



Arduino Based Autonomous Fire Fighting Robot

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ABSTRACT

There are many possibilities a fire can start in an industrial area or in any remote area. For example, in textile mills, gas storages, etc., electric leakages can lead to huge damage. Also, it's a worst-case scenario, causing heavy losses not only financially but it also can destroy areas surrounding it. Robots can protect human lives and their wealth and surroundings. The aim is to design a AUTONOMOUS FIRE FIGHTING ROBOT using embedded system. A robot is capable of fighting and helps in extinguishing fire. It must be able to autonomously navigate through floor plan while actively scanning for a flame. The robot can even act as a path guider in normal case and can act as a fire extinguisher in emergency. Robots designed to find a flame, before it reaches out of control, can one day work with fire-fighters greatly reducing the risk of injury to victims. The project will help in generating innovations in the fields of robotics while working towards a practical and obtainable solution to save lives and to reduce the risk of property damage.

Keywords: Arduino, Flame Sensors, DC motors, Water pump.

1 INTRODUCTION

Robotics is one of the fastest growing fields of this era. Robots are designed to remove the human factor from dangerous work and to act in inaccessible environment. The use of robots is more common today than ever before and it is no longer exclusively can be used by production industries, the need of fire extinguisher robot that can detect and extinguish a fire on its own is long past due. With the invention of such a device, people and property can be saved with much higher rate with relatively minimal damage caused by the fire. Our task is to design and build a prototype system that could autonomously detect and manually extinguish a fire. Also aims at reducing air pollution. In this project, we have designed a wireless controlled robot. If a robot is used instead, which can be controlled from a distance or which can perform actions intelligently by itself, which will reduce the risk of fire fighters.

2. LITERATURE SURVEY

[1] Hisato Ando et al (2017) submitted a paper on "Aerial Hose Type Robot for Fire Fighting" where they designed a prototype to validate the feasibility of the amount of water required to extinguish a fire, and then evaluate the reaction force and its effect on the robot.

[2] Teh Nam Khoonet al (2012) presented a paper on "Autonomous Fire Fighting Mobile Platform" which illustrates the advancement work depending on the stage, identify for flame and smother the fire. At the point when the fire sources being recognized the fire will be speedily quenched utilizing fire smothering framework that is mounted on its stage to distinguish the fire source the contribution from fire sensors are finely tuned in connection to the encompassing zone.

[3] Kadam.Ket al (2018) submitted a paper on "Fire Fighting Robot" designed robot which extinguishes fire. These robots are for the enterprises where possibility of unplanned fire accidents take place. The proposed vehicle can identify the flame when it goes closer to it and stifling it consequently by utilizing gas sensor and temperature sensor. It includes equip engines and engine driver to control the development of robot.

[4] CheeFaiTan (2013) presented a paper on "Fire Fighting Robot" which is a remote-controlled robot to replace the fire fighters and reduce the risk of working in hazardous area and perform firefighting task. Different types of currently available fire fighting machines such as LUF60, FIREROB, FFR-1,

FIREMOTE 4800, MVF-5, JMX-LT50, SACL2.0, ArchiBot-M, ThermiteT2, MyBOT2000 are described and compared with the present fire fighting robot technology.

[5] Sahil S. Shah (2013) was all discussed about design a FIRE FIGHTING ROBOT . A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate for a flame. The robot can even act as a path guider in normal case and as a fire extinguisher in emergency. Robots designed to find a fire, before it rages out of control, can one day work with fire-fighters greatly reducing the risk of injury to victims. The result shows that higher efficiency is indeed achieved using the embedded system

[6] U. Jyostna Sai Prasanna (2013) was design the fire detection system using four flame sensors in the firefighting robot, and program the fire detection and fighting procedure using sensors. The firefighting robot is equipped with flame sensors that continuously monitor the temperature. If the temperature increases beyond the predetermined threshold value, buzzer sounds to intimate the occurrence of fire accident and a warning message will be sent to the respective personnel in the industry and to nearby fire station with the GSM module provided to it.

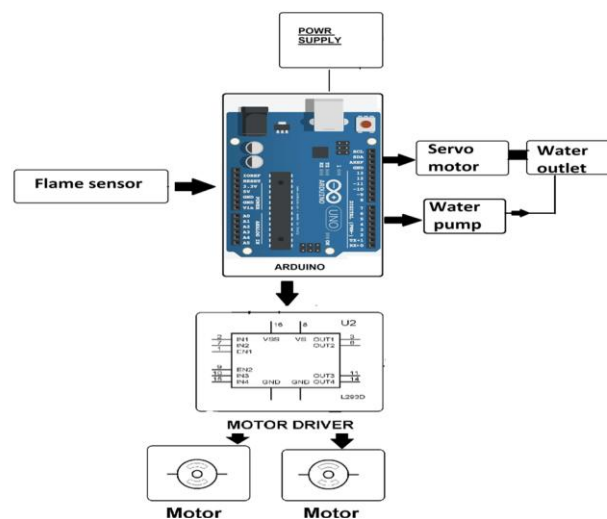
[7] Swati A. Deshmukh (2015) discussed about the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensors method.

[8] J. Reinhart V. Khandwala (2003) was about design and the implementation of the firefighting robot. The key design elements of the robot to be discussed include: the assembly and construction of the robot hardware, the processing algorithm based on the sensors response, and the navigation algorithm that will enable the robot to find an efficient path.

3. METHODOLOGY

The basic theme of this paper is to sense the fire and extinguish it with the help of a water pump. The Arduino UNO Microcontroller board based on the ATmega328P. The Arduino UNO is good platform for robotics application. Thus the real time fire extinguishing can be performed. The Arduino software runs on different platforms such as mac, windows and Linux. Simple and clear programming is possible in case of Arduino software. The Arduino libraries play a major role in making the programming easier by providing wider range of libraries. There are many built in libraries available in the Arduino software and it allows to add additional libraries that are available in the open source for download. Adding of new boards to Arduino software is possible. Since, Arduino C is derived from C and C++ programming and is much easier when compared other controller programming. fire extinguishing robot which detects the fire location and extinguish fire by using sprinklers on triggering the pump. The direction of movement of the robot are described by the motor driver board. It is used to give high voltage and high current is given as an output to run the motors which are used in the project for the movement of the robot. In this project a simple DC motor is used for the rotation of the wheel which are responsible for the movement of the robot. DC motors usually convert electrical energy into mechanical energy. To extinguish the fire a pump is used to pump the water on to the flame. A simple motor is used to pump the water. The pumping motor in extinguishing system controls the flow of water coming out of pumping.

BLOCK DIAGRAM



4. CIRCUIT DIAGRAM

The circuit contains basic components like:-

1.ATmega328P microcontroller (Arduino UNO):The arduino Uno board. ArduinoUno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, 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.

2.DC Motor: In this project DC motor is used for rotation of the wheel which are responsible for the movement of the robot.Usually DC motors convert electrical energy into mechanical energy.

3.Flame sensors: This sensor is able to detect a flame by sensing light wavelength between 760 –1100 nanometers. The test distance depends on the flame size and sensitivity settings. The detection angle is 60 degrees, so the flame does not have to be right in front of the sensor.

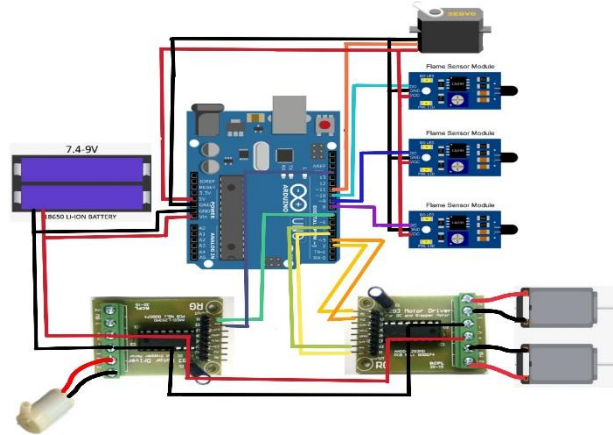
There are two sensor outputs

Digital – sending either zero for nothing detected or one for a positive detection

Analog – sending values in a range representing the flame probability/size/distance; must be connected to a PWM capable input

4.Motor drivers: Motor drivers are used to describe the direction of movement of the robot. It is used to give high voltage and high current as an output to run the motors which are used for the movement of the robot.The circuit of the H Bridge which is used for the motor driving, IC L293D and also provides the bidirectional motor control.

5.Pump: Pump is a mechanical device which is used to pump water on to the fire to extinguish it. It uses a simple motor to pump water



5. CONCLUSION:

Fire causes tremendous damage and loss of human life and property. It is sometimes impossible for the fire fighter to access the sight of fire because of explosive materials, smoke and high temperature. Through this we can conclude that robot can be placed where human lives are at risk. The robot can operate in the environment which is out of human reach in very short period. In such environments, fire-fighting robots can be useful for extinguishing fire. The robot accurately and efficiently finds the fire within minimum time after the fire is detected. The movement of the robot is controlled by the sensors. This project gives a detailed mechanism about the robot that continuously monitors and extinguishes the fire. So by executing this project we can resist the losses that occur.

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