Fire Fighting Robot

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Abstract—A large number of fire accidents occur in world, be it natural or man-made. There are many possibilities a fire can start in an industry or in any industry like cotton mills, fuel storage, etc. In worst case this can cause huge financial loss, environmental damage, and also there is always the risk of life. Fire fighters have to divide their resources between rescue and extinguishing fire. To counter this, we need a system that can be employed to fight alongside the fire fighters making it easy to manage the resources. The goal here is to build a Fire Fighting Robot using embedded system. It is designed to navigate autonomously and find and extinguish fire before it rages out of control. This project will help generate interest in the field of robotics while working towards a practical and obtainable solution to save lives and minimize the risk of property damage.
Keywords: Arduino Atmega328p, firefighting robot, LDR, temperature sensor.

I. INTRODUCTION

We live in the age of technology, yet in fire fighting techniques we have not even scratched the surface. In the event of a fire breakout, human resources are exploited to simultaneously extinguish the fire as well as rescue which is unsafe. In this project, we will build a robot using Arduino that could move towards the fire and pump out water to extinguish the fire. The system can be divided into three different modules sensor module, Arduino module and the appliance module. The project is summarized in different section, in the literature review section, the research and motivation for the project is included. In the proposed system the block diagram and flowchart of the system is given. In component details various components used in the system used are given, followed by conclusion and references.

II. LITERATURE REVIEW

Creativity and Innovative desire has always been curiosity of man; it is all because of this nature of man that we are growing each and every day to more modern world. We are proud as the students of Electronics and Communication as this field is striding to new innovations every day. The existence of electronics has not only reduced the labour required to perform but also enhanced the efficiency of the device. The potential application of the multifunctional firefighting system has been defined as a group that includes the chemical and oil industry, nuclear plants, military storage facilities, as well as mine fields and dangerous substance transport. On taking a look at the work done in the field of robotics, it was clear the we are close to developing a perfect fire fighting machine. There were some areas where this robot was not living up to the expectations. So, in an attempt help the community this idea of making a fire fighting robot came to be.

III. PROPOSED SYSTEM

3.1. Block Diagram
The main brain of this project is the Arduino, but in-order to sense fire we use the LDR's and Temperature sensors. These sensors ere used to detect the fire. When fire burns it emits a small amount of Infra-red light, this light is received by the LDR on the sensor module. We will detect the direction of the fire we can use the motors to move near the fire by driving 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 and a 5V pump is placed in the container and is placed on top of a servo motor so that we can control the direction in which the water has to be sprayed.
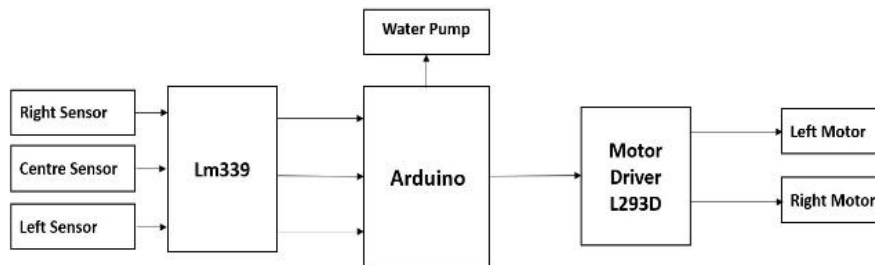

Figure 1: Block Diagram

3.2. Flowchart

The following figure shows the total Architecture of the project in a complete Flowchart.

As we start the system the first step will be to initialize all the pins and sensors that are connected in the system.

The next step will be to scan for fire if yes it will move forward but it will keep scanning for fire until detected.

Once detected the system checks which sensor detected the fire.

The following table will show how the system will turn.

Table 1: Sensors and direction to move

LDR sensor	Move
Right Sensor	Right
Left Sensor	Left
Centre Sensor	Forward

As soon as the temperature sensor heats an interrupt is activated that will stop the system and pump motor will activate to extinguish fire.

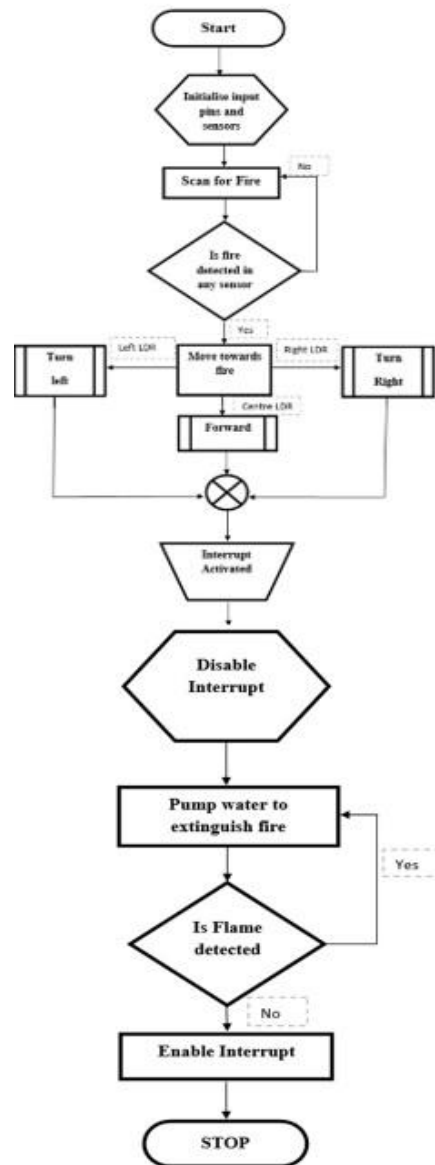Again, the system starts moving and scans for the fire.

Figure 2: Flowchart of the system

IV. COMPONENT DETAILS

4.1. Sensor nodes

The main function of sensors is to detect the flame nearby. This is done by Light Dependent Resistors (LDR's) and Temperature Sensor.

The LDR is used for the detection of light, internally it has a resistance which is sensitive to light. Whenever light falls on the LDR sensor, its resistance start decreasing and when it comes to dark then its resistance start increasing. Using the value of resistance, one can easily detect whether there is fire or not.

The temperature sensor's resistance depends upon temperature. When temperature changes, the resistance of the sensor changes in a predictable way. Both the sensors work in tandem in detecting the fire. The output signals are sent to the micro-controller, which is responsible for the operation of the system.

4.2. Appliance nodes

The appliance nodes contain motors, water pump and l293D motor driver. The Arduino is connected to the l293D IC, which receives command (in form of signals). This IC is capable of driving two motors in clockwise or anti-clockwise direction which makes turning the robot possible. The pump motor is connected to the Arduino. It pumps out liquid to extinguish fire, we can use any kind of liquid solution in place of water. Two driving motors are also connected to the system provides mobility to the system the two motors connect to motor driver in H- bridge. This module has its own independent power supply of 9V to reduce system load.

V. CONCLUSION

This project presents the design and the implementation of a fire fighting robot that moves towards the fire and pump out water to extinguish the fire. The project explained how to interface various components to Arduino. The system can potentially be useful to accompany fire fighters and prevent an outbreak. A system capable of navigating towards fire and then extinguishing it by pumping water was made. Study on different component and their interfacing techniques were achieved.

VI. CONCLUSION

Fire fighting product has their end users in sectors such as defence, fire department, medicine, health monitoring etc. Obstacle sensor could be used to prove better navigation through hurdles.

A memory can be used as to maintain logs of the fire incident.

The sensors have a limited field of detection, this can affect the capability of the system.

The wheels of the robot could be upgraded to make it suitable for all terrain.

VII. ACKNOWLEDGEMENT

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