

Fabrication of Robot to Assist the Firefighter

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Abstract: *As the human population and technology have improved, the number of fires has increased. Because of human limits and a poor environment, fire suppression is a difficult and demanding undertaking. Manually extinguishing a fire is a potentially fatal task. Robotics is a rapidly evolving solution for protecting people and the environment. The purpose of this project is to develop a remote-control firefighting robot using Bluetooth technology. The robotic vehicle is equipped with a water tank and a water pump that is operated via wireless communication. This robot is connected to over mobile phone through Bluetooth model for giving the command to perform the task.*

Keywords: Robot.

I. INTRODUCTION

Robot is a machine which perform a multiple task easy or complex work for human being. In this paper proposed a robot to assist the firefighter or to help the firefighters to handle the fire situation and our life's. This robot has a Bluetooth module that sends signals to the microcontroller, which then activates the pump, which sprays water on the fire to put it out. A mobile phone is used to control this robot. Environmental fire sensing and proportional motor control are implemented in this robot. The motor driver is responsible for bidirectional control of the robot's motors. With the help of Bluetooth, the robot receives all motion control instructions.

Thus, the element is Bluetooth module and Arduino UNO board microcontroller. But the part is the programming of the Arduino, for programming we were using the C and C++ language and the software is Arduino IDE programming software. It is easily available in internet or google. This software runs on any designed computers like Window, Mac etc. The main thing on this programming software is operated anyone easily and program.

II. LITERATURE REVIEW

Firefighting is a risky business in today's world. Many authors are working on various firefighting strategies. Ratnesh Malik et al. created a method for developing a firefighting robot. The robot has been conceived and built to be able to put out fires. The robot has semi-autonomous capabilities. It incorporates concepts like as sensing and proportional motor control. The robot collects data from sensors and sends it to the Arduino UNO, which then sends commands to the motor drivers, allowing the robot to function. The robot then activates an electrical valve, which sprays water over the blaze. This robot is utilized in dangerous situations where human lives are at risk.

Kristi Kokasih and colleagues created an intelligent firefighting tank robot. Tank robot is constructed of acrylic, plastic, aluminum, and iron. Two servo motors, two DC motors, a flame detector, a white detector (IR and photo transistor), and a micro switch sensor are among the robot's components. The goal is to search a specific area, find and extinguish the flame for various flame positions and room configurations with disturbance.

Swati Deshmukh et al. created a wireless firefighting robot. It consists of a machine that can detect and extinguish fires. The firefighting robot can move in both forward and reverse directions, as well as turn left and right. As a result, fire fighters can control the robot from afar, eliminating the need for humans to be present near the fire. For fire detection, light dependent resistors are used. These resistors are extremely sensitive devices that can detect very small fires. The robot guards the home, buildings, factory, and laboratory. It is a multisensory intelligent security system that includes a firefighting system in everyday life.

III. PROBLEM STATEMENT

There are many places where firefighters cannot enter to extinguish the fire because there is not enough space to enter in particular area and still, they struggle to enter in this area which results into death or get wound because they do not have exact idea regarding internal situation.

IV. COMPONENT DETAILS

There are lot of components are used in this project, some of the main component are follow:

Arduino uno board



Arduino is a microcontroller board that is open source. The ATmega328P-based Arduino Uno is a tiny, comprehensive, and user-friendly board. The boards have 14 digital and analog input/output (I/O) pins (7 digital and 7 analog pins) that can be used to connect to expansion boards, breadboards, and other circuits.

Bluetooth module (HC -05)



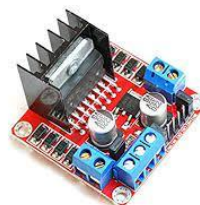
HC -05 module is used to connect the microcontroller to mobile phone for movement of robot. The range of module is 10m. It has small LED light it is indicate to that the robot is connected to mobile phone. First microcontroller gives the input on Bluetooth module that time LED is not blinked slowly means BT module is connected to mobile phone. There are 6 pins and it operated 3.3 to 5V.

Relay

The Single Channel Relay Module is a board for controlling high voltage, high current loads like motors. Screw terminals are used to connect the relay terminals (COM, NO, and NC). It also has an LED that shows the state of the relay.



L298N Motor Driver





This L298N Motor Driver Module is a high-power motor driver module for driving DC and Stepper Motors. The L298N Motor Driver is a controller that uses an H-Bridge to easily control the direction and speed of up to 2 DC motors.

Infrared Sensor

Infrared sensors are electronic devices that detect and quantify infrared radiation in the environment.

DC Motor

For the rotation of the wheel, which is responsible for the robot's movement, we utilise a simple DC motor. DC motors transform electrical energy into mechanical energy in most cases.

Specification:

Speed: 200 rpm, Voltage: 12V, Torque: 15Kg-cm, Shaft Diameter: 8mm

Shaft length: 17.5mm.

V. CONSTRUCTION & WORKING

5.1 Construction

It consists of 12v Dc battery, Arduino uno, HC-05 Bluetooth module, relay, Dc motor, L298n motor driver. First, we connected the battery to DPDT switch the positive terminal of battery is connected to the middle position of the DPDT switch and one side of the points are connected to the battery charger and another side point is connected to the 7805 Mosfet. At there we have use 3 mosfet and all connected in serial. The mosfet converts the 12v supply to 5v. So, first mosfet is connected to Arduino uno and second is connected to servomotor and third is connected to relay. As shown in the schematic diagram and pump is working on 12v Dc supply. We have use relay foe controlling the supply Arduino to dc motor and it also controlling the speed of water pump. L298n motor driver connected to the Arduino and both motor drive is parallely connected to both side wheels. First motor drive is connected to front wheels and second is connected to rear wheels and drive give 12v supply on dc motor through battery.

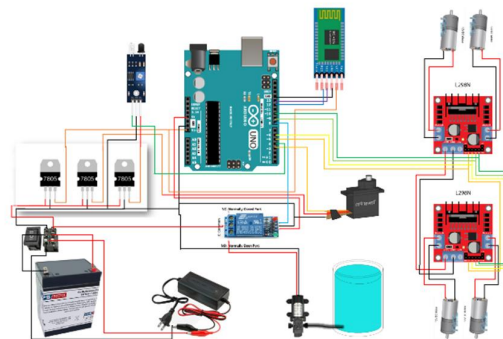


Figure: Schematic Diagram of Robot Circuits

5.2 Working

In this project we are using Arduino Uno, L298n Motor drive, Bluetooth module, servo motor, 12V battery, DC motors, IR sensor and water pump. Then we first started the switch ON through switch button then battery voltage converts 12V to 5V through insulated mosfet. Then 5V supply give the Arduino uno, Bluetooth module, IR sensor. Then we have connected the robot on mobile phone through Bluetooth module, but for connecting we need android mobile application. Android have setting on hc-05 module and then select the hc-05 then they connect on our mobile phone and then robot movement have possible. Then when we press A button that time robot moves forward direction, press button B that time moves backward direction. Press button C & D then robot move left & right direction and for stop the robot to press button F.

When the fire incident happens in any room, then robot go inside the fire location and extinguish the fire with the help of water pump. Then when press F button that the water pump is start and spray the water and also servo motor 0 to 180 degrees continuously for sprayed the water and extinguish the fire in 180 degrees.

VI. CONCLUSION

We have successfully fabricated the robot to assist the firefighters which is operated by Bluetooth module. The robot is capable of performing the operation where the firefighters unable to reach at fire location. In future we will add more sensor to get more efficient perform.

VII. FUTURE SCOPE

We can add the camera in top of the robot for giving the clear picture on mobile phone, because fire fighter doesn't know what the condition is actually at fire location. Once the robot gives the information about the situation then firefighters are totally aware about it and help to extinguish it. And also add thermal detection to detect the temperature and give the flammable object details. We can also make this robot fully automatic where we will not require any person to operate it.

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