

Design and Fabrication of I.O.T Based Fire Fighting Robot

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Abstract— in this paper, design and fabrication of I.O.T. Based Fire Fighting Robot is discussed. Now a days, fire accidents are very common and sometimes it becomes very difficult for a fireman to save someone's life. It is not possible to appoint a person to continuously observe for accidental fire where robot can do that. Therefore in such cases firefighting robot comes in picture. Robot will detect fire remotely. These robots are mostly useful in industries where probability of accidental fire is more. The proposed vehicle is able to detect presence of fire and extinguishing it automatically by using smoke sensor and temperature sensor. It contains gear motors and motor driver to control the movement of robot. Relay circuit is used to control the pump and when it will detect fire then it will communicate with microcontroller (Arduino UNO) through Bluetooth module. The proposed robot has a water jet spray which is capable of sprinkling water. The sprinkler can be move towards the required direction. At the time of moving towards the source of fire it may happen that it will come across some obstacles, then it has obstacle avoiding capability because of it has a night vision camera. With the help of camera we can see all obstacles which will come in the way of robot. Communication between the mobile phone and robot will take place with the help of camera because camera is two way operatable which is operate with the help of Bluetooth and I.O.T.

Keywords: Rotatable camera, Sprinkler, Bluetooth

I. INTRODUCTION

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 life, fire accidents have become common and sometimes may lead to hazards that make it hard for to avoid loss of property and human life. A firefighting robot is capable of detecting fire if a house catches fire while someone in the house is either sleeping or not present in the house. By means of this firefighting robot, people and properties can be saved from fire accidents. Previously firefighting robots were controlled by using different electronics devices. But this reduces the scope of control of firefighting robot. However, with the advanced techniques we can build the same robot by using android application to control the actions of the robot. With the help of such robots, firemen's work really decreased and movements of robot are so much effective. By using an android app fireman can detect the fire and can able to extinguish it. Fireman can send commands to robot through Bluetooth module which is mounted on robot itself. Smart phones has facility of Bluetooth, through that Bluetooth fireman can control the movement of firefighting robot. For fire detection it is using a temperature sensor.

II. LITERATURE SURVEY

Firefighting and rescue activity are considered risky mission. They are an ideal target for robot technology to keep away fire fighters from danger. Moreover, it makes possible to rescue much more victims. Some fire departments have already developed and deployed firefighting and rescue robots. However, the performance of the robots is not enough. The author considers and examines them from two points of view: "size and weight" and "cost and performance". [1] The result shows that higher efficiency is indeed achieved using the embedded system. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, and expansion; allow for embedded intelligence, essentially foster the resilience of the instruments; and eventually benefit the customers with improved services, reliability and increased convenience. [2]

In this paper basically a low cost fire detection and control system based on smoke and heat detection is proposed. It is comprised of a combination of electrical / electronic devices / equipments working together to detect the presence of fire and alert people through audio or visual medium after detection. These alarms may be activated from smoke detectors or heat detectors which, when detects fire. Then, it automatically operates a relay which can be used to send Short Message Service (SMS) to the registered mobile numbers and switch on a water sprayer or a Solenoid Pump to spray water or fire ceasing foam. [3]

Multisensor Fire Detection System (MSFDS) is one of the important research issues. Here, a fire fighter robot is fabricated providing extinguishment platform. The base of the robot is made of the wood of 'Rashed tree', locally known as 'Kerosene wood'. There is about 1 liter water reserving capacity. An arduino based simple algorithm is used for detection of fire and measurement of distance from fire source while the robot is on its way to extinguish fire. When the fire is detected and the robot is at a distance near to fire, a centrifugal pump is used to throw water for extinguishment purpose. [4]

The aim here is to design a FIRE DETECTOR AND EXTINGUISHER ROBOT using embedded system. A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate through a modelled floor plan while actively scanning for a flame. The robot can even act as a path guider in normal case ad as a fire extinguisher in emergency. [5]

A. Conclusion Drawn from Literature Review

This paper enhanced the smoke and fire detection technology to save lives of people and property more and more. The heart of the system is a PIC microcontroller which is very cheap now a day. The fire extinguishing vehicle is controlled by an atmega 16 microcontroller which is also very cheap and easily programmable. The sms sending feature make the

system more reliable and more sophisticated in terms of life safety as it is done by the help of a gsm module. The use of photoelectric smoke detector in the design makes the system more reliable for detecting smouldering fire. They have introduced the webcam facility. So better image processing methods can be included to find out the exact point from where fire has been originated. [2]

In this paper we proposed an automatic fire alert and fire distinguishing system by sensing smoke and heat. We have experimented our proposed system in our laboratory and noticed its feasibility. It is also seen that the system does not respond if the fire generates very small smoke particles and very small amount of heat. The system does not display properly if two or more than two rooms or blocks are affected at a same time. [3]

This project gives a detailed mechanism about the robot that continuously monitors, intimates the respective personnel and extinguishes the fire. In the industry if any fire accident occurs, there is a need of person to monitor continuously and rectify it. In this process if any time delay takes place irreparable loss occurs since it is a cotton industry. [5]

III. GAP OBSERVED

Gap available was that in earlier modals there was a fixed camera but in this modal there is rotatable camera (355° horizontally and 90° vertically) with two-way communication. In this way the person in front of the camera would be able to communicate to the operator of the robot. This camera is a night vision camera i.e it is able to provide live stream in dark surroundings also.

IV. COMPONENTS USED AND SPECIFICATIONS

A. Rotatable Camera

Actually in our project work we took the use of rotatable camera as a purpose to see the obstacles and from the camera we also can see the way to fire if we are operating our robot from somewhere else. This camera is also used as a communication device because this camera consist of a mic and speaker.

- Camera:- 355 degree rotatable camera

B. Sprinkler

Here in our robot we have used a plastic sprinkler. The main purpose of sprinkler is to throwing the water in a larger way at the fire so that the fire may extinguish in a good manner and it may take less time to extinguish the fire.

- Material- Hard Plastic

C. Arduino Uno

The arduino uno is an open source microcontroller board based on Microchip ATmega328p microcontroller and developed by Arduino.cc. The board is equipped with various input/output pins that may be faced to various extension boards and other circuits.

- Operating Voltage:- 5 volts
- Clock Speed:- 16 MHz

V. PROPOSED METHODOLOGY

- 1) A firefighting robot is designed and built with an embedded system. The robot is implemented using a variety of hardware components and software built around C language. The mode of operation used in our robot is manual controlled using Relay module. A wireless IP camera is used for seeing the fire and the robot can be controlled using a mobile device through which the user can control the robot's movement and focus on an area which is important.



- 2) A fire fighting robot is designed and built with an embedded system. Basically it works on the intelligence communication of embedded system. It consist of temperature sensor, buzzer, MCU, water pump and geared motors. It has 2 boards- Nano Board and UNO Board. Nano board works on bluetooth and UNO board works on wifi system.



- 3) Whenever the temperature exceeds a limit value the buzzer starts and robot starts throwing water at the fire with the help of pump. All the operations like forward, backward, left, right, pump off-on, pump upward downward and camera movement are performed with the help of relay system. An IP camera is used in robot for seeing the fire and also we can see the way to fire when we operate our robot from any other place using IOT. The robot can be controlled using a mobile device

through which the user can control the robot's movement and focus on an area which is important.

VI. CONCLUSION

Thus we will be developing a robot which will be used for fire fighting purpose. This proposes a great chance for automation and will be useful at places where human cannot reach or is dangerous.

APPENDIX

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