International Conference on Communication and Information Processing (ICCIP-2020)
Available on: SSRN

Fire Fighting Robot

Rasika Sohani, Shruti Somoshi, Vaishnavi Tayade, Amruta Kapse
Bhivarabai sawant institute of technology and research, Pune-India

Abstract

Fire assumes a significant job in the human life however alongside that it is hazardous too. Fire occurrence is a catastrophe that can cause the loss of human life, property harm and lasting incapacity to the influenced casualty. Firemen are principally entrusted to deal with the fire occurrence, yet regularly they presented to the higher dangers when quenching fire particularly in dangerous condition, for example, in atomic force plant, oil treatment facilities and gas tanks. Additionally they confronted with different troubles especially when the fire happens in tight and limited region, as it is important to investigate the vestiges of structures and obstructions to smothering fire and spare the person in question. Thus this paper presents the advancement of putting out fires Robot utilizing embedded system that can quench the fire without the requirement for firemen. This Putting out fires Robot furnished with the Fire sensor to identify the fire, Smoke Sensor and temperature sensor to recognize the temperature in encompassing zones and we controlling the movement with the assistance of Bluetooth model and robot is customized to distinguish the fire. So here we are attempting to give the specialized answer for previously mentioned issue.

Keywords- Fire Fighting Robot, Flame sensor, Smoke sensor, Temperature sensor, Bluetooth model.

1. Introduction

Robot is a machine that seems as though a person and performs different complex assignments. There are numerous kinds of robot. Here a FIRE Quenching ROBOT is proposed. This robot is furnished with a solitary fire sensor used to detect ecological fire and feed the signs to the microcontroller so as to trigger the siphon which sprinkles water so as to stifle the fire. This robot is made to be worked by utilizing Arduino Uno microcontroller. This robot actualizes the ideas of natural fire detecting, corresponding engine control. The engine driver is utilized for the bidirectional control of the engines prepared in the robot. Each guidance for movement control is given to the robot with the assistance of microcontroller.
Along these lines, the robot forms data from its different key equipment components, for example, fire sensor, ARDUINO Uno board (microcontroller). The programming of the robot is finished utilizing the Arduino which is gotten from C and C++ dialects. This project is introduced as additionally proposed

methodology in given segment which establishes of block diagram, components and their clarification. Equipment and programming subtleties are incorporated, results and ends are incorporated.
The goal of our project is to distinguish fire in the debacle prone territory. Additionally give sound and visual signs. Stifles fire on identifications. Decreases the endeavors of human work and level of decimation. Robot will distinguish the fire in everywhere throughout the headings around itself and work as per the guidelines given by microcontroller

2. Methodology

The essential point of this undertaking is to detect the natural fire and douse it with the assistance of a water siphon. The Arduino UNO R3 Microcontroller board dependent on the ATmega328P. The ATmega328P is acceptable stage for apply autonomy application. In this way the constant fire smothering can be performed. Since, ARDUINO is gotten from C and C++ programming and is a lot simpler when contrasted with other controller programming.
The microcontroller in turn control the extinguishing system. The Working Voltage of the controller is 5V and the Clock Speed is 16 MHz, and the prescribed Info Voltage 7-12V, though the constraint of Information Voltage between 6-20V. The fundamental point of this venture is to build up an ARDUINO based programmed fire stifling robot which distinguishes the fire area and quench fire by utilizing sprinklers on setting off the siphon. The heading of development of the robot are portrayed by the engine driver board. It is utilized to give high voltage and high current is given as a yield to run the engines which are utilized in the venture for the development of the robot. Right now basic DC engine is utilized for the pivot of the wheel which are answerable for the development of the robot. DC engines as a rule convert electrical vitality into mechanical vitality. To quench the fire a siphon is utilized to siphon the water on to the fire for a simple motor is used to pump the water. The pumping motor in extinguishing system controls the flow of water coming out of pumping.

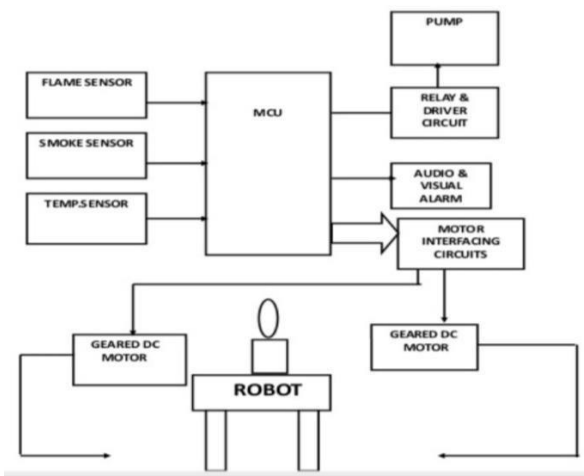

Fig 1 Block diagram

3. Tools/platform

3.1 Hardware used

3.1.1 Microcontroller based Arduino uno

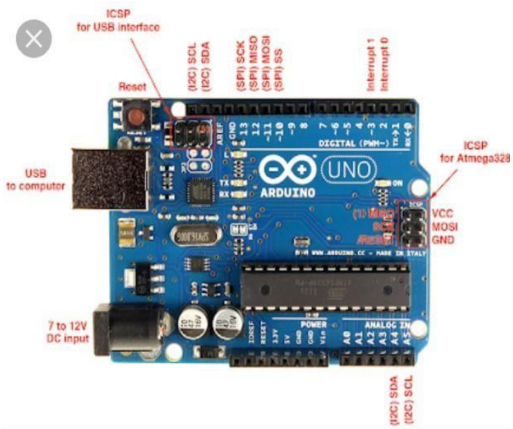

Fig 2 ARDUINO Uno circuit

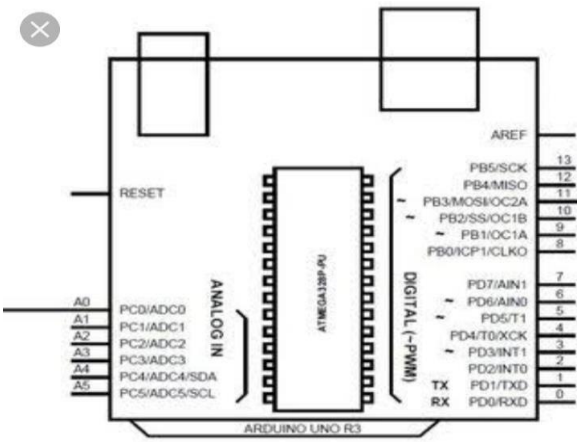

Fig 3 Pin Diagram

Fig 2 shows the ARDUINO Uno board based on the ATmega328P. It has 14 digital input/output pins of which 6 can be used as PWM outputs(pins 3,5,6,9,10,11) 6 ANALOG inputs (A0-A5), a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller. Serial Peripheral Interface pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library. TWI (two-wire interface) / I²C: pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library. AREF (ANALOG reference) Reference voltage for the ANALOG inputs.

3.1.2 Flame Sensors:

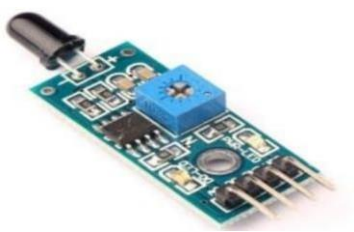

Fig 4 Flame Sensor

Fig 4 shows the flame sensor. This sensor is able to detect a flame by sensing light wavelength between 760-1100 Nano meters. The test distance depends on the flame size and sensitivity settings. The detection angle is 60 degrees.

3.1.3 Motor Drivers:

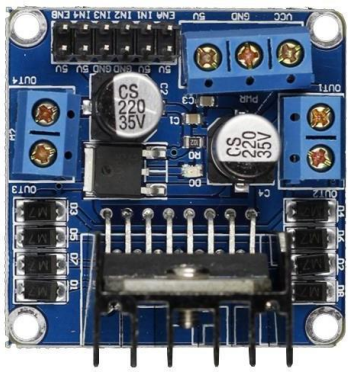

Fig 5 Motor driver

The L298N is an integrated monolithic circuit in a 15 lead multi watt and power SO20 packages. It is a high voltage high current dual full bridge driver design to accept standard TTL (Transistor-Transistor logic) level.

3.1.4 DC Motor:

Fig 6 DC Geared Motor

A simple DC motor is used for the rotation of the wheel which are responsible for the movement of the robot.

3.1.5 Pump:

Fig 7 Pump

Pump used is micro DC water pump.

Voltage: 12V
Current: 3.0Amp
Flow rate: 4.0ltr/m
Driving mode: DC driving

3.1.6 Temperature sensor (LM35):

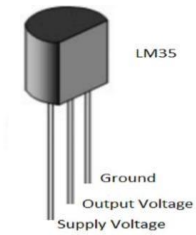

Fig 8 Temperature sensor

Temperature sensor is a device which senses variations in temperature across it.

- Calibrated directly in degree Celsius.
- Rated for -55 to +150degree Celsius range.
- Operates from 4-30V.
- Low self-heating

3.1.7 Ultrasonic Sensor (HC-SR04):

Fig 9 Ultrasonic sensor

- Working voltage: 5V(DC)
- Static current: Less than 2mA
- Sensor Angle: Not more than 15 degree.
- Detection distance 2cm-450cm.
- High precision up to 0.5 cm.

3.1.8 Smog sensor:

Fig. 10 Smog sensor

3.1.9 Buzzer:

Fig. 11 Buzzer

- Operating Voltage: 3-24V DC
- Current: <15mA
- Frequency: 3 kHz tone at an 85Db level.
- Operating Temperature: -20 to +60 degree Celsius.

3.1.10 Battery:

Fig 12 Battery

Battery Specification:

12V, 7.6AH/20HR

3.2 Software Used:

3.2.1 ARDUINO IDE 1.6.7:

For programming the microcontrollers, the ARDUINO project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.The open source ARDUINO IDE makes it easy to write code and upload it to the board.

Component Table:

Sr no	Name of Component	Quantity
1	ARDUINO Uno R3 (AT mega 328P)	1
2	Battery (12 V, 7.6AH/20HR)	1
3	Geared Dc Motor (12V, 25 W)	2
4	Flame sensor	1
5	Temperature sensor	1
6	Smoke sensor	1
7	Ultrasonic Sensor	1
8	Buzzer	1
9	Motor Driver	1
10	Relay Circuit	1
11	Pressure Pump	1
12	Connecting Wire	As required

Table 1 Component Table

4. Result

We design the fire detection system using flame sensor that is capable of sensing the flame. The robot can operate in the environment which is out of human reach in very short time, the delay employed is very minimal. The robot accurately and efficiently finds the fire and within minimum time after the fire is detected it is extinguished.

5. Conclusion and Future scope

5.1 Conclusion

Fire causes tremendous damage and loss of human life and property. In this paper we have designed a fire fighting robot which to be controlled using microcontroller ARDUINO Uno. Output of the sensors is given to microcontroller board and accordingly robot is operated successfully.

5.2 Future scope

In future, we can implement following factors:

Use of Co2 Gas Cylinders:

Due to its physical and chemical properties, Co2 is the most commonly used gas on-board ships in order to extinguish fire during accidents.

Use of Dry Chemical Powder:

Dry Chemical Powder is discharged by pressure of nitrogen gas stored in bottles without other power source. . Dry Chemical Powder is not electrically conductive and therefore it can be used to electric equipment.

Use of Foam:

Foam has been used as a fire-extinguishing medium for flammable and combustible liquids.
Foam is made up of three ingredients - water, foam concentrate and air.

Can use Higher Resolution Zooming Camera:

By using higher resolution zooming camera we can detect the fire from the long distance.

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First A. Author Ms. Rasika S. Sohani is an undergraduate student at JSPM'S BSIOTR Pune She is pursuing bachelor's degree in Electrical Engineering

Second B. Author Ms. Shruti V. Somoshi is an undergraduate student at JSPM'S BSIOTR Pune. She is pursuing bachelor's degree in Electrical Engineering.

Third C. Author, Ms. Vaishnavi D. Tayade is an undergraduate student at JSPM'S BSIOTR Pune. She is pursuing bachelor's degree in Electrical Engineering

Fourth D. Author Ms Amruta Kapse, is an Assistant Professor in JSPM' BSIOTR Pune. She received her master's in electrical power system.