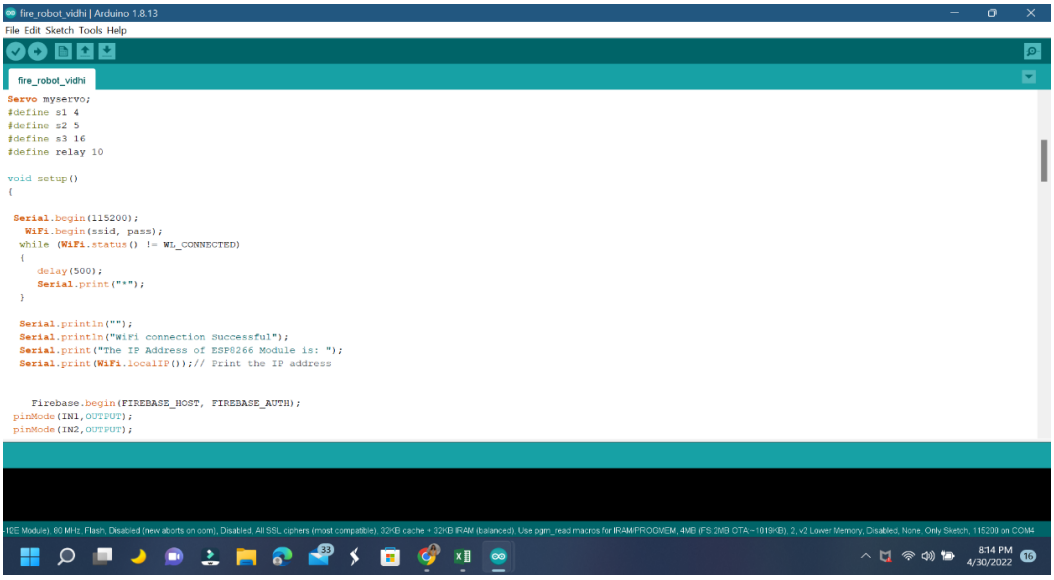

Fig 4.2.1 Arduino Program Console (1)

4.3 FINDINGS/ RESULTS/ OUTCOMES

The outcome of this project is a successful fire fighter robot which detects fire and extinguish it. The control operation such as movement of forward, backward, left and right is controlled by our android application.

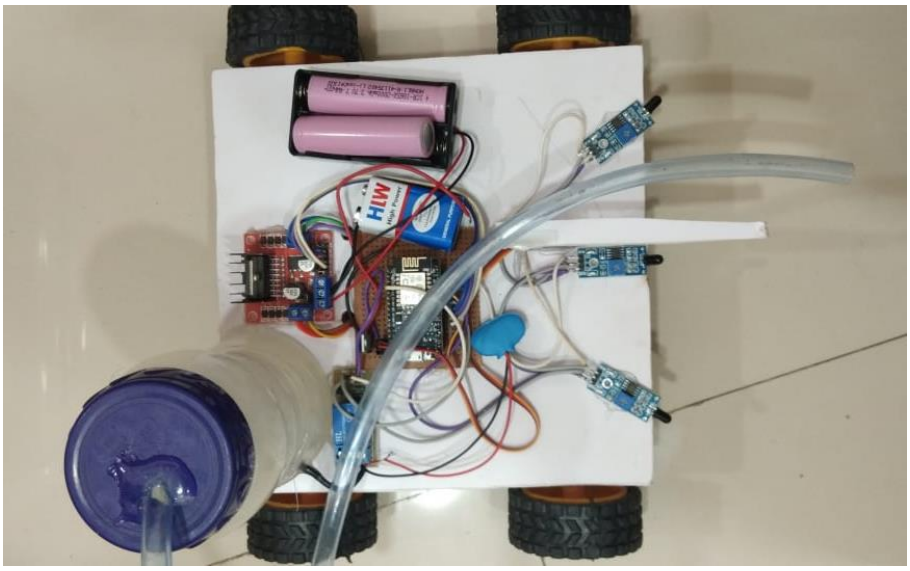

Fig 4.3.1 Initialization of Robot

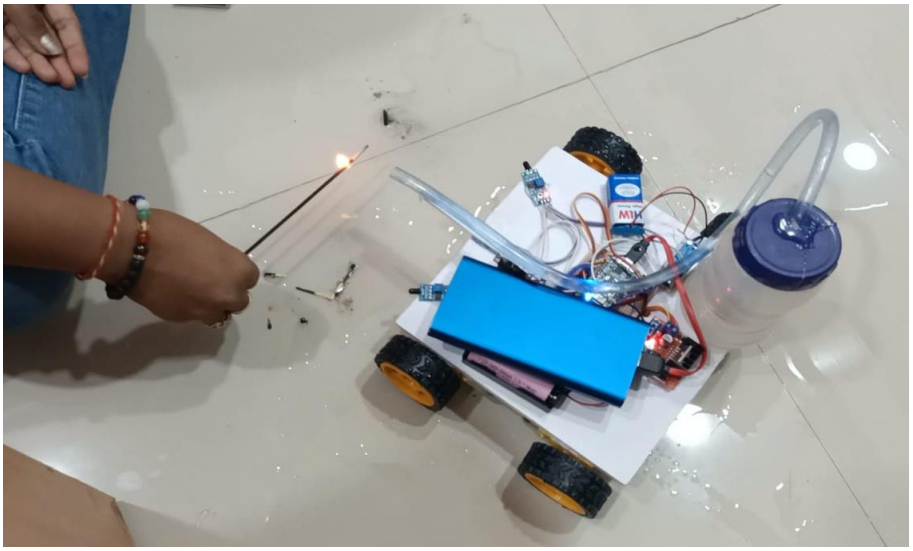

Fig 4.3.2 Detection of Fire by Robot

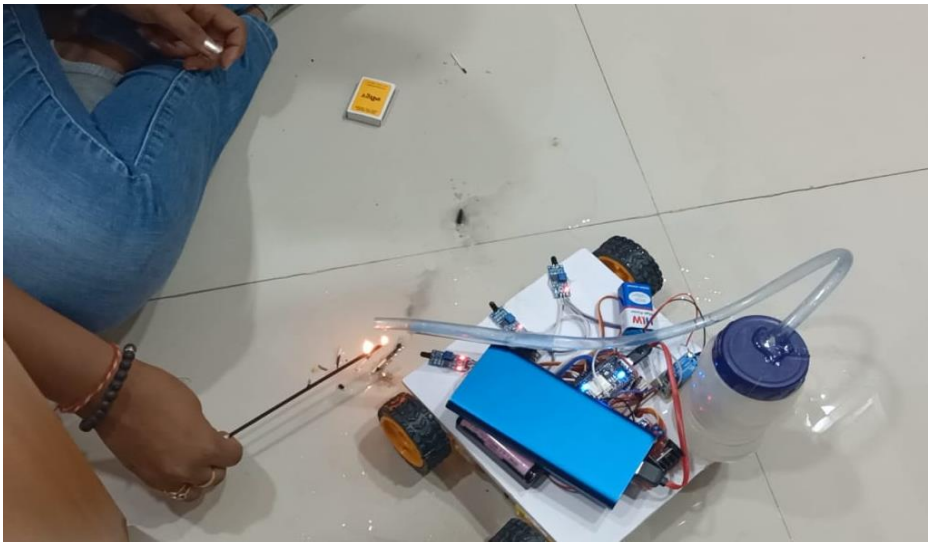

Fig 4.3.3 Extinguishing of Fire by Robot

Fig 4.3.4 Controlling of Robot through Android Application

4.4 RESULT ANALYSIS/COMPARISON

The hardware employed is to implement the proposed robotic system. In addition to presenting a number of real experiments which have been carried out to assess the efficiency of the proposed system.

We need to connect to the battery so that the Node MCU and flame sensor we get start. Then a lithium battery is connected so that the mini pump gets started so that when the flame sensor detects the flame it pours water on it. Now, we need to connect a power bank so that the BO motor can be operated. After all the connection has been made now it is ready to use.

With a lighter burn some paper and then with the Android application move the robot towards the fire place so that it can detect the fire and as it detects the fires the water gets started to sprinkle on it.

5.0 TESTING

5.1 TESTING PLAN/ STRATEGY

Following testing plans are used in testing of fire fighter robot project.

Usability Testing

Users use many devices of varying shape and form factors. Also, the perception varies from user to user. This is why investigating the usability of the system is very important in IOT testing. The usability of each device used in IOT must be determined. Usability testing refers to evaluating a product or service by testing it with representative users. Typically, during a test, participants will try to complete typical tasks while observers watch, listen and takes notes. The goal is to identify any usability problems, collect qualitative and quantitative data and determine the participant's satisfaction with the product.

The Usability of our system is carried out by asking different user to download the application in their mobile and then asking them to check the system. So that we can get the feedback of users that what changes we need to do in our project. Also are they comfortable with the system or not.

Compatibility Testing

A number of devices can be connected through the IOT system. Such devices have varying software configurations and hardware configurations. Therefore, there is a huge number of possible combinations, thereby making the compatibility of an IOT system important.

Compatibility testing is also important due to the complex architecture of the IOT system. Testing items like OS versions, browser types, devices' generation, and communication modes is vital for compatibility testing.

The Compatibility of our system is carried out by us with respect to different Android version mobile phone. To check the application made by us is compatible in every Android version or not. Also we made our robot work in such places where man cannot go, to check if it can be operated at everywhere.

Performance Testing

Performance testing is essential for developing a strategic approach to develop and implement the IOT testing plan. Performance testing is the practice of evaluating how a system performs in terms of responsiveness and stability under a particular workload. Performance tests are typically executed to examine speed, robustness, reliability, and application size.

In Performance testing we tested different approach to get the best of our project. We did various testing like how fast the robot will reach to the destination, is there a delay introduce or not, how the system is safe in a particular scenario.

5.2 TEST RESULT AND ANALYSIS

5.2.1 Test Cases

Testing Case 1

First testing case consists of a manual fire fighter robot. This fire fighter robot is operated manual i.e., without use of android application. It represents basic module of detecting fire and extinguishing it manually.

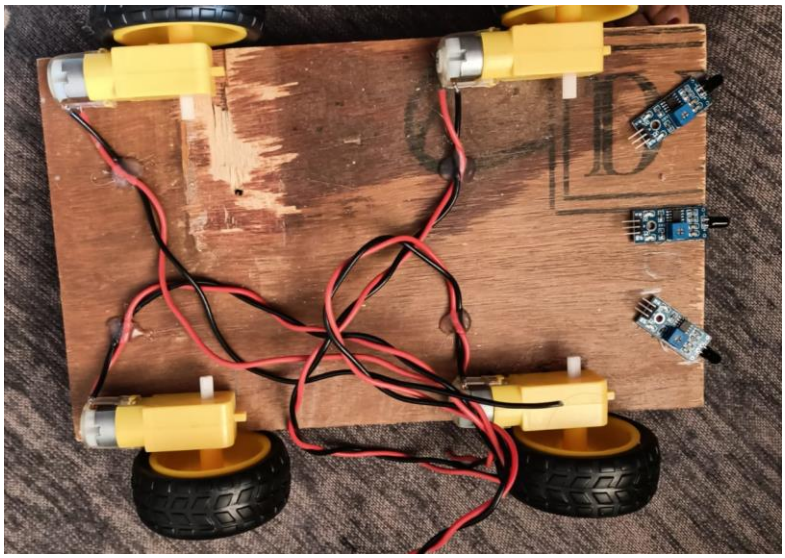

Fig 5.2.1.1 Manually Operated Fire Fighter Robot

This model is traditional and has lots of limitations. It is not secure and does not provide remote control to the user. User has to manually place it to fireplace which is not safe.

Testing Case 2

Second testing case is using existing application Blynk for remote control. The robot is controlled via android application. The application is connected via Wi-Fi to the robot. It has controls such as to move in direction upwards, backwards, left and right.

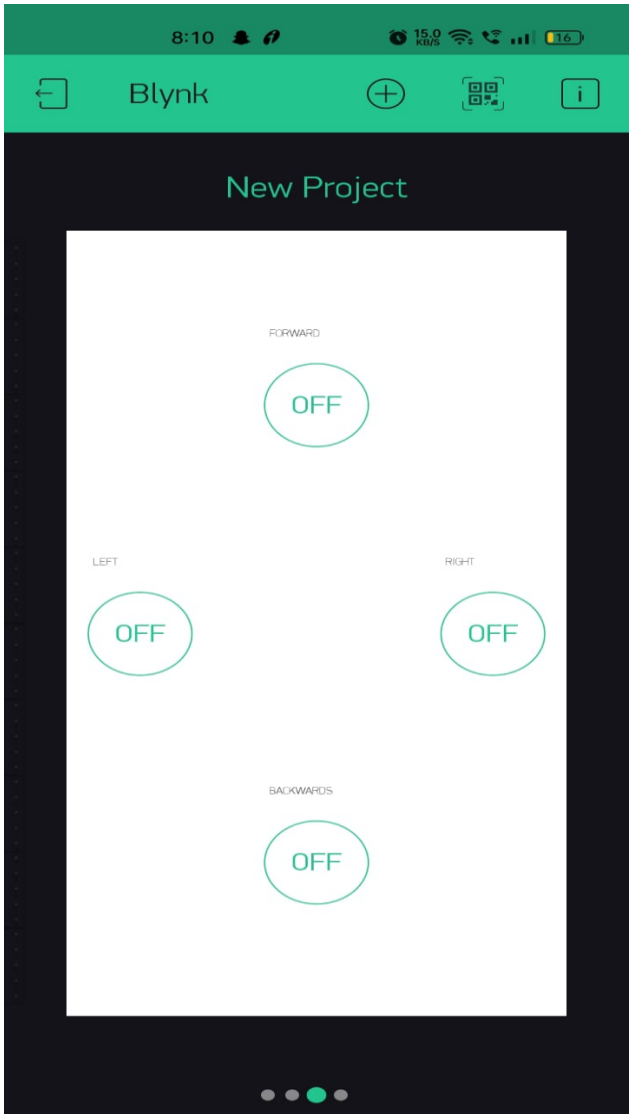

Fig 5.2.2.2 Robot Controlled via Blynk Application

This testing case also has limitation. The connection fails abruptly and the process of detecting and extinguishing stops. The robot sometimes passes of fireplace without detection.

Testing Case 3

Third testing case is the one which we implemented. We made application named ‘Fire fighter robo’ which is used for remote controlling of the robot. The connection between robot and application is secure and executed using Google firebase.

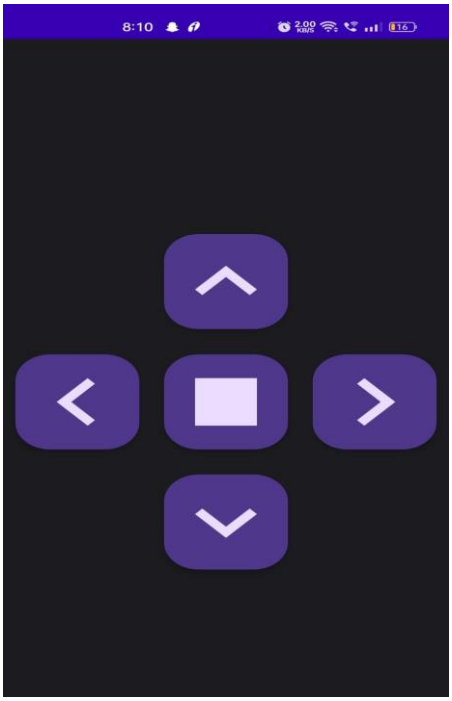

Fig 5.2.3.1 Fire Fighter Robo Application

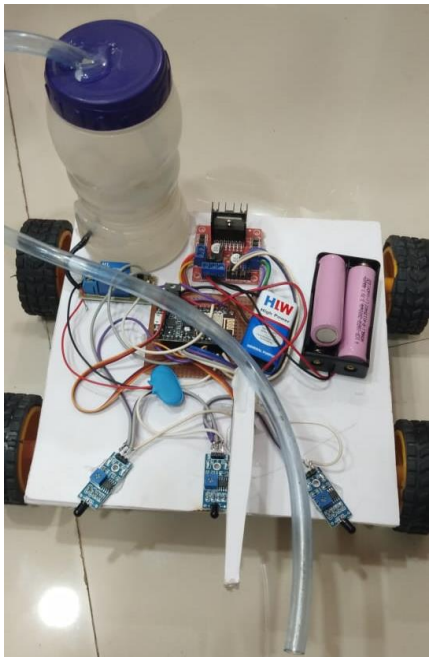

Fig 5.2.3.2 Android Controlled Fire Fighter Robot

6.0 CONCLUSION

6.1 DATES OF CONTINUOUS EVALUATION

8 January 2022

Researched for project definition. Definition approved.

15 January 2022

Researched for hardware and software components.

22 January 2022

Learned and studied android and IOT specification of the project.

29 January 2022

Worked on software specification. Studied block diagram.

4 February 2022

Studied external components such as different Arduino Uno boards. Studied IOT modules.

12 February 2022

Researched about hardware components. Started deciding algorithm used in processing.

19 February 2022

Literature survey. Prepared system flow of the project. Funding from SSIP.

26 February 2022

Edited and finalized system flow of project. Finalized the algorithms used and specified their roles. Purchased hardware components.

4 March 2022

Studied L293D motor driver shield, Relay module, Arduino UNO board and its connection.

12 March 2022

Researched and set up connection with help of circuit diagram (basic module). Prepared IOT code. Implemented and tested basic module

19 March 2022

Resolved the error and analyzed bugs.

26 March 2022

Designed android application

2 April 2022

Implemented android application.

9 April 2022

Set up connection between android application and model through Google Firebase.

16 April 2022

Tested the module and analyzed its limitations

23 April 2022

Set up final connection and tested it.

30 April 2022

Completed project implementation.

6.2 SUMMARY OF PROJECT WORK

Robot and smartphones are a perfect match, especially mobile robots. As phones and mobile devices are each time more powerful, using them as a robot for building a robot with advanced feature such as voice recognition. It is concluded that smart living will gradually turn into a reality that consumer can control their vehicle remotely and wirelessly.

This project describes about the real time firefighting robot controlled by using android application that extinguish the fire. The detection of fire is done by sensor module which uses flame sensor and android application. The fire extinguishing is done by pumping mechanism that spray water on fire and extinguish it. The robot is connected with mobile phone through Wi-Fi module and processes data received from the sensors.

However, in this project, extinguishing of fire is done with the water which is most suitable for both time and material work and also it makes project cost effective. This fire extinguishing process is very effective and safe.

6.3 FUTURE ENHANCEMENTS

The knowledge is ever expanding and so are the problems which the mankind strives to solve. In this spirit, it is hoped that the current activity will lead to further enhancements. Further modification can be done by replacing the sensors with the Camera to provide the accuracy and overcome the issues suffered by the sensors.

For example:

1. Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies etc.
2. By making it GPS enabled, robot can be controlled from remote station also.
3. It can be further expanded with voice interactive and 360-degree vision camera system facility.

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