FIRE FIGHTING ROBOT

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Abstract - *This paper describes researches on fire fighting robot. In modern days the fire can be exist any time ,any where because of weather effect , in chemical industries ,high temperature working industries , by gas leakage etc. for those reasons the fire is exist that affect human being as well as animals to avoid this situation it need a robot that extinguish the fire. For design such kind of robot it required controller and processor that help the robot to control all the parts of robot. Now such types of robots are already designed. Those robots are use different methods and techniques to extinguish the fire for example with the help of fan to extinguish the fire. The main factor is to detect the fire with the help of sensing devices like IR sensor, flame sensor, ultrasonic sensor etc. The robot work automatically so the behavioural of robot can change any time for that we uses the android application via the Bluetooth transmission to control the robot manually.*

Key words *- Fire Extinguishing, Robot Design, Arduino, water tank, water pump motor.*

1. INTRODUCTION

The main aim of this project to sense and extinguish fire automatically. Robots are intelligent machines that may be use per need. This Project our fundamental goal is to style a model that will be able to sense and extinguish the fire. When fire occurs in building, factories or any places. Fighting with fire is sort of risky for fire fighters collectively may get trapped in such places. In such cases, the robot may be very efficient for fire fighting there's no need for human to travel even near the world blazing.

Robot accommodates flame sensor, microcontroller, smoke sensor, motor driver, water tank, pump etc. Flame sensor is employed for to detect the hearth or to sense the warmth. Motor driver can get the instruction from microcontroller and followed that instruction for drive the motor of robot. The many types of controller are available for example 8051, 8052, ATmega328, AVR etc. from this we can choose Arduino as a controller because it is more efficient and having less cost [1].

2. EXPECTED COMPONENTS

2.1 Arduino UNO

Fig.1 Arduino UNO

The Arduino UNO is a basic microcontroller board used for many basic proposes in students projects and it is also use for small industry propose i.e. fire detection, smoke senssing,water level indicator, home automation projects etc [9].

It has 14 digital input/output pins from those pins 6 are PWM pins and 6 are analog pins and remaining are VCC and ground. It has 16 MHz quartz oscillator, a USB connection for communication between Arduino board and computer, an influence jack, an ICSP header and refresh button. Arduino has its own open source platform for programming for the individual task. It's called integrated development environment (IDE) software which is freely present on official site.

2.2 FLAME SENSOR

Fig.2 Flame sensor for fire detection

A flame-sensor is one reasonably detector which is particularly designed for detecting likewise as responding to the occurrence of a hearth or flame. The flame detection response can rely upon its fitting. This sensor is utilized in industrial boilers [8]. The foremost function of this could be to convey authentication whether the boiler is correctly working or not. The response of these sensors is quicker

likewise as more accurate compare with a heat detector due to its mechanism while detecting the flame. This could interface with the arduino and provides the analog output to the arduino. The pin functions of flame sensor are as follows,

- Pin1 (VCC pin): Voltage supply ranges from 3.3V to 5.3V.
- Pin2 (GND): this can be a ground pin.
- Pin3 (AOUT): this can be an analog output.
- Pin4 (DOUT): his can be a digital output pin.

2.3 SMOKE SENSOR

Fig.3 smoke sensor

The smoke detector is devices that help to sense the any type of smoke like Dry Smoke and Wet Smoke give the analog output. It's a four terminals VCC (+5 volt), ground, analog and digital pin. The sensor senses the output according to gas and smoke level within the atmosphere. The sensor outputs a voltage that's proportional to the concentration of smoke. If gas concentration is more than output voltage is more. The lower the gas concentration, the output voltage is a smaller amount. The smoke sensor could be a gas sensor module. The module has 4 pins for interfacing of which two pins are VCC and ground, one pin is analog output and another pin is digital pin via a comparator (LM358). The analog output pin of the module is utilized for detecting concentration level of smoke or gas leakage [11]. The output are often an analog signal that will be read with an analog input i.e. A0 of the Arduino or a digital output i.e. D0 that will be read with a digital input of the Arduino.

2.4 GEAR MOTOR

Fig.4 DC gear motor

Geared DC Motor features a gear assembly attached to the motor. The speed of motor is calculated in terms of rotations of the shaft per minute and is called as RPM. Using the correct combination of gears in an exceedingly gear motor, its speed may be reduced to any desirable. This idea where gears reduce the speed of the vehicle but increase its torque is understood as gear reduction [13].

2.5 SERVO MOTOR

Fig.5 servo motor

The servo motor is most typically used for prime technology devices within the industrial applications like automation technology. It's a self contained device, which rotates parts of machine with high efficiency and great precision. Moreover the output shaft of this motor are often moved to a specific angle. Servo motors are mainly utilized in home electronics, toys, cars, airplanes and lots of more devices. This can place on top of robot for spread the water on the detected fire [12].

3. BASIC CONCEPT OF PROPOSE SYSTEM

Based on the robotic chassis that we are using in project you would possibly not be able to use the identical variety of container that I'm using. There in case uses your own creativity to line up the pumping system. However the code will remain same. I used little aluminium can (cool drinks can) to line the pump inside it and poured water inside it. I then assembled the full can on top of a servo motor to regulate the direction of water. My robot looks something like this after assembly. As you'll be able to see, I have got fixed the servo fin to the underside of the container using got glue and have fixed the servo motor with chassis using nuts and bolts. We will simply place the container on top of the motor and trigger the pump inside it to pump water outside through the tube. The full container can then be rotated using the servo to regulate the direction of the water as show in fig.6.

4. WORKING OF ROBOT

The function of fire fighting robot is same as the ordinary robot only the advancement is to detect the fire and terminate it. The brain of this project is that the Arduino, but in order to sense fire we use three fire sensor modules (flame sensor) like left sensor, front sensor and right sensor, that's shown fig.6. We detect the direction of the fire we are able to use the motors to maneuver near the fire by driving our motors through the L293D module. When near a fire

occur we've got to place it out using water. Employing a small container to hold water, the pump is placed within the container and also the full container is placed on top of a servo motor so we are able to control the direction of sprayed water when the fire is detected. The robot works as an automatically as well as manually with the help of Bluetooth device this can be controlled by android application (i.e. Bluetooth RC controller show in fig. 7).

Bluetooth RC controller application is works on Bluetooth. We use HC-05 with base module. It is very easy to grasp base program, with some modifications to the program it's easily to match any vehicle. For using this application we want to connect with android to bot. After connecting pair we must always "connect to car" select this feature. After that we move robot or car according to your need.

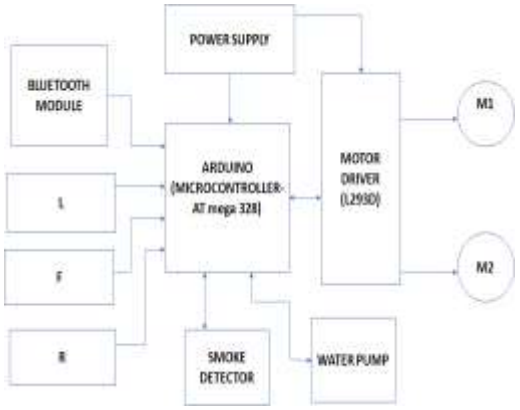
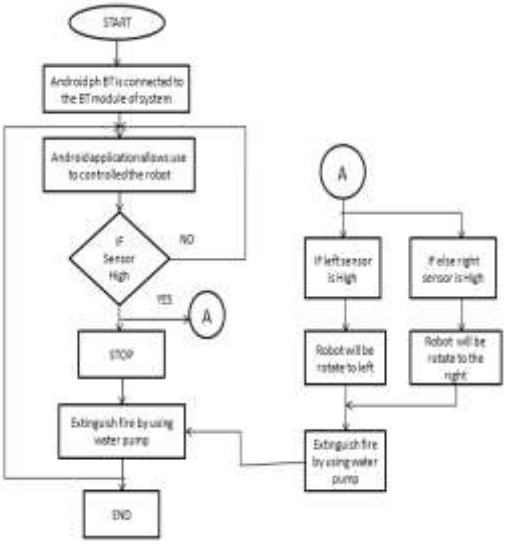


Fig.6 Block Diagram of Fire Fighting Robot.

Fig.7 Bluetooth RC controller

FLOW CHART



5. PROGRAMMING PLATFORM

The Arduino IDE is open source platform for arduino programming. This software is easily available with the web and it is simple and easy when as compare with the other software. It also includes Library files of different external device to interface with the arduino a boot loader has already been installed on Arduino Uno. With this boot loader we will develop software without the necessity for an external programmer to program Arduino. The programming work can easily be performed by making the required settings and methods within the IDE program [10].

Fig.8 Arduino IDE platform image

6. ADVANRAGES

- The robot is going to be used at places where it's dangerous for humans to enter.
- It can move automatically inside the area with none supervision.
- It has a provision of manual handling when robot misbehaves by using android application.

- It can spread the water in all direction consistent with fire sense by sensor.

7. APPLICATIONS

- To fight fires in hazardous location, which fire fighters cannot access safely.
- It will be employed in industrial, commercial and domestic sectors.
- Robot will be accustomed enter small spaces that are impossible to be accessed by an individual.

8. PROJECT OUTPUT

Fig.9 Hardware of fire fighting robot

9. CONCLUSION

In this paper by analysis of all the modules of project are combined together to work as a fire fighting robot. This is great innovation in research platform that easily detect that fire and extinguish detected fire within the range. The main heart of this system is controller but in the market there are many types of controllers are available from that we choose Arduino ATmega328. The many types of robots are already developed but problem of their robot is misbehave during extinguish the fire. We add advanced features i.e. controlled by Android with the help of Bluetooth module it can secure the life of robot and save the money.

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