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FIRE FIGHTING ROBOT USING ARDUINO

JERIPOTHULA MOUNIKA[1] CH GANESH[4] P SRIMAN REDDY[3] B PRIYANKA[2]

Department of ECE, Sreenidhi Institute of Science and Technology, Hyderabad

Abstract:

The purpose of this project is to create a fire-extinguishing robot. A firefighting robot is the main emphasis of the project that is being showcased. Robots are capable of carrying out jobs more effectively, cheaply, and accurately than people. Because technology has advanced and made human job easier, its popularity has increased.

The robot known as a "Fire Fighter Robot" is able to identify and put out fires on its own. It employs a flame sensor to do so and a fire extinguisher to do so. While actively searching for fire, the robot can rotate; the sensors do this searching. When a fire is detected, the robot, which is installed on the sides, can move in its general direction before stopping in front of it and activating an extinguisher to put it out.

I.INTRODUCTION:

A traditional element that has been a leveller on Earth from the dawn of recorded history is fire. Although it has many beneficial qualities (heat, energy, purification, etc.), when it gets out of hand, it may be very harmful. Fires in buildings, cars, aeroplanes, ships, and wildland areas can wreak havoc and result in significant injury or even death.

Both human life and property are at risk when there are fires. 39% of all fires, according to the national fire administration are structural fires. These kinds of fires cause serious fatalities, serious injuries, and major property loss up to millions of dollars. By laws and organisations like the fire departments that are devoted to responding to flames, the state has implemented efforts to reduce the severe harm caused by fires. Firefighters risk their lives in an effort to respond as promptly as possible to incidents of fires in order to preserve lives and save property.

Robots are any autonomously run machines that eliminate the need for human labour, even if they may not look like humans or carry out tasks in a way that is humanlike. The word robot, which means "forced labour" or "serf," originated in Czech. Robots are employed in many different ways to increase safety. They may be an essential component of a system in partial control, like an aeroplane autopilot, in addition to removing humans from dangerous circumstances. They can serve as assistants to prevent damage and as tools that physically work alongside people such as a body exoskeleton during lifting. With broader access, more sensors, and less downtime than people, they can examine assets like structures or pressure vessels more frequently which enables early fault discovery and increases reliability. They are able to work in places where people cannot such as underwater drilling and mining operations or inside of demolished buildings.

Firefighters are called in when the fire gets out of hand. But due to the intense fire, rescue workers frequently suffer injuries. A firefighting robot can help prevent accidents of this nature. While being a crucial job,

combating fires is a very risky one. Robots are made to locate fires before they spread out of control as a result. It could be utilised in conjunction with firemen to lessen the possibility of injuries to both victims and firefighters.

A firefighting robot is suggested in this paper. The proposed robotic firefighting system was created with a specific set of objectives in mind. It includes evaluating and locating fires, carrying out search and rescue operations, keeping an eye on dangerous variables, and performing the main mission of controlling and suppressing fires. The robot moves towards the fire and draws water from the pump from a specified angle to another angle repeatedly until the fire is put out with the intention of saving humans. It also keeps an eye on the temperature of the surrounding area and by this it can lower risk, increase revenue, and be more successful at saving people.

II.LITERATURE REVIEW:

J. Reinhart V. Khandwala (2003)[1] was all discussed about design and the implementation of the fire-fighting 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 sensor's response, and the navigation algorithm that will enable the robot to find an efficient path in and out of the house model.

Miller, Lynette [2] the construction of each component of the robot that is intended to locate and put out a minor fire represented by a light emitting diode in a model home was discussed by Daniel Rodriguez (2017)[2]. This essay will discuss every element of the robot, starting with the start signal and moving on to the robot platform, line following, room finding, and, finally, fire detection.

According to Sahil S. Shah (2013)[3], an embedded system was used to construct a FIRE FIGHTING ROBOT. We'll create and test a robot that can put out a fake house fire. It must be capable of independently moving around a simulated floor layout while aggressively looking for a flame. The robot can even serve as a fire extinguisher in an emergency and a path guider in regular circumstances. In the future, robots that can locate fires before they get out of control will dramatically reduce the danger of injury to victims. The outcome demonstrates that employing the embedded system does really result in greater efficiency.

Four flame sensors were used in the firefighting robot's fire detection system design by Sai Prasanna, M.V.D. Prasad (2013)[4], and sensor-based programming was used to programme the fire detection and fighting technique. Four thermistors/flame sensors that continuously track temperature are built inside the firefighting robot. A buzzer sounds to alert everyone in the industry and the neighbouring fire station to the possibility of a fire mishap if the temperature rises beyond the predetermined threshold value. This is done using the GSM module that is attached to the device.

In the College of Engineering, American International University - Bangladesh, Swati A. Deshmukh (2015)[5] explained the fire detection system employing sensors and programmed the fire detection and fighting technique.

III. METHODOLOGY AND REQUIREMENTS:

The main goal of this project is to locate the fire and put it out with the use of a water syphon.

The main aim of the proposed system is to implement a fire detection system which has an alarm system implemented to alert when fire is detected. The frame of the robot is designed and fabricated which include the water dispencing system,the drive and control system for robot's motion

The ATmega328P is a main component in the Arduino UNO board. The ATmega328P is a good starting point for autonomous application. As it is cost effective widely available. Although ARDUINO is derived from the C and C++ programming languages, it is much simpler than other controller programming. The extinguishing system is managed by the microcontroller. The controller's working voltage is 5 volts, its clock frequency is 16 MHz, and the recommended information voltage is 7 to 12 volts, with a range of 6 to 20 volts allowed. The main goal of this project is to construct an ARDUINO-based programmed fire-stifling robot that can recognise a fire's location and put it out by activating sprinklers. The engine driver board illustrates the direction

of robot development. It is used to provide high voltage and high current as a yield to power the engines included in the project to construct the robot. The pivot of the wheel, which is responsible for the evolution of the robot, is currently powered by a simple DC engine. Typically, DC engines convert electrical energy into mechanical energy. A syphon is used to syphon water onto the fire in order to put out the fire since a basic engine is being used to pump the water. The extinguishing system's pumping motor regulates the flow of water that exits the pump. Camera is connected to the Arduino via Bluetooth where we can watch the surrounding environment with the help of camera.

L298N motor driver is been connected to the Arduino board to which external power supply is given. Then 2 dc motors are connected to the motor driver to which tyres of the vehicle can be set. A motor pump is connected to the Arduino with the help of a relay to pump the water in order to extinguish the fire.

V. IMPLEMENTATION AND WORKING:

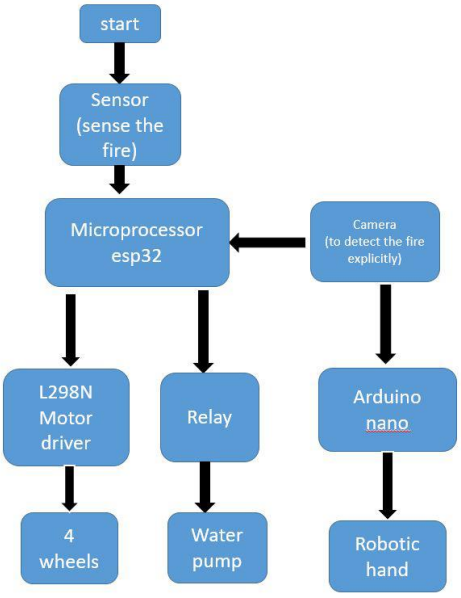

FIGURE 1 BLOCK DIAGRAM

WORKING:

Initially, the proposed robot is controlled by humans who would send commands through Bluetooth which is received by esp32 on the robot Based on these commands, the robot would move towards the fire environment. Once the robot reaches the fire environment, a camera and fire sensor installed on the robot would enable the controller to examine the situation. Based on their decisions, the controller would then send commands through Bluetooth to turn on the extinguisher. If the fire was too close, the robot could detect it through its flames sensor and turn on the extinguishers like gas. As soon as the robot receives a command from the controller by Bluetooth, the instructions are computed in the ESP32 microprocessor. The ESP32 then sends commands to the motor driver, allowing the robot to move according to the human commands. When it is time to extinguish the fire, the signals are sent to the relay by the ESP 32 to turn on the water pump. The entire environment is also monitored by humans to ensure that the fire is completely extinguished.

Another essential component of our firefighting robot is the robotic hand. This robotic hand is used to clear obstacles in front of the robot to move forward or to move to a desired location. In emergency cases, the robotic hand can also open doors and pick up abstacles, allowing it to rescue humans from fiery situations.

VI. RESULT:

An autonomous firefighting robot has been developed that is capable of spotting flames and smokes and successfully putting them out. This robot is perfectly capable of moving forward, left, and right. The robot's movement is managed by the Arduino code in conjunction with the motors. A warning about the dangerous environment will be displayed on the virtual terminal if any of the flame sensors or smoke sensors are activated. If no such detection is made, a safe environment will be presented. Upon receiving a signal indicating a dangerous environment, the motor will begin to rotate and transport the robot to that location, where it will begin to pump water using a water pump.

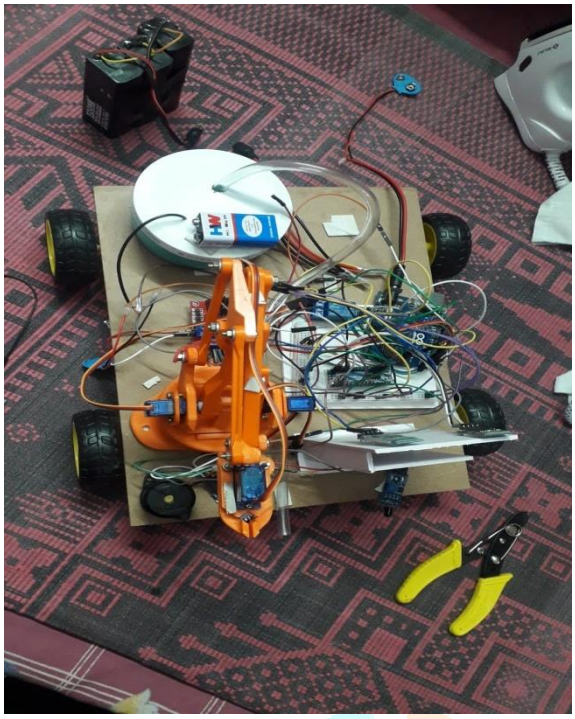

Figure 2 Purposed Robot Prototype

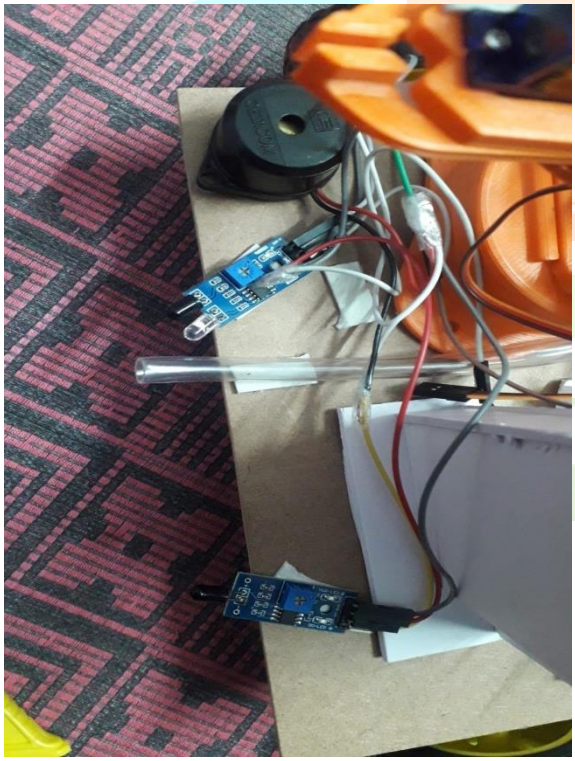

Figure 3

VII. FUTURE ENHANCEMENT:

The experimental robot prototype can be turned into a useful robot in the future, but this will require performance enhancements across the board. In order to save people trapped in fire, face detection technology is being developed for fire-fighting robots. In order to facilitate their rescue, the face detection technology warns the existence of people who are trapped in fire.The ultrasonic sensor can also be fitted to the robot to detect any nearby objects to prevent any collisions. To allow people to manage the robot's mechanism according to their own demands, a wireless remote-control concept might be included to this system. and its performance can be improved by connecting it to a wireless zooming camera with higher resolution so that the person operating it can see the robot's movement remotely on a screen.

VIII. CONCLUSION:

The Fire Fighting Robot is powerful enough to put out small-scale fires. In darker environments, it is more sensitive to fire flame. It was created as a robot preventer because it can quickly detect fire and put it out before it spreads. This multisensory-based robot might provide a defence against all fire risks. This robot includes a number of sensors, including flame. A water spraying system is activated to put out the fire if it is detected. This robot's design also has a higher reserve capacity to fight against huge fires, and an updated sensing unit can even provide early fire detection in all situations with sufficient budget and scope.

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