



Fire Warrior Using Microcontroller and IoT

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ABSTRACT:

Now days everything is getting automated, work which is done by humans are now handled by machines. We call them robot. To fight the different kind of natural disasters we are trying to make something to save humanity and the nature. The moto of this project is to extinguish the fire without losing man power keeping human beings safe from dangers. Robots do work more efficiently and accurately wireless robots can conduct successful work allowing the robots operating from a safe distance. LTDAR is the algorithm developed ultraviolet radiation to detect the fire and sprinkle the water to keep the fire under control. A robot designed to use in such extreme conditions. It can be operated and controlled by remote user and has the ability to extinguish fire after locating the source of fire. It is equipped with a monitoring system and operates through a wireless communication system. The fire detection system is designed using the sensors mounted on the Robot. Through testing, it is possible to run in a realistic scene simulated in the lab and to detect and extinguishment the flame. Robot can transfer video to remote location. This concept helps to generate interest as well as innovation in field of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

Keywords: Arduino Uno, water pump, ultrasonic sensor, flame sensor;

I. INTRODUCTION

There are a lot of precautions taken for Fire accidents, these natural/man-made disasters do occur now and then. In the event of a fire breakout, to rescue people and to put out the fire we are forced to use human resources which are not safe. With the advancement of technology especially in Robotics it is very much possible to replace humans with robots for fighting the fire. This would improve the efficiency of firefighters and would also prevent them from risking human lives. The main function of this robot is to become an unmanned support vehicle, developed to search and extinguish fire. There are several existing types of vehicles for firefighting at home and extinguish forest fires. Our proposed robot is designed to be able to work on its own or be controlled remotely. By using such robots, fire identification and rescue activities can be done with higher security without placing fire fighters at high risk and dangerous conditions. In other words, robots can reduce the need for fire fighters to get into dangerous situations. Additionally, having a compact size and automatic control also allows the robot to be used when fire occurs in small and narrow spaces with hazardous environments such as tunnels or nuclear power plants, automatic message to the owner of the home. Whenever the mission is started when it search/scan the flame where it is happened and then it settled down back to its place. 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.

II. PRODUCT FUNCTIONS & METHODS

A fire extinguishing robot typically has several functions and methods to detect and extinguish fires. Some of these include:

Mobility: The robot should be able to move around in the environment where fires may occur. It can move on wheels, tracks or legs depending on the design.

Detection: The robot should be able to detect the presence of a fire through various means such as heat sensors, smoke detectors or flame sensors.

Localization: Once a fire is detected, the robot should be able to locate its position accurately to target its extinguishing mechanism effectively.

Extinguishing: There are various methods the robot can use to extinguish a fire. Some examples include:

Water mist extinguishing: The robot can spray a fine mist of water to reduce the temperature of the fire and create a barrier between the flames and fuel.

Navigation: The robot should be able to navigate around obstacles in its path and reach the fire site quickly and efficiently.

Overall, a fire extinguishing robot is designed to detect and extinguish fires quickly and efficiently, while minimizing the risk to human life.

III. SYSTEM DESIGN

A. System Architecture

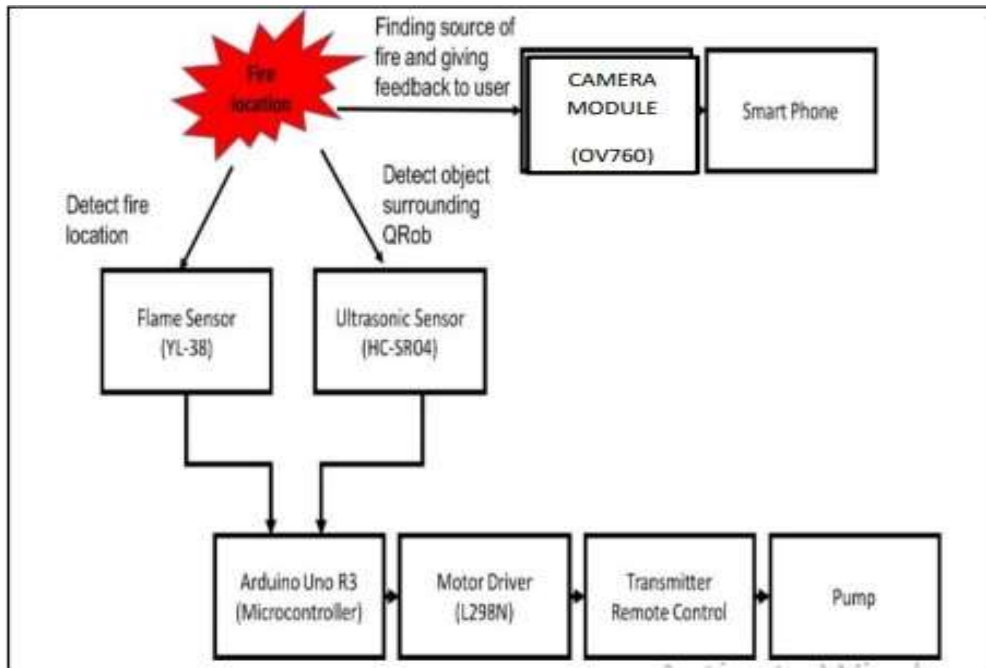


Figure: Advance System Architecture

Ultrasonic sensor: One of the most crucial aspects in inventing an autonomous target detection robot is a barrier and obstacle avoidance. A sensor must be compact, low cost, simple to produce and functional on a larger scale. Moreover, it should be able to sense things with enough limits to let robots to react and travel appropriately.

Flame sensor: In most firefighting robots, fire sensors perform an essential part in investigations, which are always used as robot eyes to discover sources of fire. It can be utilized to identify fire based on wavelength of the light at 760 nm to 1100 nm. The detection angle and distance are roughly 60 degrees and distance 20 cm (4.8V) to 100 cm (1V) respectively..

Temperature Sensors: Typically as like an indication of flame. Where the commercial, industrial and also huge residential devices issue a signaled alarm to a fire alarm system to start alerting the people around the smoke whereas, fire sensor used to detect/scan the flame before it gets fired out and then it gets smoke. By this way, it is very advantageous than the smoke detectors respectively.

Arduino Uno: The Arduino is a microcontroller board based on the Atmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, av16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with USB cable or power it with an AC – DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FDTI USB- to-serial driver chip.

Water pump: The water pump is important part in this robot as it will pump water or soap to extinguish the fire depending on the class of fire that occurs. Small-size and light-weight category of water pump has been selected for use in this project.

IR sensors: The IR sensors senses the infrared rays coming out from the flame and then it feels the signals to the microcontroller. An Infra-Red sensor can able to measure the heat of an object or material as well as detects the motion. It is a type of sensor which measures only the IR radiation, rather than it emitting is known as “passive IR sensors”. When the IR receiver does not receive a signal, where the potential at inverting/reversing the input went much higher than that of the non-inverting reversing input of the comparator goes low, but in there the LED wont glow till the output comparator goes high.

Metal Shield: Metal Shield is a hardcore material shield which is used to protecting the sensors and all the components for the additional security to the robot and its components for protecting damage and safe the components.

DC Motors: An electrical motor is a motor which converts electrical energy to mechanical energy, very typically through the interaction of magnetic fields and a current-carrying conductors. It is a DC motor type where it runs on direct current (dc electricity). In this we are using 2 or 3 dc motors. The advent of the power electronics has made replacement of dc motors with ac motors possible in many applications.

IV. RELATED WORK

A. Fire Fighting Robot

Fire injuries are very frequent and often become impossible for firemen to save someone's life. It is not necessary to designate a human to watch constantly for accidental fire where the robot will do so. In such situations, however, firefighting robot comes in a frame. Robot can remotely sense a burn. This robots are particularly effective in industries where there is more risk of accidental combustion. The planned vehicle is capable of sensing and extinguishing fire presence automatically by means of a gas sensor and a temperature sensor. It requires gear motors and a motor driver to control the movement of a robot. The relay circuit is used to monitor the pump and when a fire is detected, it interacts with the microcontroller (Arduino UNO) through the Bluetooth module. The proposed robot is fitted with a water jet spray capable of sprinkling water. The sprinkler should be pushed in the appropriate direction. At the moment of going towards the source of fire, it may happen that certain obstacles will be met, and so there is an obstacle avoiding the capacity. It will have an Interface for arduino android service.

B. Fire Fighting Robot Remotely Controlled By Android Application

If the fire is viewed at an early point, an immense amount of damage will be prevented. If the fire is noticed right in time, significant deprivation and absence of essential properties will be prevented. Because of their various change capabilities, the robotics industry has earned attention. A weighing unit and a fire extinguisher are part of the robot. Infrared (heat) sensors calculate the necessary distance and heat and make the extinguisher behave according to the atmosphere it perceives. In order to monitor the movement of the robot, we used a virtual Android app. And we use the Bluetooth module to connect with the controller and Android. The controller can be attached via the UART protocol to the Bluetooth module. Commands sent from the Android app provide commands for the robot's primary & secondary behavior.

C. Multiple Sensors Based Fire Extinguisher Robot Based on DTMF, Bluetooth and GSM.

In this study, a multi-sensor based fire extinguisher robot is built with knowledge about construction and function included in the research. The fire extinguisher robot can be created using various technologies such as DTMF, Bluetooth, GSM and GPS technology. The use of three separate flame sensors, temperature sensors, and smoke sensors assures utmost fire safety. The robot can be controlled by both a DTMF radio control system and a phone app and can be programmed to function in three distinct modes. The first mode, which can be triggered by the customer or the robot, lets the robot travel in full autonomy. The second mode is an auto-follow mode where the robot follows a black line drawn on the ground to sense fire, and the third mode is a manual mode where the robot is controlled and operated remotely.

D. A Novel Fire Extinguishing Robotic Vehicle Controlled by Android Application

The project exists to build a mobile robot that can be serviced remotely, controlled by Android. The robotic vehicle is fitted with a firefighting device that includes a water dispenser and an extinguishing system. The ATmega-32 is used for the desired purpose. Remote service is provided by an Android-based Interface that is controlled from a smartphone or tablet.

V. CONCLUSION

The project "Fire Warrior Using Microcontroller And IOT" issued to detect fire. The design of the fire detection system is done by the ultrasonic and flame sensor. The Arduino Unions used as the controller which controls the overall function of the robot. This project describes about the real time firefighting robot which moves in a constant speed, identify the fire and then extinguish it with the help of pumping mechanism. It has advantageous features such as ability to detect location of fire automatically besides having a

compact body and lightweight structure. . The fire warrior robot can be used at a place that has a small entrance or in small spaces because it has a compact structure. The operator is able to extinguish fire using remote control from longer distance. Operators can also monitor the environmental conditions during the process of firefighting by using the camera that is connected to the smartphone. From the experimental results, the robot can sense smokes and fire accurately in a short time. The robot can be used at a place that has a small entrance or in small spaces because it has a compact structure. The system can potentially be useful to accompany fire fighters and prevent an outbreak. The operator is able to extinguish fire using remote control from longer distance. Operators can also monitor the environmental conditions during the process of firefighting by using the camera. From the experimental result, the robot can sense smokes and fire accurately in a short time FUTURE SCOPE.

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