



Fire Seeking Robot

Batch Id - 190151

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Abstract

In this project, we will build a simple robot using Arduino UNO that could move towards the fire and pump out water around it to put down the fire. It is a simple robot that would work on underlying concept of robotics.

The robot rotates while actively scanning for fire. This scanning is performed by sensors placed on the sides. When a fire is detected, it moves in the direction of fire and stops in front of it and trigger the extinguisher to turn out the fire.

Even though there are a lot of precautions taken for Fire accidents, these natural/man-made disasters do occur now and then. In the event of a fire breakout, to rescue people and to put out the fire we are forced to use human resources which are not safe. With the advancement of technology especially in Robotics it is very much possible to replace humans with robots for fighting the fire. This would improve the efficiency of firefighters and would also prevent them from risking human lives.

Introduction

Fire fighting is the act of extinguishing destructive fires. A firefighter must be able to stop fire quickly and safely extinguish the fire, preventing further damage and rescue victims to a safer location from the hazard. Technology has finally bridged the gap between fire fighting and machines allowing for a more efficient and effective method of fire fighting. Robots were designed to find a fire, before it rages out of control. The robots could one day work with fire fighters in reducing the risk of injury to victims.

The Fire Fighting Robot will autonomously move around the house (field) to rescue the victims as much as possible and stop the fire (standard emergency candle) in the given time.

The aim of the project is to make the robot to move around in the maze using the wall follower method, junction counting method and able to rescue the victim and stop the fire. The planning of the behaviour is starts by configuring the major movement probability of the robot such as following the right wall and following the left wall subroutine. After that, the route of the robot must also be planed To make sure the robot will pick the table tennis ball and stop the fire as much as possible using shorter route.

Background

According to National Crime Records Bureau (NCRB), it is estimated that more than 1.2 lakh deaths have been caused because of fire accidents in India from 2010-2014. Even though there are a lot of precautions taken for Fire accidents, these natural/man-made disasters do occur now and then.

In the event of a fire breakout, to rescue people and to put out the fire we are forced to use human resources which are not safe. With the advancement of technology especially in Robotics it is very much possible to replace humans with robots for fighting the fire. This would improve the efficiency of firefighters and would also prevent them from risking human lives. Today we are going to build a Fire Fighting Robot using Arduino, which will automatically sense the fire and start the water pump.

In this project, we will learn how to build a simple robot using Arduino that could move towards the fire and pump out water around it to put down the fire.

Problem Definition

With the development in the field of robotics, human intrusion has become less and robots are being widely used for safety purpose. In our day-to-day life, fire accidents have become common and sometimes may lead to hazards that make it hard for the firemen to protect human life. In such cases, a fire fighting robot is used to guard human lives, wealth, and surroundings from the fire accidents.

Objective

The main intention of this project is to design a fire fighting robot using Android application for remote operation. The firefighting robot has a water tanker to pump water and spray it on fire; it is controlled through wireless communication.

A fire fighting robot is used to guard human lives, wealth, and surroundings from the fire accidents. A fire fighting robot is capable of detecting fire if a house catches fire while someone in the house is either sleeping or not present in the house. By means of this fire fighting robot, people and properties can be saved from fire accidents.

Methodology

The main brain of this project is the Arduino, but in-order to sense fire. As these sensors have an IR Receiver (Photodiode) which is used to detect the fire. When fire burns it emits a small amount of Infra-red light, this light will be received by the IR receiver on the sensor module. Then we use an Op-Amp to check for change in voltage across the IR Receiver, so that if a fire is detected the output pin (DO) will give 0V(LOW) and if there is no fire the output pin will be 5V(HIGH).

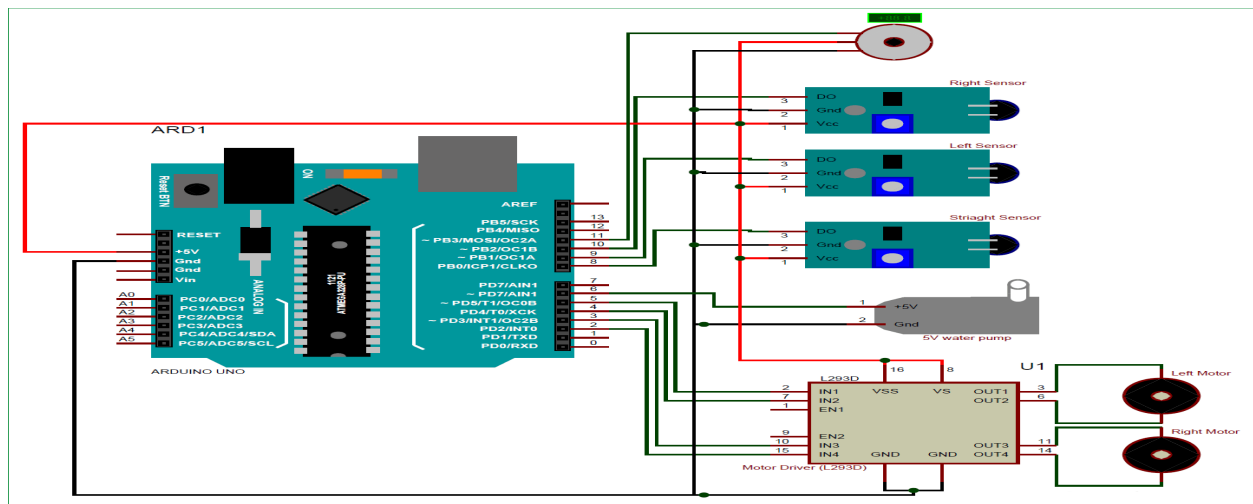
Material Required:

1. Arduino UNO
2. Fire sensor or Flame sensor (3 Nos)
3. Servo Motor (SG90)
4. L293D motor Driver module
5. Small Breadboard
6. Robot chassis with motors and wheel (any type)
7. A small can
8. Connecting wires

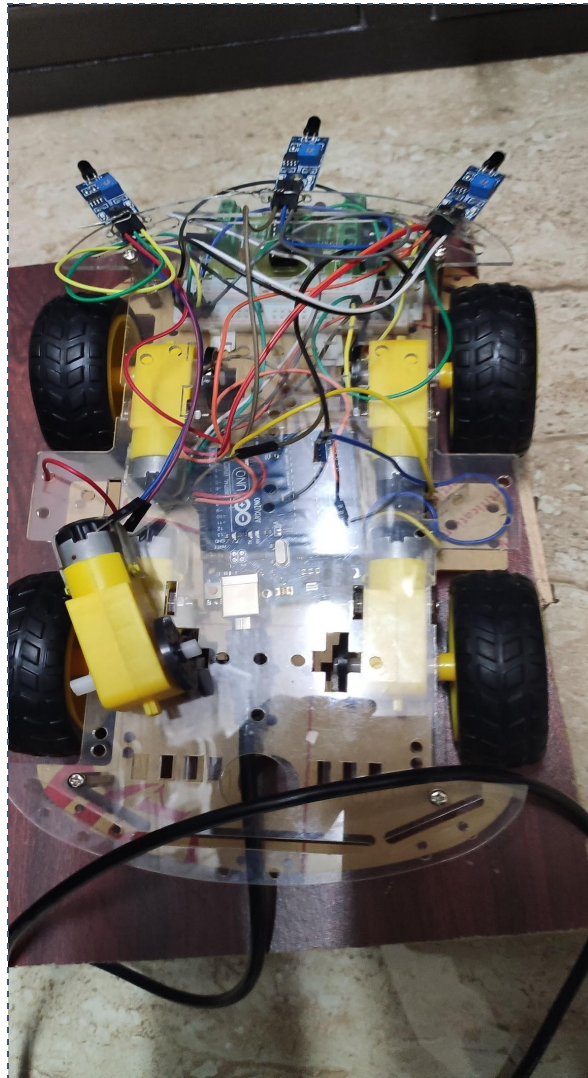
To detect the direction of the fire we can use the motors to move near the fire by driving our motors through the **L293D module**. When near a fire we have to put it out using water. Using a small container we can carry water, a 5V pump is also placed in the container and the whole container is placed on top of a **servo motor** so that we can control the direction in which the water has to be sprayed.

Circuit Diagram

The complete circuit diagram for this **Fire Fighting Robot** is



Results



Successfully detecting fire and running towards it, pumping water on it upto it is completely finished.

Conclusion and Future scope

Overall, an autonomous fire fighting robot has been successfully built. All the fundamental wall follower action such as moving forward, reverse, turn left and turn right function flawlessly. Overall, an autonomous fire fighting robot has been successfully built. All the fundamental wall follower action such as moving forward, reverse, turn left and turn right function flawlessly.

Here, **Obstacle sensor** can be added for sensing obstacles, **Flame sensor** can be added in backside as well to work in both directions. Whereas **MQ sensor** is also a good option as it can sense excessive gas.

Reference

- <https://en.wikipedia.org/wiki/Arduino>
- <https://circuitdigest.com>
- <https://www.instructables.com/id/Autonomous-Fire-Fighter-Robot/>

Appendix

Code:

```
/*----- Arduino Fire Fighting Robot Code----- */
```

```
#include <Servo.h>
```

```
Servo myservo;
```

```
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
```

```
/*-----defining Outputs-----*/
```

```
#define LM1 2    // left motor
```

```
#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(LM1, OUTPUT);
```

```
  pinMode(LM2, OUTPUT);
```

```
  pinMode(RM1, OUTPUT);
```

```
  pinMode(RM2, OUTPUT);
```

```
  pinMode(pump, OUTPUT);
```

```
  myservo.attach(11);
```

```
  myservo.write(90);
```

```
}
```

```
void put_off_fire()
```

```
{
```

```
delay (500);
```

```
digitalWrite(LM1, HIGH);
```

```
digitalWrite(LM2, HIGH);
```

```
digitalWrite(RM1, HIGH);
```

```
digitalWrite(RM2, HIGH);
```

```
digitalWrite(pump, HIGH); delay(500);
```

```
for (pos = 50; pos <= 130; pos += 1) {
```

```
myservo.write(pos);
```

```
delay(10);
```

```
}
```

```
for (pos = 130; pos >= 50; pos -= 1) {
```

```
myservo.write(pos);
```

```
delay(10);
```

```
}
```

```
digitalWrite(pump,LOW);
```

```
myservo.write(90);
```

```

    fire=false;

}

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

    if (digitalRead(Left_S) ==1  &&  digitalRead(Right_S)==1  &&
digitalRead(Forward_S) ==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
    {

```

```

//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

{

//Move the robot left

digitalWrite(LM1, HIGH);

digitalWrite(LM2, LOW);

digitalWrite(RM1, HIGH);

digitalWrite(RM2, HIGH);

}

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

{

//Move the robot right

```

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

```
delay(300); //Slow down the speed of robot
```

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