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FIRE FIGHTING ROBOT

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ABSTRACT Fire-fighting robot has invented and modified various inventors. Still, the research on this topic is to be continued. Our focus during modification in this robot is: 1. To make its design simple, 2. To invent a robot which can easily use by common people, 3. To reduce the number of parts used in a household fire-fighting robot, and 4. To enhance the responsive nature of robot.

KEYWORDS : Robot, firefighter, automation, sensor, microcontroller

Literature review

In today's era fire-fighting is a dangerous issue. Many authors are working on different techniques for fire-fighting. Several losses occur due to fire. Fire becomes the biggest disaster if it takes place near any forest area, petrol pump, gas line and any educational place. If the fire is not extinguished initially, it can harm a huge number of people as well as areas.

We are here to contribute one further step in the development of a fire-fighting robot. We have invented a simple household robot which can take place in everyone houses, every shop and malls and other common but crowded areas easily. We have used an ultrasonic sensor, a smoke sensor, and a temperature sensor. There is a microcontroller which is used to control all the electronic devices working when power is supplied to them through battery. It uses water as extinguishing medium. It is fully automatic but depends on a switch to control its overall activity. If switch is off so it will be a mere toy but when we leave it with the switch on its sensors are always able to sense the fire source continuously. Once it detects any fire source, it starts a move towards that source and when it reaches the location according to the pre-command given to it; starts sprinkling the water on source until the fire exhausts. We have used the ultrasonic sensor to maintain the proper distance between the robot and fire source.

Now day's fully automated robots are developed. Some of them with the different technologies from past years are given below:

Author Zervas developed a "Multisensor data fusion for the fire detection". Here he takes the example of forest fire. He says if forest fire is detected using the temperature, humidity and vision sensor, probability of fire blow-out can be reduced or closed. It is profitable to county government as well as for the citizens who establish there. By this robot a proper results is perform and this data is fused with the fusion sensors that monitor the same graphical area. [1].

In the paper "Autonomous Fire Fighting Mobile platform", Author Teh Nam Khoon proposed a novel design of an autonomous robot. This robot, called AFFMP, has a flame sensor and an obstacle avoidance system. Working of this robot is totally based on programming. The AFFMP follows a preset path through a building and uses a guide rail or markers such as black painted line or a tape to navigate through the environment until it detects an elevated

possibility of a fire. But when it senses any fire activity within its range, at that point it will leave its track and follow the fire. It range to detect fire is up to-30cm from it. Then it would unlock the fire extinguisher that is mounted on it. If there is any blockage or it has divert from its route during fire extinguishing, the obstacle avoidance will start to perform and it will be able to guide the AFFMP to reach to the fire point again. When it has blown-out the fire completely then it returns to its guiding track to continue again with its further investigation of any other fire sources. [2]

Author H. P. Singh has developed an Autonomous Industrial Fire Fighting Mobile Robot. He said that the system contains two optically isolated D.C. motors. This robot is based on analog to digital converter. Whatever data is provided to the robot via infrared sensor, it converts data from analog to digital signals. There are five infrared sensors used. Two sensors control the motion of the robots and three are for flame detection. Except these sensors, it uses water to extinguish the fire. It also contains a D.C. water pump as well as a water container. The main task of the robot is to sense the flames or fire and extinguish it. For the task, infrared sensor is used. This sensor is used for input the data which come in the form of rays (these rays is generate from the fire and sensed by the infrared sensor). Microcontroller is used to control the robot by controlling its sensors as well as other electrical and electronic devices. [3]

Author Ratnesh Malik has developed an approach towards fire-fighting robot in March 2012. This robot is designed and constructed and sense the flame and extinguishes the fire. The robot is fully autonomous. It implements the concept of environmental sensing and awareness of proportional motor control. The robots flow of information from its sensors and hardware elements. He introduced Ultraviolet, Infrared and visible light to detect the components present in the environment. The robot is capable of extinguishing tunnel fire, industrial fire. It is designed and built for military applications too. i.e. it is able to blow-out a fire that occurs due to military war. It contains Ultraviolet sensors which are used to detect fire. He has programmed an alarm in it, thus if fire is detected by ultraviolet sensors, robot rings alarm to alert others and also simultaneously comes into inactivation. Once it comes in active mode, it also activates an electronic valve which release sprinkles of water on the flame until the robot sensors input the information of fire extinguished. [4].

Author Kristi Kokasih has developed an intelligent fire-fighting tank robot in 2010. Materials use to manufacturing the tank robot is acrylic, plastic, aluminum and iron. Robot consists various components like: two servo motors, two DC motors, ultrasonic sensor, compass sensors, flame detector, thermal array sensor, white detector (IR and phototransistor), sound activation circuit and micro-switch sensor. The objective behind this invention is to search fire affected area and extinguish the flame from different flame positions. It can work in room configuration with disturbance. Robot is based on the principle of dual tone multi-frequency (DTMF) signaling transmitter and receiver [5].

Swati Deshmukh has developed Wireless fire-fighting robot. It is the combination of machines which has ability to detect fire and extinguish it. This fire-fighting robot can move in both directions: forward as well as reverse direction and also can rotated in right and left directions. So fire-fighters can operate the robot over a long distance. This robot does not require any human handling, so there is no need of a human stay near the area of fire. That fire-fighter can also save others as well as their own life in fire disasters. She uses light dependent resistors for detection of fire which are highly sensitive devices and are capable of detecting very small fire. This robot can provide security at home, buildings, factory and laboratory. It is an intelligent multisensor based fire security system as fire alarm and also contains fire-fighting system for daily life. [6].

Before the introduction of automated devices and machines remote-controlled robots are developed. Few of them are given below:

A Remote Controlled Fire Fighting Robot has been developed by Phyo Wai Aung. It is one of the best inventions and example of remote-controlled fire-fighting robot. It has two main parts namely transmitter and receiver. In these parts RF module sets are used. One RF module is used to transmit the data to the motor driver and another RF module is used to know the condition of fire. To operate the whole system of the robot, Microcontroller PIC16F887 is used. To drive the motors L298 and ULN2003 drivers are added in this system. Since this robot is not able to detect the fire and follow the path itself, so it consist a camera which is wireless and mounted on robot. With the help of this camera human/firefighter is able to see the location where the fire source is and where the robot is going? It consist an alarm also which ring when robot go under the temperature more than 40 degree Celsius. If the temperature of fire sight is above 40 degree Celsius, the alarm will be ringing so that operator can control the fire-fighting robot and avoid any damage of robot due to heat. [7].

There are also few robots which are remote controlled but we use cell phone/smartphone as a remote dence. Description of such robots is:

Android Phone controlled Robot Using Bluetooth; this is invented by Arpit Sharma in 2014. This robot includes various techniques of Human Machine interaction using gestures. He attaché a accelerometer in it. Gestures are captured by the accelerometer. The robot applies motion technology to capture gestures by using an Android smartphone. This phone has inbuilt accelerometer and Bluetooth module to control kinetics (motion) of the robot. He uses a microcontroller which uses to controls the signals of the Bluetooth module. Features of the robot are: user-friendly interface, lightweight and portability. OS based smartphone has overtaken the sophistication of technologies like programmable glove, static cameras etc which making them obsolete in further time. [8].

Lakshay Arora has developed a Cell phone controlled robot with fire detection sensors. This device consists of a mobile phone for the purpose of controling a robot by making a call from the mobile phone which is connected to the robot. One phone is also placed on robot. All the process of robot is completed via calling with the help of sounds produced by on phone. These sounds work as instructions for the robot and produced by pressing buttons of the mobile. When call is activated, if any button is pressed on the phone, the tone corresponding to the button is heard at the other end of the call that is placed on the robot. The robot reads Dual-Tone Multiple-Frequency (DTMF) tone with the help of phone mounted on the robot and generates an input data. The received code/data is processed by the microcontroller and then the robot performs actions accordingly. In the developed system DTMF technology is used to position the shaft of motor at a required point with different sensors. Each sensor is performing its own task. His objective to propose a simple and cost-effective system is clearly seems here. [9].

Author Saravanan P has designed and constructed an Integrated Semi-Autonomous Fire Fighting Mobile Robot. The System has four D.C. motors powered by Atmega2560 and controlled autonomously by navigation system. Navigation system includes integrated ultrasonic sensors and infrared sensors. The robot has wireless camera which is used to captures the video and transmits it to the base station. The fire detection comprises of LDR and temperature sensor. If there is fire, the fire detection sensors detect it and the robot will be moved to the source and extinguishes it. The extinguishing system consists of a BLDC motor with water container. This robot has SABOT which can be operated manually in the extreme conditions. It comprises of a GUI support through which robot can be controlled from the base station. [10]

Intelligent Fire Extinguisher System is developed by Poonam Sonsale. This robot includes a number of adaptive algorithms for fire detection. It consist of a smoke sensor, flame sensor, temperature sensor for fire detection. It contains intelligent multisensory based security system that contains a fire-fighting system also. The security system can detect abnormal as well as dangerous situations and notify them to the robot. The purpose of Intelligent Fire Extinguiser System is to extinguish flame in a certain amount of time to reduce the losses due to fire. With the help of multiple sensors, system detects the fire location and extinguishes fire by using water sprinklers. A very different step is involved is that, it cuts off the electricity of areas where fire has murred so that fire will not mix with electricity and becomes a more dangerous problem and starts the sprinklers only on fire affected area. [11].

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