Fire Fighting Robot

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Abstract

A fire incident is a disaster that can potentially cause the loss of life, property damage, and permanent disability to the affected victim. Firefighters are often exposed to higher risks. With the advent of technology, humans are replaced with robots in life-threatening situations. We aim to design a robot capable of detecting and suppressing fires. By designing and implementing a firefighting robot capable of detecting and extinguishing flames, disasters can be avoided with minimal risk to human life. This paper demonstrates the simulation and implementation of an autonomous firefighting robot that can automatically sense the fire and start to pump water over the flames. These sensors can automatically detect fire and smoke & the robot navigates itself to the source of the fire & start extinguishing it by using the fire extinguishing system. This robot also consists of a container on top of the servo motor to control the path on where water is being sprayed on. Two DC motors were used to control the motor movement while the robot is in operation mode to extinguish the fire.

Keywords: - Arduino, buzzer, fire sensor, Bluetooth controller, servo motor, motor driver.

Introduction

Now a days mobile robots are very useful in construction sites, warehouses and manufacturing plants. Mobile robots can also be used in material handling applications which applications are growing day by day. For analyzing different items and for handling materials mobile robots can be used. Wireless navigation is also possible for movements of mobile robot, can be controlled through android. With the help of such robots, fireman's work really decreased and movements of robot are so much effective. By using an android app fireman man detect the fire and can able to extinguish it. At the same time robot can detect the obstacles and can avoid them by using ultrasonic sensors. Our project is designed to build an android application which can control operations of the firefighting robot. Fireman can send commands to robot through Bluetooth module

which is mounted on robot itself. Smart phones have facility of Bluetooth, through that Bluetooth fireman can control the movement of firefighting robot. For fire detection it is using two sensors. One is temperature sensor and second is smoke detector. Fire extinguishing system will be get activated when fire detection system detects fire. Sprinkler will start sprinkling water when it detects fire. At the transmitting end android application is used and at receiving end two motors are interface to micro-controller.

Objective

The robot can manually operate using Bluetooth remote interface. With all such functionalities, the robot helps not only civilians but also firemen during fire extinguish and rescue operations. It is basically used to detect fire in the disaster-prone area. This robot reduces the efforts of human labor and level of destruction and it also extinguishes fire on detection with the help of pump and servo motor. It also consists of buzzer system which alerts the surroundings with an alarm.

Methodology

In this robot fireman can send commands to robot through Bluetooth module which is mounted on robot itself. Smart phones have facility of Bluetooth, through that Bluetooth fireman can control the movement of firefighting robot. For fire detection it is using two sensors. One is temperature sensor and second is fire sensor. Fire extinguishing system will be get activated when fire is detected. Sprinkler will start sprinkling water when it detects fire. At the transmitting end android application (Arduino Bluetooth) is used and at receiving end two motors are interface to microcontroller. Fire is detected using temperature sensors and command goes to servo motor and relay motor to start. Relay motor is used to flow water through pump and servo motor is used to rotate pump in 180-degree directions. Servo motor starts spraying water through the pump.
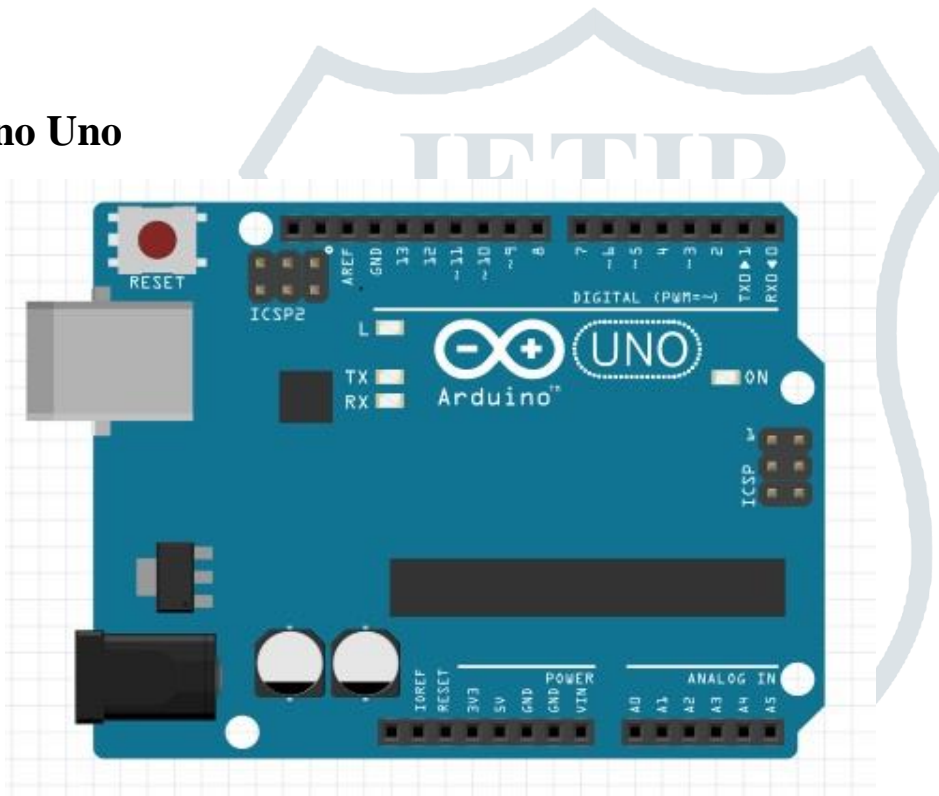
Features

•Bluetooth based user friendly interfacing

•Use of android smartphone Bluetooth

•Low power consumption and hence reduces cost

•Easy to handle and control.

The major building block of this project is:

°Bluetooth Module

°DC motor with driver

°Arduino Uno

°Relay

°Servo motor

Hardware Requirement

Arduino Uno

The Arduino UNO is categorized as a microcontroller that uses the ATmega328 as a controller in it. The Arduino UNO board is used for an electronics project and mostly preferred by the beginners. The Arduino UNO board I type of Arduino board only. The Arduino board is the most used board of all Arduino boards. The board contains 14 digital input/ output pins in which 6 are analog input pin, one power jack, USB connector, one reset button, ICSP header, and other components. All these components are attached in the Arduino UNO board to make it functioning and can be used in the project. The board is charged by USB port or can be directly charged by the DC supply to the board.

The microcontroller used in the Arduino UNO board ATMega328 is easy to available and can be used easily. The board contains other components like PWM pins, timers, external interrupts or internal interrupts, and other types of sleep modes.

FIRE SENSOR
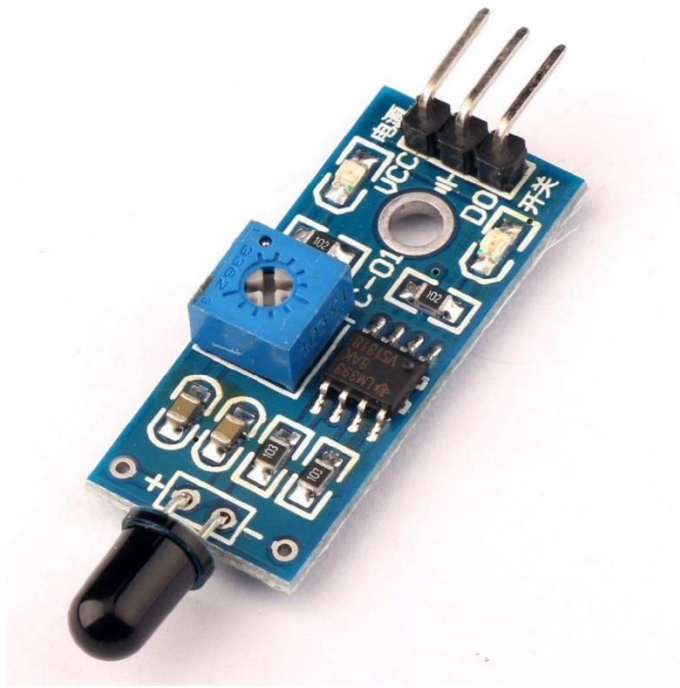
A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame. A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. So, this sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in firefighting robots like as a flame alarm.

Motor Driver
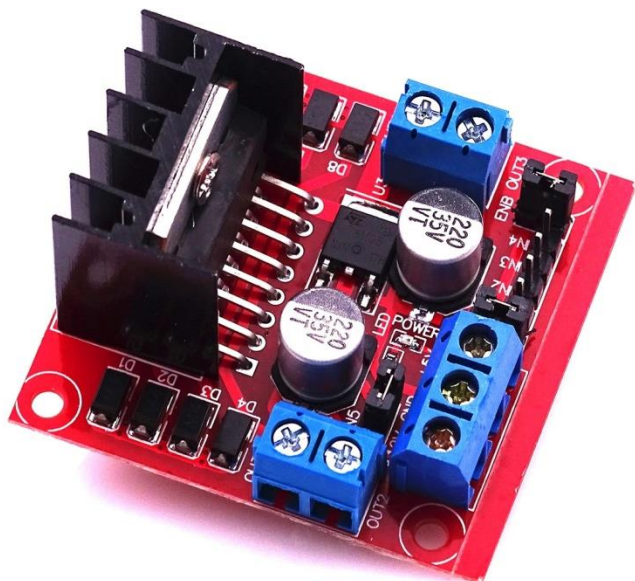
The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. This motor driver module consists of two main key components, these are L298 motor driver IC and a 78M05 5V regulator.

Bluetooth module
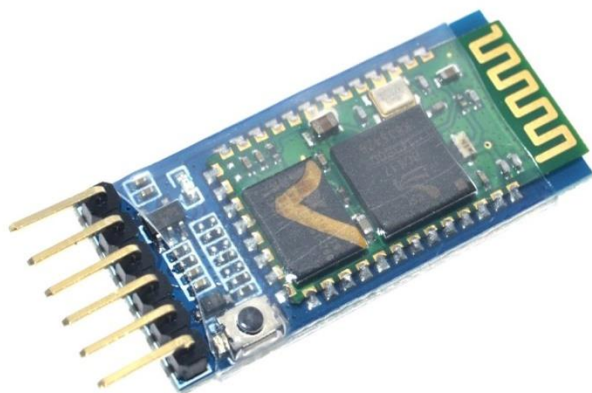
The **HC-05** is a popular module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin.

Servo Motor

A servo motor is a motor that works in angles between 0° and 180°. A servo motor is a motor that can only be controlled by a microcontroller like an Arduino. Servo motors have three wires: power, ground, and signal. The power wire is typically red, and should be connected to the 5V pin on the Arduino board. The ground wire is typically black or brown and should be connected to a ground pin on the board. The signal pin is typically yellow or orange and should be connected to PWM pin on the board.

BLOCK DIAGRAM
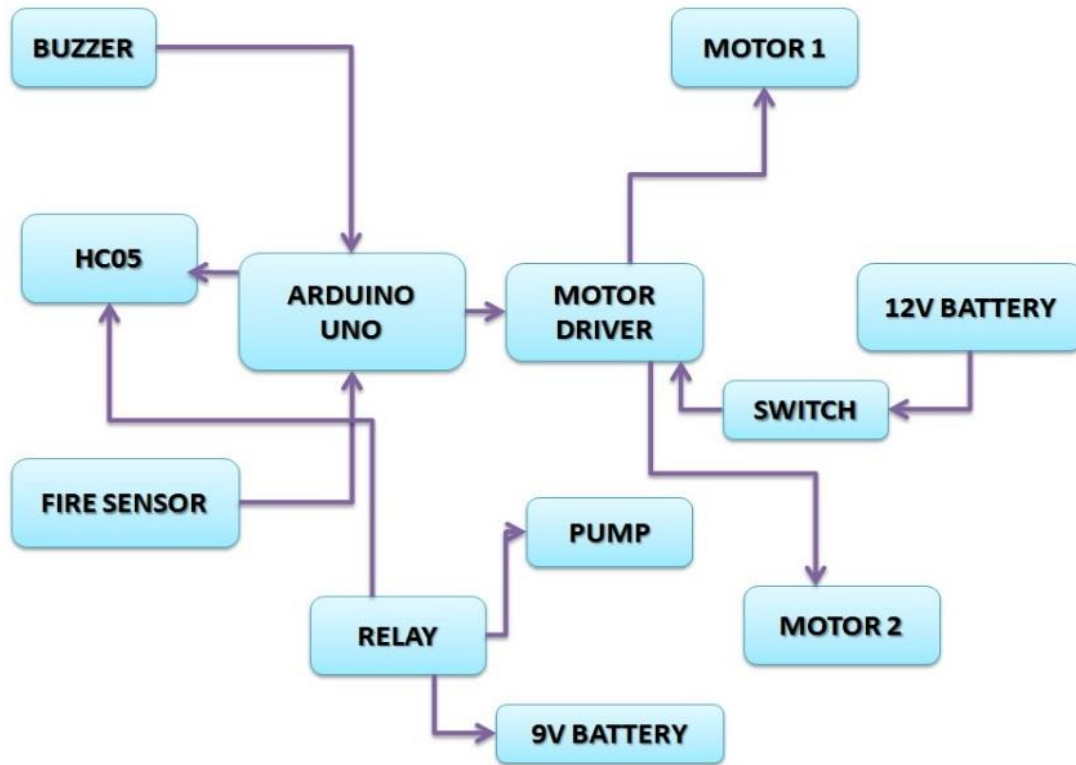
CIRCUIT DIAGRAM
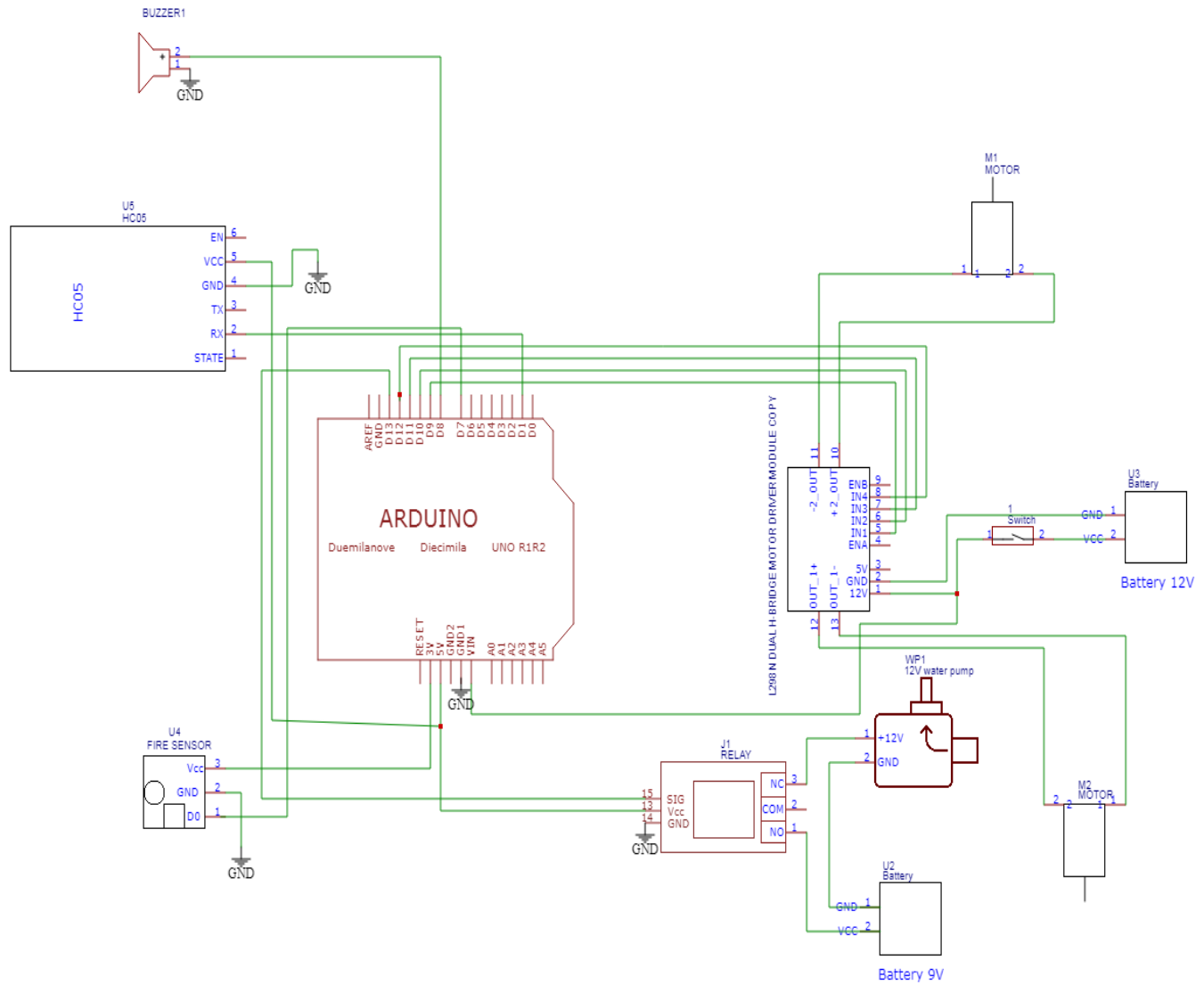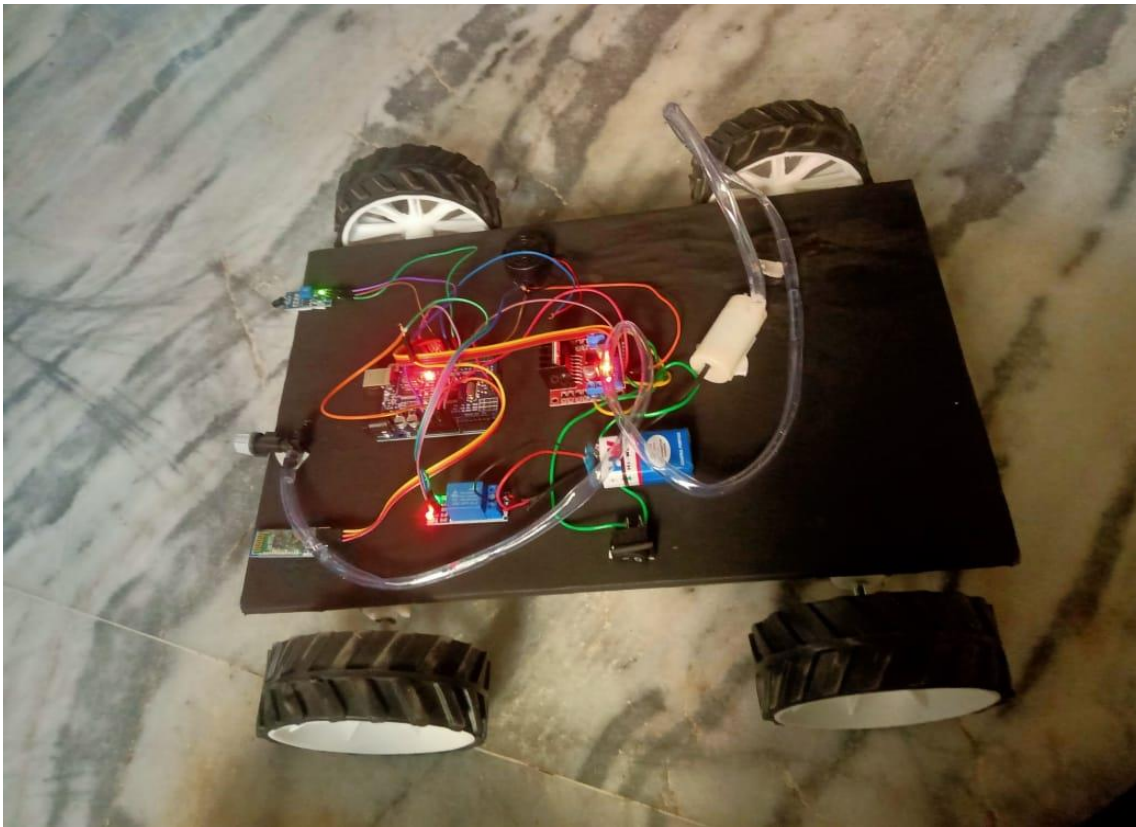
FUTURE SCOPE

It can be enhanced by interfacing with a camera so that the real time images can be sent.

In case of huge fire, it can automatically inform Fire Station with the help of IOT.

CONCLUSION

This project is been implemented by using android application and Bluetooth module. The water container is placed on the robot when the fire is detected, it sprays the water on the fire and extinguish it.

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