

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 "ARDUINO BASED 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. 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 lives, 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 fire accidents

1. INTRODUCTION

Robot is a machine that looks like a human being and performs various complex tasks.

There are many types of robots such as fixed base robot, mobile robot, underwater robot, humanoid robot, space robot and medicine robot etc. In this paper a FIRE

EXTINGUISHING ROBOT is proposed.

This robot is equipped with a single flame sensor used to sense environmental fire and feed the signals to the microcontroller in order to trigger the pump which sprinkles water in order to extinguish the fire. This robot is controlled using a

mobile phone through DTMF tones decoded by the DTMF decoder. This robot implements the concepts of environmental fire sensing, proportional motor control. The motor driver is used for the bidirectional control of the motors equipped in the robot. Every instruction for motion control is given to the robot with the help of DTMF technology. Thus, the robot processes information from its various key hardware elements such as flame sensor, DTMF decoder via Arduino Uno board (microcontroller). The programming of the robot is done using the arduino C which is derived from C and C++ languages. This paper is presented as follows. Proposed methodology in section II which constitutes of block diagram and components and their explanation. Hardware and software details are included in section III. In Section IV, results and conclusions are included

2. RELATED WORK

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..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.Kadam.Ket al (2018) submitted a paper on “Fire Fighting Robot” designed robot which extinguishes fire. These robots are for theenterprises 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.CheeFaiTan (2013) presented a paper on “Fire Fighting Robot” which is a remote-controlled robot to replace the fire fighters and reduce the risk on working in hazardous area and perform firefighting task. Different types of currently available fire fighting machines .

]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

3. IMPLEMENTATION

Fire fighter is dangerous job a lot of brave men are dying every year to save lives, the fire-fighting robot should take place, send a robot if a building is going to collapse or think of big chemical fires with a lot of heat and not so healthy gases and the danger of explosions or smaller spaces.

Fire fighter also have to do so may job.

1. Rescue
2. fire drill
3. disaster
4. accident

"The main objective of the project is to automatically or manually design and implement a fire fighter robot to extinguish fire. The robot is equipped with sensors that help us detect fire, smoke or any obstacles in its path." To study a robot which can search, detect and extinguish burnt area immediately and develop a program using to control the movement of the robot. Besides, learn how to connect

microcontroller and GSM modem. To design the robot that includes the flame sensor to detect the fire and then send notification by Short Message Service (SMS). To analyze how the robot performance to detect the angle of burnt area in front of the robot and detecting burnt area in 0m ~ 2m in radius.

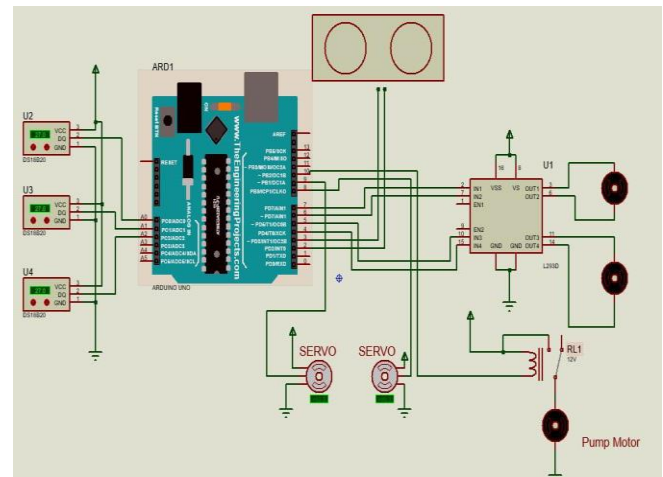
Components Required

1. Arduino Uno
2. Ultrasonic sensor
3. Fire sensor
4. Servo motors
5. Push button
6. Battery

Methodology

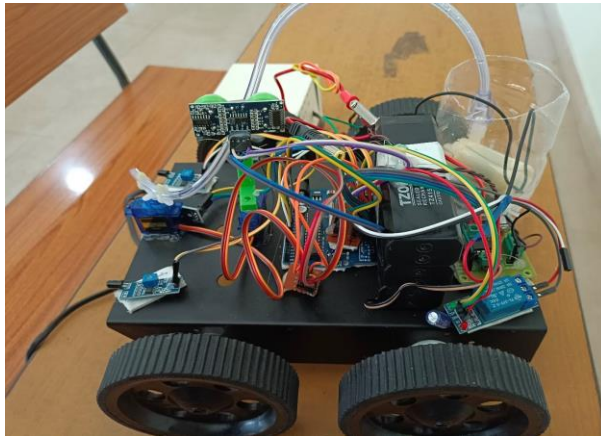
Initially we need to make sure all the components are connected and give power supply through an external device. The robot remains idle initially, later it starts rotating in 360 degrees to detect the presence of object with the help of flame sensor. If the object is not within the range it moves ahead and then again checks the presence of object within the range. The signal is sensed to the one of the 5 channel flame sensor and then robot moves if it signals to center sensor so that we can move to the object accurately. After detecting the flame it moves to certain distance and again checks the range of

distance until it moves near the flame object. After it reaches it then in turn activates fire extinguisher or water pump to sprinkle the water on fire object. This project consists of a user controllable fire fighter robot which has a water tank and a gun attached to it for extinguishing fires.. The RF based remote transfers the commands sent by the user through RF signals to the receiver circuit. The receiver circuit then decodes the data commands sent. The commands are then sent to the microcontroller which then processes these instructions and then instructs the vehicle motors to run the vehicle in the desired direction. On the basis of the user commands, the water pump is controlled. This allows the user to operate the robot and extinguish the fire by standing at a safe distance. The range of the robot is within 7 metres of that of the remote. This robot also has a wireless camera mounted over it. This camera helps the user to move the robot body in whichever direction as required. By installing the water pump assembly and the camera, the robot is able to extinguish the fire when required ensuring the safety of the user.



4. EXPERIMENTAL RESULTS

The Arduino UNO development board issued to control this firefighting robotic system, which is made up of HC-SR04 sensors. A gas sensor (MQ2) for sensing hazardous smoke, a temperature sensor (LM35) for more precise temperature measurement, and a fire flame sensor (IR) for detecting and sensing the approaching fire are all mounted on a servo-motor for obstacle detection and free path navigation. In addition, for extinguishing the flames, it also makes use of a water tank and a spray gun mechanism. With the aid of a 12V pump, water is pumped from the main water tank to the water nozzle



5. CONCLUSION

Here we successfully developed the fire fighting robot. Robot detects temperature, smoke and flame at the site where the robot exists. The Fire Fighting Robot employs DTMF technology to control the directions of the robot. We design the fire

1. <https://images.app.goo.gl/9XGpYRqfbGXX4F8u7>

2. https://www.google.com/url?sa=t&source=web&rct=j&url=https://microcontrollerslab.com/iot-fire-detection-esp32-flame-sensor-email-alert/&ved=2ahUKEwiP15mlp7n4AhVGyDgGHX_1C4sQFnoEAcQAQ&usg=AOvVaw0c98RC69ik1g4PEOFDSaET

3. <https://www.google.com/search?q=battery&client=ms-android-vivo-rvo2&sxsrf=ALiCzsZeEr59ljHDSpSAe->

4. <https://www.google.com/search?hl=en-GB&sxsrf=ALiCzsbIRi2siql73u74lwRoYyB9BkxIng:1655634617256&q=fire+fighting>

detection system using flame sensor that is capable of sensing the flame of wavelength range 760 to 1100 nm, and the sensing range depends on the sensitivity and varies from 10cm to 1.5 feet. 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.

6. REFERENCE