FIRE FIGHTING ROBOT

ECS PROJECT REPORT

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Abstract-

In this paper we propose a fire fighting robot that can prevent many fire accidents based on instructions given by user. It has both manual and automatic modes. In recent times, the increasing frequency and intensity of fire-related incidents have highlighted the critical need for advanced and efficient fire-fighting technologies. This project presents the development of a Fire Fighting Robot utilizing a combination of sensors and modules, such as gas sensors, camera module, a Bluetooth module, and thermal sensor, IR sensors, sound sensors. The Fire Fighting robot aims to provide a comprehensive solution for detecting and combating fires in hazardous and inaccessible environments, thereby reducing human intervention and improving overall safety.
Key Words: Bluetooth Controlled, Wireless, Fighting robot, Android Phone, Low Cost, Reliable, efficient, Surveillance

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INTRODUCTION

Fires are among the most important form of problems. Robot industry has a lot of work in this area. So today robot is more commonly used to reduce the human efforts. The need of Fire Fighting Robot that can detect and extinguish a fire on its own and can be operated manually. Robotics is one of the fastest growing engineering fields of today. Robots are designed to remove the human factor from labour intensive or dangerous work and also to act in inaccessible environment. With the invention of such a device, lives and property can be saved with minimal damage caused by the fire. we tried to design a prototype that could autonomously detect the fire and extinguish it. The Fire Fighting Robot is designed to detect for a fire in the house or industry for extinguish the fire. The main and only work is to deploy the robot in a fire prone area and the robot will automatically work and be manually operated once it detects a fire breakout. This prototype helps in Rescue operations during fire accidents where the entry of service man is very difficult in the fire prone area. There are several existing types of vehicles for firefighting at home and extinguish forest fires. Our proposed robot is designed to be able to work on its own or be controlled remotely. By using such robots, fire identification and rescue activities can be done with higher security without placing fire fighters at high risk and dangerous conditions. In other words, robots can reduce the need for fire fighters to get into dangerous situations. When we the field of firefighting has long been a dangerous one, and there have been numerous and devastating losses because of a lack in technological advancement. 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. A recent trend that has become popular is to use robots instead of humans to handle fire hazards. This is mainly because they can be used in situations that are too dangerous for any individual to involve themselves in. In our project, we develop a robot that is able to locate and extinguish fire in a given environment and also have camera where the places affected can be monitored. The robot navigates the area and avoids any obstacles it faces in its excursion. Arduino board acts as a brain of the whole control circuitry .Robot consist of the uv sensors to overcome obstacles. Sensors are used to detect fire prone area all directions and moves the robot to fire location. When the robot reaches fire zone then a pump is attached on the robot comes into action to extinguish the fire.

OBJECTIVES:

There are four objectives of this project, which is stated in the following texts:

- To build a fire fighting robot using Arduino that can be used in real time scenarios that an ordinary firefighter cannot reach to extinguish fire
- To make the machine available for daily life scenarios in offices, kitchen areas
- To reduce human effort and to monitor and capture the surroundings
- To reduce the time delay in affected area and errors, limitations that are faced by human fire fighters.

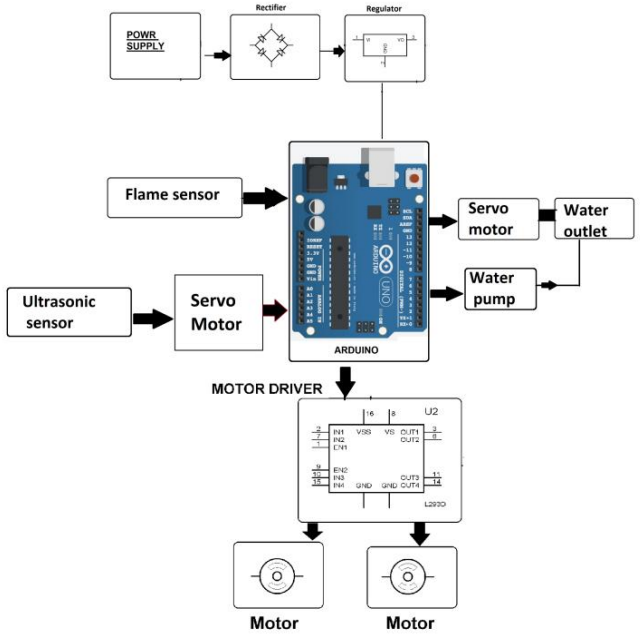
PROBLEM IDENTIFICATION:

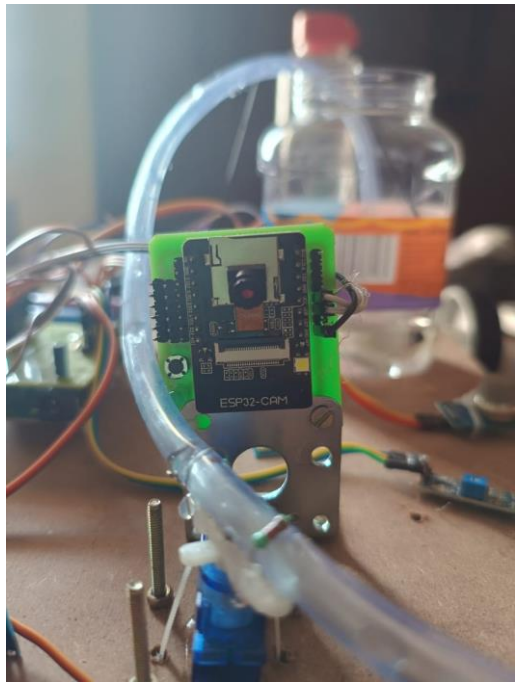
Since there are lots of time delays ,errors, like human as well as systematic error may be happened during rescue operations. So to avoid such circumstances we are designing the robot who can do work regarded supressing fire manually as well automatically and can be easily monitored.

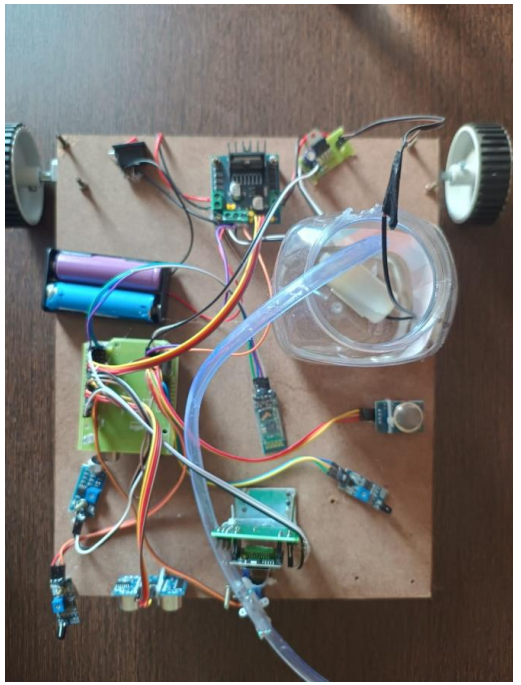
METHODOLOGY

This fire fighting robot is powered by Arduino Uno development board it consists of water pipe mounted on a servo motor for obstacles detection and free path navigation, it is also equipped with the fire flame sensor for detecting and approaching fire it also makes use of water tank and spray mechanism for extinguishing the fire. Water pump is mounted on servo motor to cover maximum area. Water is pumped from the main water tank to the water nozzle with the help of water pump. Hardware Specifications are Arduino Uno, Fire fighter robot body, Flame sensors, Cables and connectors ,Push buttons ,Switch, Motor Driver 298n ,Servomotor, Water pump ,Water tank, camera module The flame sensor sense the fire and send the information to the Arduino which is the brain of this robot. The brain will take the action according to the condition and information getting from the sensor. Arduino will give the commands to the Motors to start in the walk in the desired direction. if left sensor give the information about the fire then the Arduino will run the motor in left direction. same for the front and right side motor. It has cameral module which takes videos and pictures of surroundings and sends us through a telegram bot. The robot will stop near to the fire and start watering to it till the fire will be under control. The hardware part is one of the crucial parts in the development of firefighting robot. It includes Arduino UNO, IR flame sensors, servo motors, submersible water pump, motor driver, BO motors, and rubber wheels. firefighting robot which consists of IR flame sensors as the input of the system. Arduino UNO is used as a micro-controller that connects other components. Motor driver is used to drive motors and is capable of running DC motors at the same time.

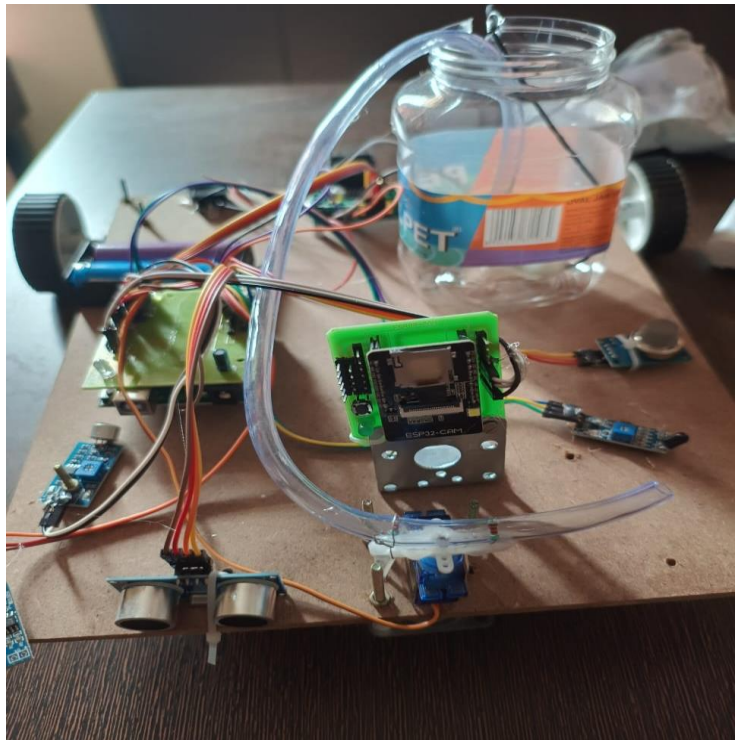
BLOCK DIAGRAM

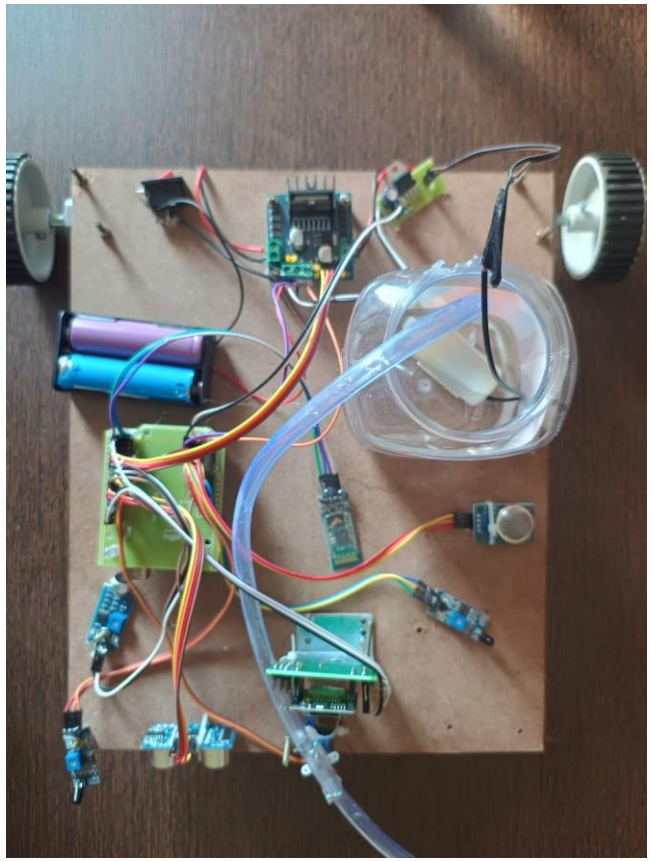






It can be operated as follows .we need to pair it using Hotspot pair it using IP address 192.168.238.224 .The following commands can be used to operate 1-automatic mode ,2.Manual mode,3-back,4-left ,5-right,6-forward,7-stop,8-pump on,9-pump off





CONCLUSION AND FUTURE SCOPE

Based on the findings of the analysis, design, and implementation that has been completed. As a result, some conclusions can be drawn, such as the fact that the fire fighting robot prototype is quite effective in assisting many rescue operations and prevent small scale fire accidents. Creating an fire fighting robot prototype using the Arduino Uno Microcontroller via Bluetooth modulated commands . Its is cost effective and very easy to use making it more efficient.

This can still have a lot of modifications.Thermal camera can be used to detect and monitor fires, night time vision camera can be also integrated to monitor clear vision in darkness. As always, possibilities are endless. . Battery monitoring, lighter body weight and to set alarm alerts are the future scope of this project.

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CODE:

```
#include <Servo.h>
Servo myservo;  // create servo object
to control a servo
// twelve servo objects can be created
on most boards
int pos = 0;
int f1s=A0;
int f2s=A1;
int m1=2;
int m2=3;
int m3=4;
int m4=5;
int md=0;
int relay=A5;
int x;
int cam=12;
const int pingPin =9; // Trigger Pin of
Ultrasonic Sensor
const int echoPin =10; // Echo Pin of
Ultrasonic Sensor
long duration;
int distance;
int gas=A2;
int ss=8;
void setup() {
pinMode(pingPin,OUTPUT);
pinMode(echoPin,INPUT);
pinMode(ss,INPUT);
pinMode(gas,INPUT);
pinMode(cam,OUTPUT);
digitalWrite(cam,0);
myservo.attach(A3);
  Serial.begin(9600);
  //lcd.print("WELCOME");
  pinMode(m1,OUTPUT);
  pinMode(m2,OUTPUT);
  pinMode(m3,OUTPUT);
  pinMode(m4,OUTPUT);
  pinMode(relay,OUTPUT);
  digitalWrite(relay,0);
 // servo1.write(70);
  digitalWrite(m1,0);
   digitalWrite(m2,0);
   digitalWrite(m3,0);
   digitalWrite(m4,0);
}
```

```
void loop()
{
 digitalWrite(pingPin,LOW);
delayMicroseconds(2);
digitalWrite(pingPin,HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance=duration*0.034/2;
//Serial.println(distance);
int gval=digitalRead(gas);
int sval=digitalRead(ss);
int f1val=analogRead(f1s)/11;
int f2val=analogRead(f2s)/11;
if(sval==0||gval<1)
{
  Serial.print("Smoke detected,0\n");
}
else
{
  digitalWrite(cam,0);
}
  x=Serial.read();
 if(x=='1')
  {
    md=0;

  }
    if(md==0)
   {
if(distance<30)
    {
      digitalWrite(m1,0);
      digitalWrite(m2,1);
      digitalWrite(m3,1);
      digitalWrite(m4,0);
    }
    if(f1val<40)
   {
    Serial.print("Fire detected,0\n");
    digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
    delay(1500);
    digitalWrite(m1,0);
    digitalWrite(m2,1);
    digitalWrite(m3,1);
    digitalWrite(m4,0);
    digitalWrite(cam,1);
    delay(2000);
    digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
     for (pos = 0; pos <= 80; pos += 1) { // goes from 0 degrees to 180 degrees
    // in steps of 1 degree
    myservo.write(pos);
```

```
digitalWrite(relay,1);// tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
  for (pos = 80; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
    delay(4000);
    digitalWrite(relay,0);
    digitalWrite(cam,0);
    }
 if(f2val<40)
  {   Serial.print("Fire detected,0\n");
    digitalWrite(m1,1);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,1);
    digitalWrite(cam,1);
    delay(2000);
     digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
    for (pos = 0; pos <= 80; pos += 1)
```

```
myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
    delay(4000);
    digitalWrite(relay,0);
    digitalWrite(cam,0);
   }
    else
    {
       digitalWrite(m1,0);
       digitalWrite(m2,1);
       digitalWrite(m3,0);
       digitalWrite(m4,1);
    }
   }
 if(x=='2')
  {
    Serial.println("Control mode");

    md=1;
   }
   if(md==1)
   {
    if(x=='3')
   {
    digitalWrite(m1,1);
    digitalWrite(m2,0);
    digitalWrite(m3,1);
    digitalWrite(m4,0);
```

```
}
 if(x=='4')
 {
 digitalWrite(m1,0);
 digitalWrite(m2,1);
 digitalWrite(m3,1);
 digitalWrite(m4,0);
 }
 if(x=='5')
 {
 digitalWrite(m1,1);
 digitalWrite(m2,0);
 digitalWrite(m3,0);
 digitalWrite(m4,1);
}
  if(x=='6')
  {
   digitalWrite(m1,0);
   digitalWrite(m2,1);
   digitalWrite(m3,0);
   digitalWrite(m4,1);
  }
   if(x=='7')
  {
    digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
   }
  if(x=='8')
  {
    digitalWrite(relay,1);
  }
 if(x=='9')
 {
  digitalWrite(relay,0);
 }
 }
}
```