Design and Implementation of an android app controlled Fire Fighting Robot

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Abstract: This paper presents the development and implementation of a Fire Fighter Robot. The proposed fire extinguishing robot works with an android application. The complete system contains a vehicle carrying a water tank along with a pump which can throw water. The communication between vehicle and android app is facilitated using Bluetooth module and receiver. The hardware of proposed fire extinguishing robot is implemented and tested. Through various commands provided in the app, the user is able to control the whole movement and the pumping action of robot.

Keywords: Aurdino, Android, Fire Extinguishing

I. INTRODUCTION

A lot of work has been done in the past regarding the construction of autonomous firefighting robots with an aim to use them in undergraduate education and to motivate the student teams to participate in mobile robot design activities [1,2]. Such activities allow students to practically apply and hence strengthen their concepts in mathematics, feedback control, computer programming, signals and systems and basic robotics courses [3]. In some of these activities, a line following robot is used to track and navigate through a line maze while avoiding obstacles and extinguish any fire sources on the basis of feedback from Light Dependent Resistors (LDRs) [4]. A remote-controlled crawler hydraulic excavator has been modified to serve as a fire- fighting robot in [8]. Similarly, a fuzzy inference system has been designed in [9] to monitor and put out fire in road and railway tunnels. A cooperative Fire fighting technique has been discussed in [10], where a human leader guides the robot(s) to perform the Fire fighting task according to his commands. An ultra-sonic obstacle avoidance scheme has been suggested in [11] and its efficacy has been experimentally validated. An adaptive fusion multi-sensor algorithm for fire detection in intelligent buildings has been discussed in [12]. A number of technologies that are currently being used in the Fire fighting robots have been explained in [13].

Our attempt is to develop and implement a fire extinguishing robot with locally available materials and it works on an Arduino based fire detection and extinguishing methodology. This paper presents the design, construction and development of fire detecting mechanism that will extinguish the fire immediately in real-time. The concept is shown in the Figure 1 below
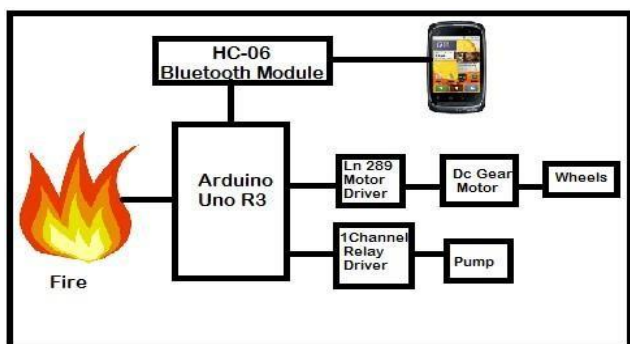
II. DESIGN DETAILS

The proposed system works with an Arduino UNOR3 Family microcontroller and a battery for power supply.

In this system, a Bluetooth is interfaced to the microcontroller for communication.

Three motors are interfaced to the microcontroller through a motor-driver IC, wherein two motors are used to change the directions of the vehicle and the other two to control the water jet of the robot.

The water pump is connected to the relay contacts for sprinkling water. The robotic vehicle is loaded with a water tanker and the pump is remotely controlled by the Android device.

User phone to this system through Bluetooth, a user can enter the commands on the Android application through GUI to control the directions of the robot, such as Forward, Backward, Left and Right. The connection between the components of the system is shown in the Figure 2 below.
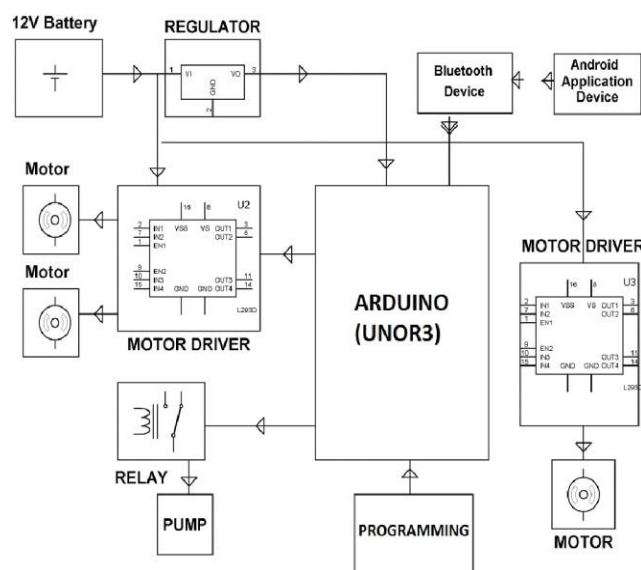

Figure 2: Proposed system architecture

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III. WORKING MODE

The Bluetooth receiver on the vehicle is used to receive those commands sent by the android device; these are then fed to the motors responsible for controlling the vehicle movements in front, back, left and right directions. The Arduino board used is flash type reprogrammable controller. Therefore, it receives the signal from Android device through Bluetooth Module unit and activates corresponding driver circuit.
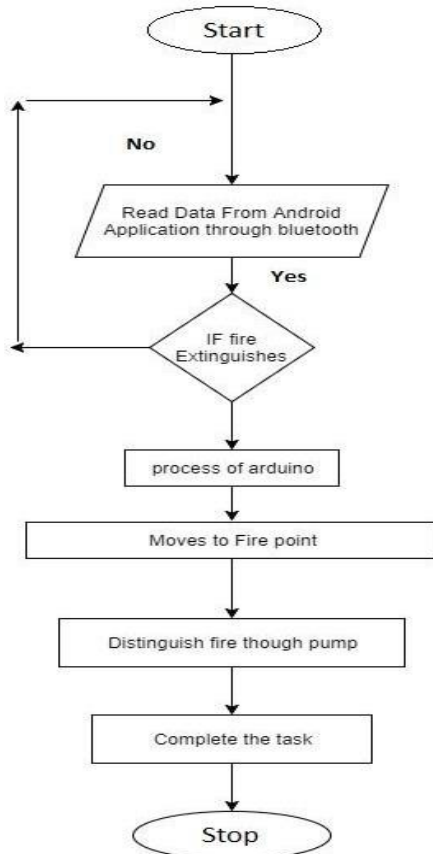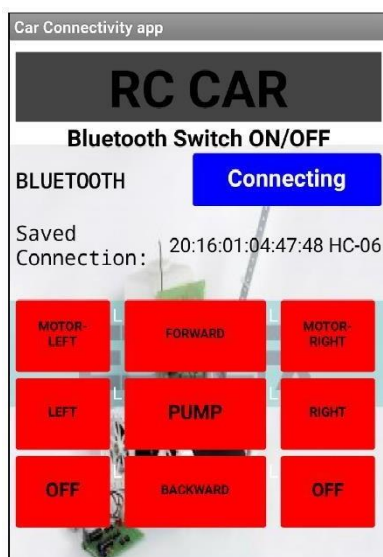

Figure 3: Work Flow of the system

IV. MODEL OF THE MOBILE APP

A clear GUI based interface is built to make it convenient for the user to use the given controls appropriately to move the vehicle.

V. MODEL OF VEHICLE

Following is the model of the vehicle containing all the components.

VI. CONCLUSION

Integrating all the hardware, a successful fire extinguishing robot has been implemented and executed with minimum level of error. Arduino microcontroller is used as the processing and control unit of the robot. An easy to use android app has been used to track and control the movement of the robotic vehicle.

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