MANIPAL
ACADEMY of HIGHER EDUCATION
DUBAI CAMPUS
(Deemed to be University under Section 3 of the UGC Act, 1956)

MECHATRONIC SYSTEMS PROJECT

FINAL PROJECT REPORT

TEAM MEMBERS

GIRISH KUMAR, EDWIN KENNY, AUSTIN JOSEPH

JUNAID MUBARAK MULLAJI, MOHAMMAD INAAM UL HAQ

VIDEO DEMONSTRATION

https://youtu.be/ac9G7cyaU_g

https://youtu.be/XwCtLE1_Zss

BTECH CSE SEM V

ABSTRACT

"Fire causes a lot of damage to the property, wasting all the resources that were used to build that property and most importantly the loss of life is catastrophic."

A robot is a type of automated machine that can execute specific tasks with little or no human intervention and with speed and precision.

One major use of robots is in dangerous places which are not safe for humans.

Firefighting robots are used in hazardous and populated areas to extinguish small flames before they spiral out of control. These robots rely on simpler systems relying on infrared and ultraviolet ray detectors to detect fires.

In this project, we will build a simple robot using Arduino that could face towards the fire and would extinguish the fire using wind energy. It is a very simple robot that would teach us the underlying concept of mechatronics.

The main brain of this project is the Arduino, but in-order to sense fire we use the Fire sensor module.

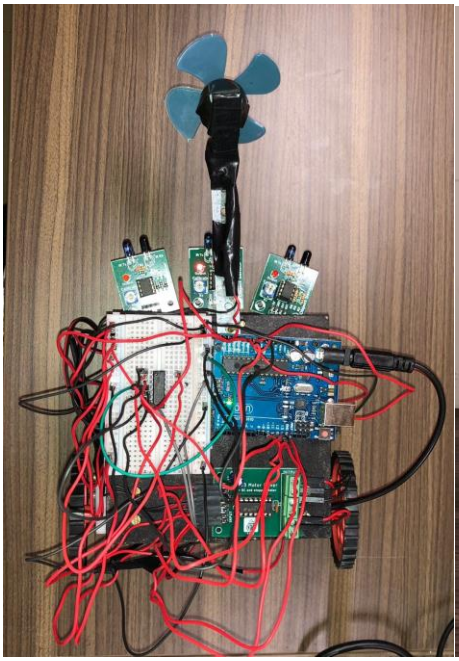
The real need of the firefighting robot is that the robot can reach places which prove dangerous for humans. As mentioned above, it is very reliable as the sensor quickly senses the heat, and the fan exerts wind energy which extinguishes the fire, if required the wind could also distribute fire retardant or water and control fire even further.

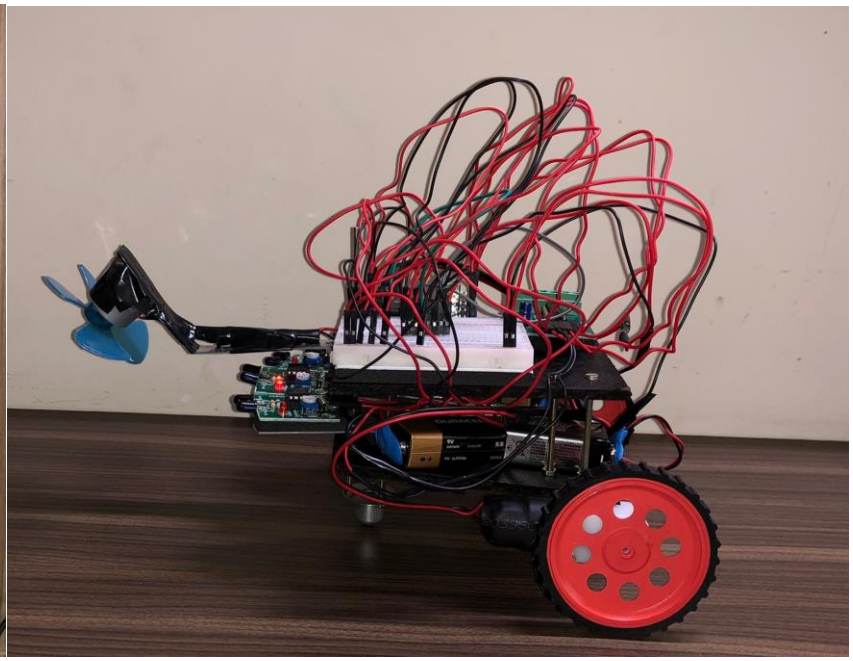
When we blow on a candle, we are doing two things - first, we are moving the flame away from its source of fuel, the vaporizing wax. Second, we are cooling down the area, so no combustion is possible any longer.

The Fire Could also be extinguished using Fire Retardants such as Borax Powder, etc.

The firefighting robot can be used in many industries as it reduces the risk of indulging human resources. Few examples include building fires, restaurant fires, malls, etc.

MATERIALS USED TO BUILD THE ROBOT





Arduino Uno, Motor Driver Circuit, Digital IR Sensors X 3, 60mm,45mm,30mm,6mm Screws, M3 Nuts, Double Sided Tapes, Breadboard, Pin Connectors, L293D Motor Driver IC, 9V Battery X 3, Metal Strips X 4, Metal Clamps X 2, DC Motor, Fan, BO1 Wheels X 2, UART Cable, Caster Wheel, BO1 Motors X2, Insulation Tape, Screwdriver, Wire Stripper.

ALGORITHM & SOURCE CODE

Sense Fire

Left Sensor > Middle Sensor & Left Sensor > Right Sensor

Motion Left

Right Sensor > Middle Sensor & Right Sensor > Left Sensor

Motion Right

Middle Sensor > Left Sensor & Middle Sensor > Right Sensor

Motion Forward

Middle Sensor > 600

Switch On Fan for 5seconds

Repeat Process

```
//Final Program Fire Fighting Robot


void setup() {
  // put your setup code here, to run once:
Serial.begin(9600);
pinMode(10,OUTPUT);
pinMode(11,OUTPUT);
pinMode(12,OUTPUT);
pinMode(13,OUTPUT);
pinMode(9,OUTPUT);
pinMode(A0,INPUT);
pinMode(A1,INPUT);
pinMode(A2,INPUT);


}
void moveRobot(String motion) {
  if(motion == "Forward"){
    digitalWrite(10,HIGH);
    digitalWrite(11,LOW);
    digitalWrite(12,HIGH);
    digitalWrite(13,LOW);
    Serial.println("Forward");
  }
  if(motion == "Backward"){
    digitalWrite(10,LOW);
    digitalWrite(11,HIGH);
    digitalWrite(12,LOW);
```

```
    digitalWrite(13,HIGH);
    Serial.println("Backward");
  }
  if(motion == "Left"){
    digitalWrite(10,HIGH);
    digitalWrite(11,LOW);
    digitalWrite(12,LOW);
    digitalWrite(13,HIGH);
    Serial.println("Left");
  }
  if(motion == "Right") {
  digitalWrite(10,LOW);
  digitalWrite(11,HIGH);
  digitalWrite(12,HIGH);
  digitalWrite(13,LOW);
  Serial.println("Right");
 }
 if(motion == "Stop") {
  digitalWrite(10,LOW);
  digitalWrite(11,LOW);
  digitalWrite(12,LOW);
  digitalWrite(13,LOW);
  Serial.println("Stop");
 }
}

void loop() {
```

```
  // put your main code here, to run repeatedly:


int Right = analogRead(A0);
int Middle = analogRead(A1);
int Left = analogRead(A2);


Serial.print(Right);
Serial.print("\t");
Serial.print(Middle);
Serial.print("\t");
Serial.print(Left);
delay(1000);


if((Left < 100) && (Middle < 100) && (Right < 100)){
  moveRobot("Stop");
}
else {
  if((Left > Middle) && (Left > Right)){
    moveRobot("Left");
    delay(500);
    moveRobot("Stop");
    delay(100);
  }
  if((Right > Middle) && (Right > Left)){
    moveRobot("Right");
    delay(500);
    moveRobot("Stop");
```

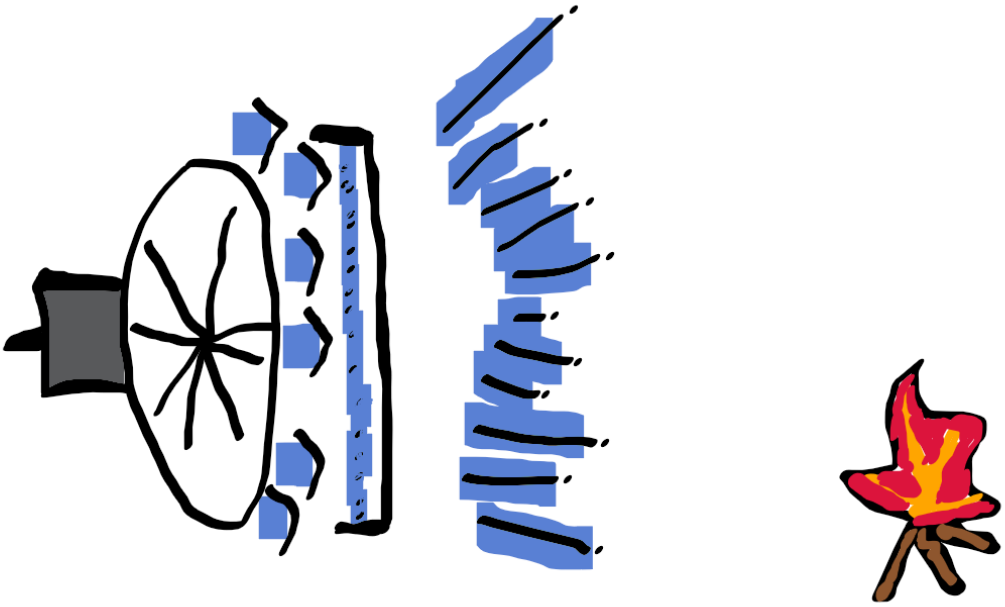
```
    delay(100);
  }
   if((Middle > Right) && (Middle > Left) && (Middle < 600)){
    moveRobot("Forward");
    delay(500);
    moveRobot("Stop");
    delay(100);
  }
  if((Middle > Right) && (Middle > Left) && (Middle > 600)){
    moveRobot("Stop");
    digitalWrite(9,HIGH);
    delay(5000);
    digitalWrite(9,LOW);
  }









}
}
```

VIDEO DEMONSTRATION

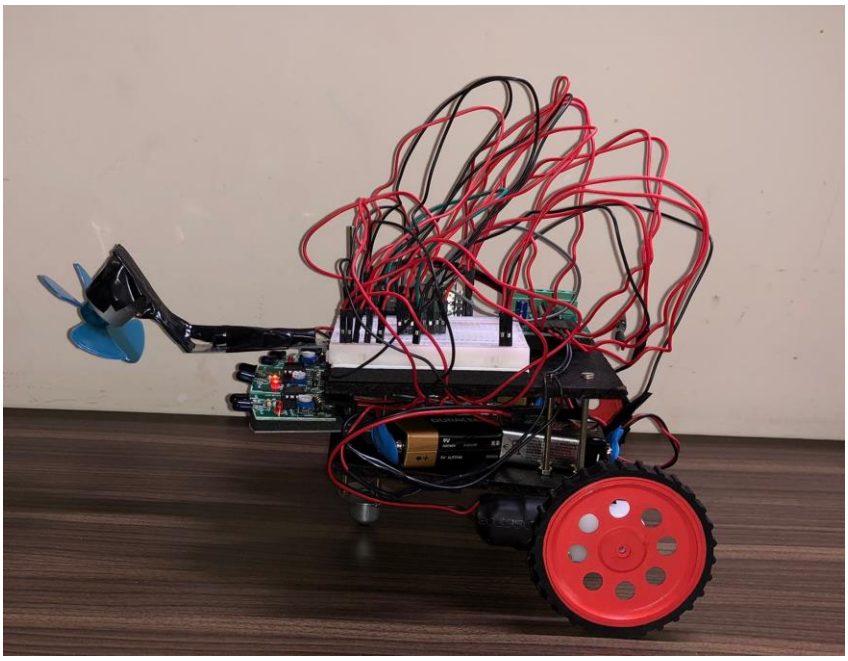
https://youtu.be/ac9G7cyaU_g

https://youtu.be/XwCtLE1_Zss

ADDITIONS

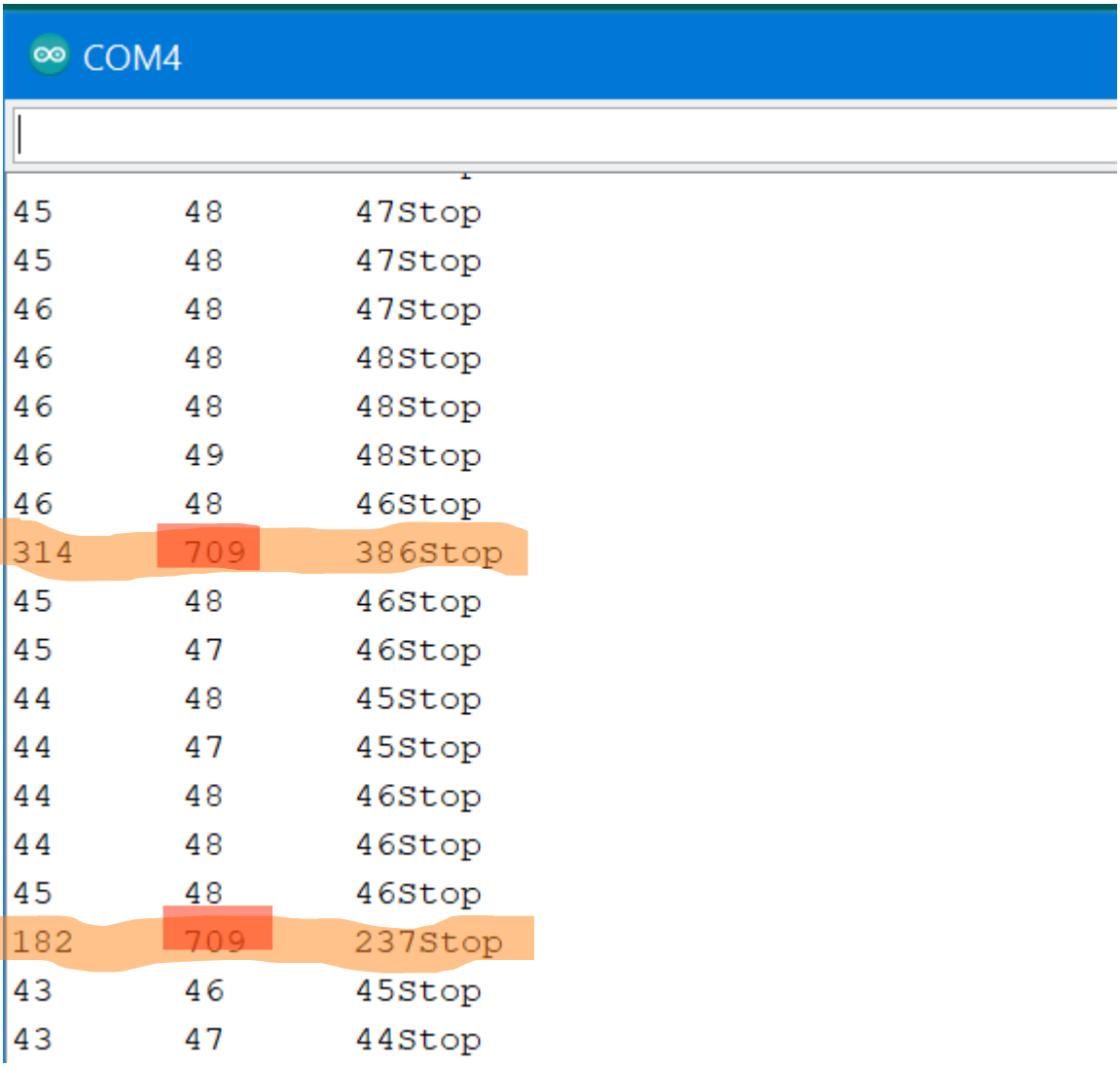


FIRE REDARDENT CAN BE PROPELLED USING THE FAN TO EXTINGUISH LARGER FLAMES BY CAUSING THE COMBUSTION TO STOP.



THE ROBOT CAN BE PROTECTED USING FIRE REDARTDANT MATERIAL FOR THE EXTERIOR AND HIGH MELTING POINT METALS BUT SINCE IN THIS CASE WE ARE USING LOW POWERED MOTORS, WOODEN CHASIS IS APPROPRIATE FOR THE PROJECT.

CONCLUSION



IR SENSOR READINGS UPON DETECTION OF FLAME

FOR VALUE OF GREATER THAN 600 IN THE MIDDLE IR SENSOR FAN SWITCHES ON TO EXTINGUISH THE FLAME.

The real need of the firefighting robot is that the robot can reach places which prove dangerous for humans. As mentioned above, it is very reliable as the sensor quickly senses the heat, and the fan exerts wind energy which extinguishes the fire, if required the wind could also distribute fire retardant or water and control fire even further.

The firefighting robot can be used in many industries as it reduces the risk of indulging human resources. Few examples include building fires, restaurant fires, malls, etc.

-THANK YOU-