

FIRE FIGHTING ROBOT

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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 “**FIRE FIGHTING ROBOT**”, submitted by *SANGEETA SUTRADHAR* and *SULTANA MAHI RUMKI * 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 25 February 2020.

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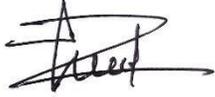
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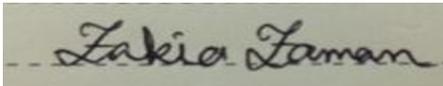
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Mrs. ZAKIA ZAMAN , SR. LECTURER , Department of CSE** Daffodil International University. We also declare that this project has been submitted elsewhere for award of any degree or diploma.

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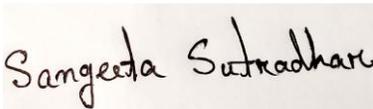
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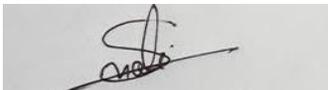


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ABSTRACT

Robotics has acquired quality on account of the headway of the numerous innovations of processing and nanotechnologies. In this way, we proposed to plan something that can make people's life simpler and agreeable. Involves a machine that not just has the fundamental alternatives of a robot, yet additionally can identify fire and human heartbeat smother it. The FIRE FIGHTING ROBOT will move in each of the 360-degree bearings. Accordingly, we will work a robot over a truly significant distance and there's no requirement for humans to head out really near the space ablaze. It comprises Infrared based fire sensors introduced in every one of the six bearings, with six sensors the forward way with long, and short reach. The microcontroller goes about as a primary control square of the proposed framework. The engine driver goes about as a push-pull enhancer which gets the rationale from the microcontroller which thus supplies the capacity to the motor and pumps.

TABLE OF CONTENTS

CONTENTS	PAGE
Approval	ii
Board of Examiners	iii-iv
Declaration	v
Acknowledgment	vi
Abstract	vii
List of Figures	x
Chapter 1: INTRODUCTION	1-4
1.1 Introduction	1
1.2 Motivation	1
1.3 Objectives	2
1.4 Expected Outcome	2-3
1.5 Project Organization	4
Chapter 2: BACKGROUND	5-7
2.1 Introduction	5
2.2 Related Works	5
2.3 Scope of the Problem	6
2.4 Challenges	7
Chapter 3: REQUIREMENT AND DESIGN SPECIFICATION	8-20
3.1 Business Process Modeling	8
3.2 Requirement Collection	9-16
3.3 Use Case Diagram	17
3.4 Design Requirements	18
3.5 Interaction Design and UX	18
3.6 Implementation Requirements	19
	viii

Chapter4: IMPLEMENTATION AND TESTING	20-26
4.1 Implementation Robot Design	20
4.2 Implementation Testing	21-26
4.3 Limitation	26
Chapter 5: CONCLUSION AND FUTURE SCOPE	27-28
5.1 Discussion and Conclusion	27
5.2Scope for Further Developments	28
REFERENCES	29
PLAGIARISM REPORT	30

LIST OF FIGURE

FIGURES	PAGE
Fig 3.1: BPM for Fire Fighting Robot	8
Fig3.2: Plastic display board	9
Fig 3.3: Wheel	9
Fig3.4: Servo motor	10
Fig3.5: Gas Cylinder	10
Fig3.6: Ultrasonic sensor	11
Fig3.7: Temperature sensor	11
Fig3.8: Heatbeat sensor	12
Fig3.9: Fire sensor	13
Fig3.10: Nozzle sprayer	14
Fig 3.11: Microcontroller	14-15
Fig 3.12: Battery	15
Fig 3.13: Buzzer	16
Fig 3.14: Use Case Diagram of Fire Fighting Robot	17
Fig 3.15: Arduino IDE	19
Fig 4.1 Robot design And implement	20

CHAPTER 1

INTRODUCTION

1.1 Introduction:

The robot is a framework that contains sensors, control conditions, controllers, power supplies, and programming all taking an interest to play out a task. Robots decay the necessity for firefighters to get into risky conditions. Firefighting is significant work yet it is a hazardous occupation. Because of that, Robots are intended to discover a fire, before it seethes wild. It very well may be utilized to work with firemen to decrease the danger of injury to casualties.

1.2 Motivation:

Firefighting and salvage movements are viewed as hazardous missions. The inspiration driving this undertaking is the fireman's passing. Numerous firemen are attempting to play out their obligation which causes a lot of death while on a mission and the conditions identified with every occurrence. Firemen are our saints and our feeling that all is well with the world in a difficult situation. They put themselves in perilous circumstances to ensure us. As of now, the world is advancing toward the utilization of advanced programming and equipment. This task presents the improvement of a firefighting robot that can quench fire without the requirement for firemen to be presented to the superfluous threats. In this way, it is fundamental to build up a robot that can distinguish the presence of fire just as stifle it.

1.3 Objective:

- The principle objective of this task is during happen fire in the structures of homes, a robot will distinguish the fire area by sensors then the robot will go to that area by haggles will splash the water or gas and it will quench from consuming that place.
- Reduce the exertion of human work and diminish cost.
- Making a robot that will screen the circumstance of happening from the fire.
- Reduce the danger for firemen.
- To guarantee wellbeing.
- Start ringer when a fire will distinguish.
- Operate by ATMEL Micro Controller.
- Extinguish homes, production lines, or ventures from consuming.
- For universally useful or mechanical reasons this robot could be utilized.
- Fire causes substantial misfortunes monetary and taking live both, this putting out fires robot could be the lifeguard.
- These kinds of robots will work with firemen sometimes.
- Before fire blast robots will smother the consuming things.

1.4 Expected Outcome:

The objective of the putting out fires robot project is to make a wheeled robot with capacities to explore through an exceptionally planned labyrinth, recognize a light fire (reproducing a fire), smother the fire, and get back to an assigned area inside the labyrinth. Our firefighting robot will distinguish any sort of heartbeat and salvage them.

•Fire-battling robot will be constrained by ATMEL Micro Controller when a fire will happen the fire sensor will identify the fire and heart chopped and will begin the signal and the robot will go to the fire region and salvage human.

•When a fire in range the robot and recognize the fire simultaneously Gas Cylinder will begin for splash gas or water and will douse the fire, at that point if the gas level in the chamber turned out to be the first floor Red LED will be turned on, in any case, Green LED will be on for known the measure of gas.

- This robot is fit however long there are water and battery charge are accessible, the robot will work.
- This robot could be utilized for mechanical reasons and home purposes.
- Expecting more affordable for this Fire-battling robot.
- Robot will actually want to convey fire smother gas with it.

1.5 Project Organization:

These have shown up in changed parts according to the going with direction: Chapter 2 has been given for the establishment of this Project. The Requirement and Design assurance has been laid out in area 3 where its execution cycle has been shown and the usage case graph has been moreover used. Execution testing has been given in part 4 to showing our normal result premise on examination and test. At last, we have thought about certain viewpoints through the conversation, end, suggestion, and suggestion for future exploration that has been additionally clarified in section 5.

CHAPTER 2

BACKGROUND

2.1 Introduction

With the advance within the field of advanced mechanics, human interruption has gotten less, and robots square measure as a rule typically used for well-being reasons. In our daily life, fireplace mishaps have gotten traditional and from time to time might prompt perils that create it arduous for the hearth fighters to make sure human existence. In such cases, a putt-out fire robot is employed to observe human lives, riches, and environmental factors from the hearth mishaps. This firefighting robot project may be a high-level task for the US. the number of fireside episodes of Asian country has distended step by step. a year ago we have a tendency to saw plenty of awful fireplace mishaps. Like, recent Dhaka fireplace misfortune Chawkbazar fireplace misfortune then on. A fireplace fighting mechanism is provided for characteristic fire if a house bursts into flames whereas someone within the home is either dozing or not present within the house. Through this firefighting robot, people and properties may be saved from fireplace mishaps. that's the rationale, we have a tendency to do this task.

2.2 Related Works

❖ Associate in Nursing machine-controlled "fireman robot" was made by Nevon, which has contained a water tank with a siphon, used Bluetooth module and 8051 microcontrollers for this task.

❖ android controlled 'fireman robot' project was made by four Indian understudies and that they used Arduino Uno R3 Microcontroller and Bluetooth Module, in any case, they used smoker sensor and engine for water sprinkle.

❖Prof.Dr. S.N KINI and his pack used PIC Microcontroller, Wi-Fi module, lightweight indicator, chimney ID finder to make up Associate in Nursing endeavor named 'firefighting robot controlled using machine Application. It worked subsequently while not manager.

2.3 Scope of the problem

There are several scopes for the fire-fighting robot. This putt out fires mechanism mainly supposed for within exercises, for home, Industrial reason robot might be used. Commercial structure putt out fires security this robot might be used. flat for living this robot might be used. Monitoring fireplace security for all occasions. For fashionable and personal reason robot might be used with govt. firemen. All institutions may be used this mechanism to forget security from the hearth. Private and govt. for each reason, this mechanism might be used. This robot might profit for advanced mechanics organization, this sorts of robots square measure valuable and essential for welfare life. For grouping this robot desires folks teams for created, work for that may create a field for his or her work. Utilizing this mechanism can smother the spot from intense. Develop this robot for real execution it might profit for carrying on with life and moreover for country celebrated. The robot characteristic consumed territory in 0m ~ 2m in span. Robots distinguish fireplace occasion and use smother to battle the hearth supply and therefore the electronic equipment related to the programmable appliance. The robot will quench the fireplace from oil, gasses, and electrical machine.

2.4 Challenges

The twenty-first century has to date been an excellent age for artificial intelligence. This mechanism will effectively add reality not just for demo half that's one of all the big difficulties. Demo mechanism and real mechanism size square measure typically important for getting supreme results. The main challenge of this mechanism is the detector used for the mechanism – fireplace detector for acknowledging fireplace of the environments. Moving every place within the place is a most crucial challenge, have to be compelled to imagine that that place mechanism can tackle the job for that reason material square measure ought to be added for that. fireplace fighter mechanism will acknowledge fireplace once fireplace happened within sight Firefighting mechanism distinguish fireplace during a kind time and smothered fireplace by splash water or gas. On the opposite hand, this mechanism had a heartbeat detector, by exploitation this detector mechanism is in a position to rescue folks people who treed within the fireplace. This sort of instrument copy for crucial the \$64000} word action to protect human life and critical property from the stack. "putting out fires robot "is a state of the art development irksome new world.

CHAPTER 3

REQUIREMENT AND DESIGN SPECIFICATION

3.1 Business process Modeling

I have been building up a putting out fires mechanical cycle for business module, how are this business interaction demonstrating are carried out, how are appropriate interaction distinguished and how are the help charged? How this undertaking is for fundamental for in this part I will expand on the process. First, what is mechanical interaction for business reason, An innovation intended for rules-based business measure which interest for current technology, this project is absolutely present day assumption based venture that for business measure match to the business. For consumer loyalty, added each cutting edge regulator and moderate devices and first working robot that will be consumer loyalty..For everybody fulfillment BPM will be attached below.

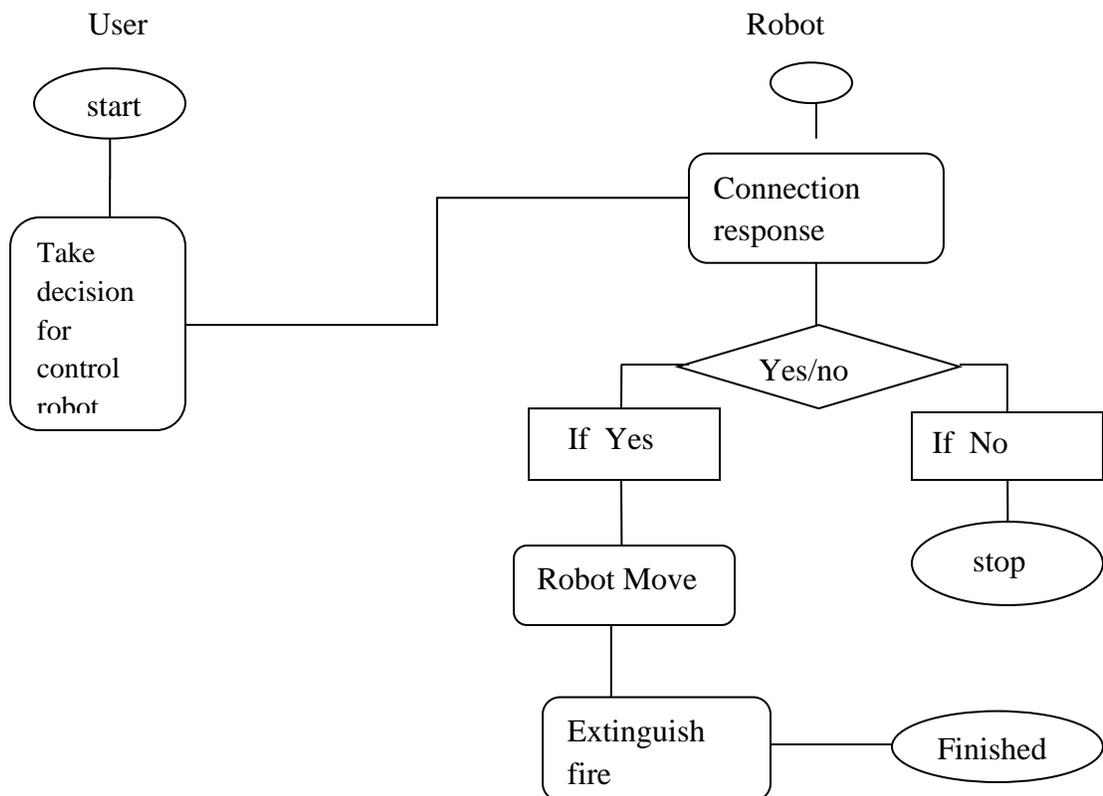


Fig3.1: BPM for Fire Fighting Robot.

3.2 Requirement Collection

Hardware:

To direct this undertaking, we need sensors, microcontrollers, robot packaging, wheels, engines, LED, and some equipment hardware that will be depict following.

1. Plastic display board where I used all the components to set up. It is the hard plastic board.



Fig3.2: Plastic display board

2. Wheel

A roundabout item that spins on a pivot and is fixed under a vehicle or other item to empower it to move effectively preposterous.



Fig3.3: Wheel.

3. Servo motor

A servo engine is a rotating actuator or a motor that considers precise control of the extent that the saucy position, speed increment, and speed. ... In this manner, it uses a standard motor and sets it with a sensor for position analysis.



Fig3.4: Servo motor

4. Gas Cylinder

All compacted gas cylinders will be gotten with chain or lash between the ... show up on the neck or shoulder of the chamber: 4L02* implies that the cylinder ... of date, so in fact, the gas supply organization can't eliminate it in the event that it is obsolete.) boundary in any event 5 feet high having a fire-rating of at any rate 0.5 hours is required.



Fig3.5: Gas Cylinder

5 .Ultrasonic Sensor

An ultrasonic sensor is an electronic contraption that exercises the distance of something objective by conveying ultrasonic sound waves and converts the reflected sound into an electrical sign. Ultrasonic waves travel quicker than the speed of recognizable sound.



Fig3.6: Ultrasonic sensor

6.Temperature sensor

A temperature sensor is an electronic gadget that exercises the temperature of its current circumstance and converts the information into electronic information to record screen or sign temperature changes. There is a wide extent of sorts of temperature sensors.



Fig3.7: Temperature sensor

8.Heartbeat sensor

Heartbeat Sensor is an electronic contraption that is utilized to gauge the thump for example speed of the heartbeat. Checking inward warmth level, beat and circulatory strain are the significant things that we do to keep us sound. To gauge within heat level, we use thermometers and a sphygmomanometer to screen the Arterial Pressure or Blood Pressure. Heartbeat can be noticed in two different ways: one course is to genuinely check the bang either at wrists or neck and the substitute route is to utilize a Heartbeat Sensor. In this undertaking, we have organized a smothering flames robot which can see the Heart pound expecting there any human or creatures are in, Monitor System utilizing Arduino and Heartbeat Sensor. I can discover the Principle of Heartbeat Sensor, working of the Heartbeat Sensor and Arduino based Heart Rate Monitoring System utilizing an accommodating heartbeat Sensor.

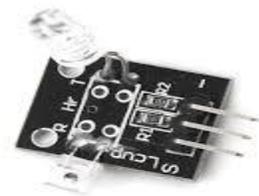


Fig3.8: Heartbeat sensor.

8.Fire sensor

A fire sensor can't avoid being a sensor proposed to recognize and respond to the presence of fire, a fire sensor is a basic device. If we see the assurance of fire sensor, power supply pointer light, range 760nm ~ 1100nm, disclosure point 0 – 60 degree, power 3.3V ~ 5.3V, working temperature - 25 degrees C ~ 85 degrees C, estimation 27.3mm * 15.4mm, mounting openings size 2.0mm. In case we see the how to use fire sensor, 4pin is associated in fire sensor, 4 pins are VCC, GND, AOUT, DOUT, working pattern of this 4pin are, VCC-3.3V ~ 5.3V DC, GND-power supply ground, AOUT-MCU.IO (basic yield), DOUT-MCU.IO (progressed yield). The fire sensor is used for distinguishing fire with no confirmation itself.



Fig3.9: Fire sensor.

9.Nozzle sprayer

A spray nozzle is an exactness gadget that works with the scattering of fluid into a spray. Nozzles are utilized for three purposes: to convey fluid over space, to expand fluid surface territory, and make sway power on a strong surface.



Fig3.10: Nozzle sprayer

10.Microcontroller

For this task used Arduino UNO microcontroller, UNO Rev3 is an ATmega328P microcontroller board based, an 8bit microcontroller with 32kb flicker memory and 2kb RAM. UNO contains all that normal to help as a microcontroller, direct affiliation it to a PC with USB connect, Arduino board has straightforward and progressed both of pins. Uno is open-source gear, for import the item code use IDE. In case we see the specific points of interest microcontroller is ATmega328, this work voltage 5V, Input voltage(recommended) 7-12V and Input voltage(Limit)6-20V, Digital I/O Pins is 14, PWM Digital I/O Pins is 6, Analog Input Pins is 6, DC current per I/O pin 40mA, DCcurrent for 3.3V 50mA, Flash memory 32kb, SRAM 2kb, EEPROM 1kb, Clock Speed-16MHz.

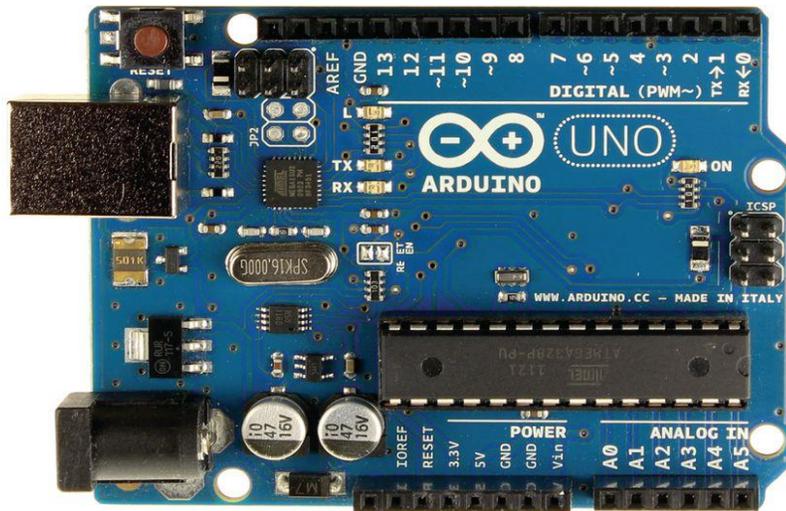


Fig 3.11: Microcontroller.

11. Battery

A battery is a force source remembering for any occasion one electrochemical cells with outside relationship for driving electrical gadgets like brilliant lights, cell phones, and electric vehicles. Precisely when a battery is giving electric force, its positive terminal is the cathode and its horrible terminal is the anode.



Fig 3.12: Battery

12.Buzzer

Buzzer resembles disturbing gadgets; Buzzer is used for somethings addresses. For this project utilized for consolidating with fire sensor that is when a fire will Buzzer bell will start Buzzing and furthermore when the water level will be increment ringer will be begin Buzzer too.



Fig 3.13: Buzzer

Others Hardware Components: With the above discussion needs more hardware components:

i.Wires

ii.Pipe (For Flow Water)

iii.Plastic Container

iv.Motors

v.Resistors

vi.Others Tools.

3.3 Use Case Diagram

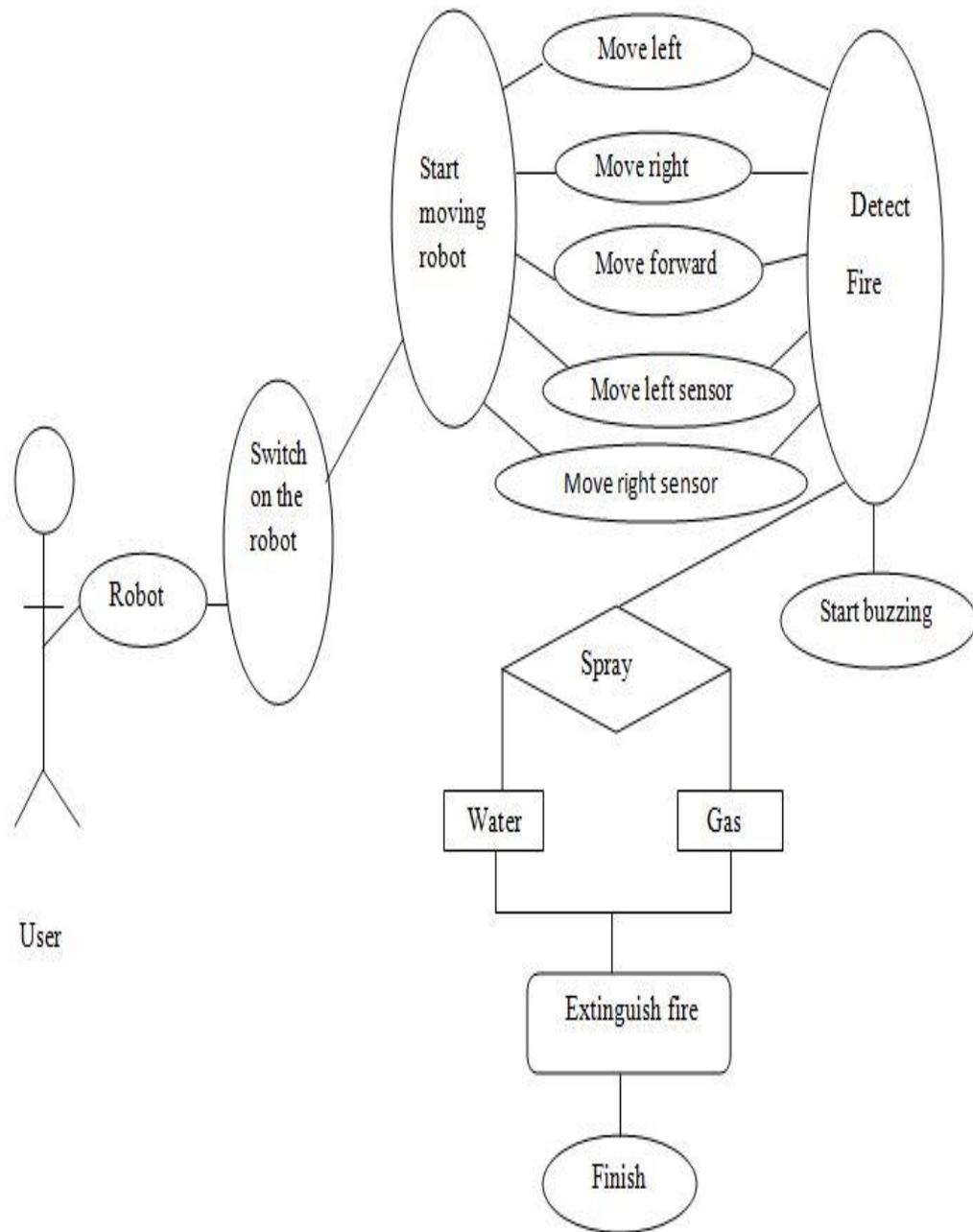


Fig3.1: BPM for Fire Fighting Robot.

3.4 Design Requirements

- A rectangular base to help entire robot construction and connected to four wheels for movement.
- This robot utilized a plastic board to plan the design robot.
- Used four motors to give movements to the robot.
- Various pieces of robot required arranged voltage-like as, motor driver utilized 4-6v, Arduino two or three sensors utilized 7-9v, water and organization station engine utilized 12v battery.
- Used Arduino Atmel microcontroller for control and program the robot
- Water tank And Gas chamber used to store fluid.
- Control robot and program for robot an Arduino Atmel Microcontroller utilized for this endeavor.
- Some diverse contraptions or stuff are partner with Arduino Atmel Microcontroller, as - Fire sensor, a couple of resistors, Led, and circuit wires.

3.5 Interaction Design and UX

An interaction plan is the design of the communication among clients and items. Presently, as we probably are aware the objective of association configuration is to create things that empower the client to accomplish their destinations in the most ideal way that is available, the cooperation between a client and a venture includes components like movement, sounds, space-time, conduct and some more, and obviously, this undertaking is, for the most part, satisfy this prerequisite for the client to project association. UX design is tied in with getting down to business the experience of utilizing a product..As we know there is a huge overlap between interaction design and UX design.

3.6 Implementation Requirements

- i. Laptop or Desktop
- ii. Plastic display board
- iii. Fire Sensor
- iv. Driving a motor
- v. Servo motor
- vii. Battery
- viii. LEDs
- ix. Wires
- x. Required Tools
- xi. Arduino microcontroller (with USB cable)
- xii. Water tank or gas cylinder (for reserve water)
- xiii. Arduino IDE (for write code)



Fig 3.15: Arduino IDE.

CHAPTER 4

IMPLEMENTATION AND TESTING

4.1 Robot design and implement

Each endeavor had an execution plan, that encourage the best way to deal with strategy project parts. "Extinguishing fires robot" project first plan on a board, by then it set up inside.



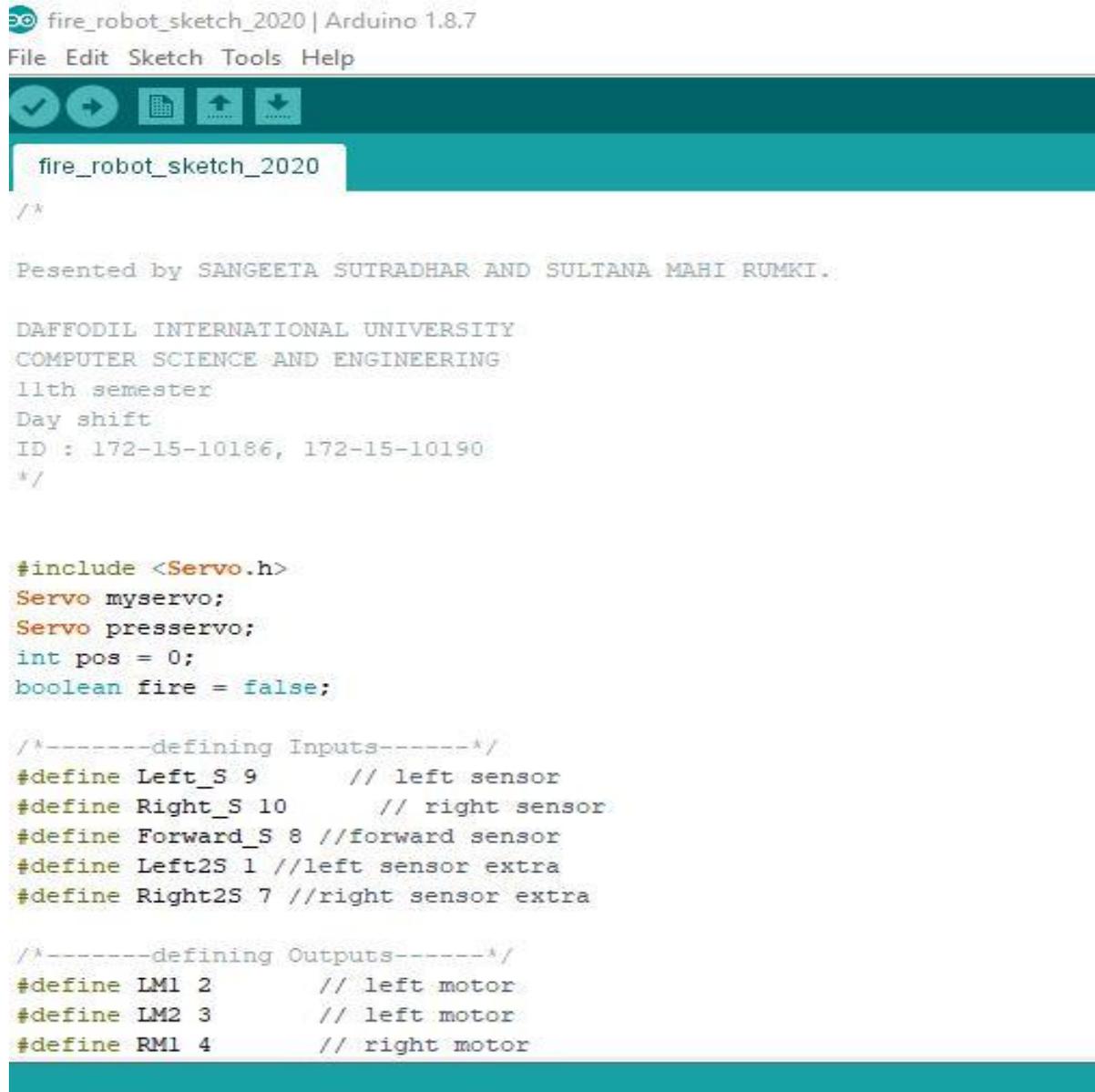
Fig 4.1 Robot design and implement.

4.2 Implementation Testing

Implementation testing refers to the way toward testing those implementations of project specifications.

Code for Fire-fighting Robot:

For the entire project below are some implemented codes for this project.



```
fire_robot_sketch_2020 | Arduino 1.8.7
File Edit Sketch Tools Help

fire_robot_sketch_2020
/*

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*/

#include <Servo.h>
Servo myservo;
Servo presservo;
int pos = 0;
boolean fire = false;

/*-----defining Inputs-----*/
#define Left_S 9 // left sensor
#define Right_S 10 // right sensor
#define Forward_S 8 //forward sensor
#define Left2S 1 //left sensor extra
#define Right2S 7 //right sensor extra

/*-----defining Outputs-----*/
#define LM1 2 // left motor
#define LM2 3 // left motor
#define RM1 4 // right motor
```

```
fire_robot_sketch_2020

#define LM2 3 // left motor
#define RM1 4 // right motor
#define RM2 5 // right motor
#define pump 6

void setup()
{
  pinMode(Left_S, INPUT);
  pinMode(Right_S, INPUT);
  pinMode(Forward_S, INPUT);
  pinMode(Left2S, INPUT);
  pinMode(Right2S, INPUT);

  pinMode(LM1, OUTPUT);
  pinMode(LM2, OUTPUT);
  pinMode(RM1, OUTPUT);
  pinMode(RM2, OUTPUT);
  pinMode(pump, OUTPUT);

  myservo.attach(11);
  myservo.write(90);
  presservo.attach(12); //botol servo
  presservo.write(60);
}

void put_off_fire()
{
  digitalWrite(pump, HIGH); //sound on
  delay(200);
}
```



```
digitalWrite (LM1, HIGH);
digitalWrite (LM2, HIGH);
digitalWrite (RM1, HIGH);
digitalWrite (RM2, HIGH);

for (pos = 60; pos <= 100; pos += 1) {
  presservo.write (pos);
}
for (pos = 50; pos <= 130; pos += 1) {
  myservo.write (pos);
  delay (10);
}
for (pos = 130; pos >= 50; pos -= 1) {
  myservo.write (pos);
  delay (10);
}
for (pos = 100 ; pos >= 60; pos -= 1) {
  presservo.write (pos);
  delay (10);
}

myservo.write (90);
presservo.write (60);
fire=false;
digitalWrite (pump, LOW); //sound off
}
```

```
void loop()
{
  myservo.write (90); //Sweep_Servo();
  presservo.write (60);

  if (digitalRead (Left_S) ==1 && digitalRead (Right_S)==1 && digitalRead (Forward_S) ==1 && digitalRead (Left2S) ==1 && digitalRead (Right2S) ==1) //If Fire not detected all sensors are zero
  {
    //Do not move the robot
    digitalWrite (LM1, HIGH);
    digitalWrite (LM2, HIGH);
    digitalWrite (RM1, HIGH);
    digitalWrite (RM2, HIGH);
  }

  else if (digitalRead (Forward_S) ==0) //If Fire is straight ahead
  {
    digitalWrite (pump, HIGH); //sound on
    //Move the robot forward
    digitalWrite (LM1, HIGH);
    digitalWrite (LM2, LOW);
    digitalWrite (RM1, HIGH);
    digitalWrite (RM2, LOW);
    fire = true;
  }
}
```

```

}

else if (digitalRead(Left_S) ==0) //If Fire is to the left
{
    digitalWrite(pump, HIGH); //sound on
    //Move the robot left
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, LOW);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, HIGH);
    delay(500);
}
else if (digitalRead(Left2S) ==0) //If Fire is to the left 2
{
    digitalWrite(pump, HIGH); //sound on
    //Move the robot left
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, LOW);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, HIGH);
    delay(2000);
    digitalWrite(LM1, LOW);
    digitalWrite(LM2, HIGH);
    digitalWrite(RM1, LOW);
    digitalWrite(RM2, HIGH);
    delay(1000);
}

else if (digitalRead(Right S) ==0) //If Fire is to the right

```



```

else if (digitalRead(Right_S) ==0) //If Fire is to the right
{
    digitalWrite(pump, HIGH);//sound on
    //Move the robot right
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, HIGH);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, LOW);
    delay(500);
}

else if (digitalRead(Right2S) ==0) //If Fire is to the right 2
{
    digitalWrite(pump, HIGH);//sound on
    //Move the robot right
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, HIGH);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, LOW);
    delay(2000);
    digitalWrite(LM1, LOW);
    digitalWrite(LM2, HIGH);
    digitalWrite(RM1, LOW);
    digitalWrite(RM2, HIGH);
    delay(1000);
}

```

```

delay(100); //Slow down the speed of robot

while (fire == true)
{
    put_off_fire();
}
}

```

There have some necessary essential codes on the total program, In the above example, the program is utilized for this putting out fire fighting robot.

Hardware Implementation:

All objects are part of the developing project, for 'Fire Fighting Robot used Sensors, microcontroller, power, LED, jumper wires, Breadboard. Now, if we want to know about the implementation of all components for this project then, after connecting every hardware part of this project all work like what was expected. Putting out fires Robot is created with different equipment segments. Execution of each piece of robot I need to coding for different parts. like concerning Arduino Microcontroller needs to coding for its pin mode, for siphon water and gas need to completed some code, for fire sensor to recognize fire need to executed coding.

4.3 Limitations

- "Firefighter Robot "can't work submerged or on Air.
- The sensor region (heartbeat) is a short area, if the human's area is ludicrous, the sensor will not work.
- Battery power is restricted, when the battery charge is over it will be closed down.
- Sensor life(fire) is short, if the Power Cross over the cutoff, the sensor will demolish.
- This robot can use for just covered fire.
- When the force of the robot is on, by then it will be worked, else it can't work itself.
- A director needs to work Robot.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 Discussion and Conclusion

Overall, the Fire fighting robot has been successfully created. Robots could be a future competitor of humans. For ordinary robots like this putting out fires robot which language is utilized for created c, Micro c and so forth For future innovation Robot is the primary column. For each field very kind of innovation is required robot field is one of them. The above portrayal is this putting out fires robot, part by part totally depicted obviously inside the entire robot. This robot is more proficient in everyday life. Arduino is all the more simple for execution for the normal robot, carry-out condition for the robot is all the more clear for comprehension. As a demo of a robot utilized all vital segments for created to this robot that which could be the genuine best powerful gadget. Here we effectively the site where the robot exists. For equipment association in the event that anybody needs to build up this project I would suggest that utilization PCB load up for association wires one to others associations, as a designer of this undertaking on the off chance that anybody needs to build up this project it's not hard to execute and built up this sort of robots simply need to give a few times above it.

Robot Behavior

Inspiration driving this errand splashed fire by using a robot that can use a choice of human. The point of the venture is to make the robot move around in the happened place utilizing the wheel, recognize the fire at that point start shower water and stop the fire. The arranging of the conduct is begun by designing the significant development likelihood of the robot-like after the correct divider and following the left divider, the course of the robot should likewise be planed which will choose administrator. To file this, the robot needs to play out a few customized subroutines, for example, follow the fire, spray water.

5.2 Scope for Further Developments

1. For future extension need to add a brilliant rescue vehicle with this robot, for that need to add a sim card with this robot for when a fire will identify that second the robot will advise approaching fire-administration.
2. For future extension work this robot association media WiFi would be added for greater accessibility.
3. For the future another smoke sensor needs to add with this robot for more delicate work.
4. For future mechanical and home reasons it very well may be utilized with fire administration.
5. Use for each home, each private reason and for less cost for everybody can utilize effectively that would be one of the things to come execution.
6. Presently robot body isn't flame-resistant for that body could be harmful so that in the future, will work for this robot body as a flame resistant body.
7. This robot will be executed as a Drone for further developed office.
8. This robot can be created by adding a cell phone and associate it with Bluetooth.

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