

## DESIGN AND FABRICATION OF A FIRE EXTINGUISHER ROBOT

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**Abstract-** The project is designed to develop a firefighting robot using Bluetooth technology for remote operation. Recently Fabrication of a fire Extinguisher Robotics one of the important research issues. The robotic vehicle is loaded with a water tanker and a pipe. The pipe is controlled over wireless communication to throw water. An Arduino is used for the operation. At the controller using push button, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc. At the receiving end, three motors are used for the movement of the vehicle and the remaining one to position the arm of the robot. The Bluetooth module acts as a remote control where the receiver decodes it to drive the Dc motor via the motor driver. A water tank is mounted on the robot body along with the water pump and its operation is carried out from the microcontroller output through an appropriate signal from the transmitting end. The whole operation is carried out by an AT32 mega Arduino. The controller drives the motors through a motor driver which is interfaced to the microcontroller. Moreover, a camera can enhance the project so that the person controlling it can view the operation of the robot remotely on a screen. The water jet is provided two both in the horizontal and vertical course to put out the fire. So, this kind of new firefighting methodology with suited controlling two mechanisms two is effective than the current firefighting systems.

**Keywords:** Bluetooth, Firefighter Robot, Sensor, Mobile control, DC motor.

### 1. INTRODUCTION

Robot is one kind of mechanical design which performs human tasks and behaving like a human. Sensors, control systems, manipulators, power supplies and software are the main necessities for robot. It's about building systems and putting together motors, wires, among the other components [1]. Robots are designed to minimize human interaction in intensive or dangerous work and also to act in the inaccessible environment [2]. The fire extinguisher Robot can detect and extinguish a fire on its own is long past due. People and property can be saved at a much higher rate with relatively slight damage caused by the fire with the invention of such device [3]. Our task was to design and build a model system that could autonomously detect and extinguish a fire. Also aims at minimizing air pollution [4]. In this Project, a Bluetooth controlled Robot is designed. It is the Robot that can move through a model structure, and extinguish the fire with help of a Water Jet. The goal of this project is to develop an intelligent firefighting robot in our daily life. The firefighting robot is equipped with a microcontroller, dc motors, pump etc. A firefighter robot is one that has a small water tank added to it. By attaching a small water tank to the robot, the automation put out the fire by human controlling. This robot processes information from its signal key hardware elements via the

microcontroller. After receiving the signal, the microcontroller drives the pump to supply water from a small water tank attached to the robot body to minimize the fire accident.

### 2. METHODOLOGY

The project focuses on the implementation of a firefighter robot which can be used to extinguish the fire. It also can be controlled using a smartphone. By using the controller app, a signal can send to the Arduino as there is a Bluetooth module to connect the robot with the smartphone. The Arduino controls the motor and the water is pumped to the storage tank. When the circuit scenes fire it uses the water to extinguish the fire.

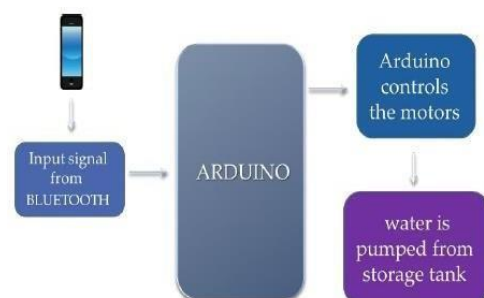


Fig. 1: Methodology of the robot controlling

### 3. CONSTRUCTION

#### Regulated Power Supply

A regulated power supply is an established circuit, this converts unregulated AC into a constant DC using a rectifier.

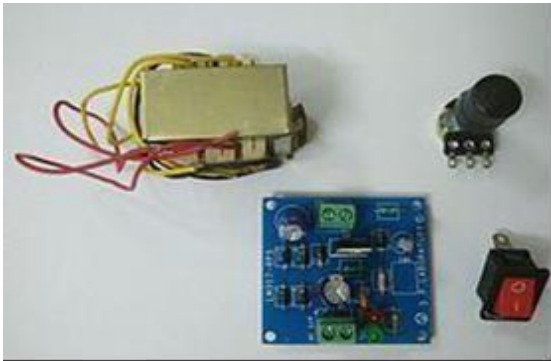


Fig. 2: Regulated Power supply

#### Arduino

Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware in order to load new code onto the board that's why Arduino Mega is used.



Fig. 3. Arduino [5]

#### Bluetooth module

Bluetooth Module is an electrical component. Bluetooth Module builds communication between Arduino and smartphone to send data to show the status on the smartphone.



Fig. 4: Bluetooth module [6]

#### Servo motor

A servomotor consists of a suitable motor coupled to a sensor for position feedback. It also required a relative sophisticated controller, often a dedicated module designed specifically for use with servomotors.



Fig. 5: Servo motor [7]

#### Brushless DC pump

Brushless DC pump known as electronically commutated motors are synchronous motors that are powered by a DC electric source.



Fig. 6: Brushless DC pump [8]

#### Crystal oscillator

An electronic oscillator is an electronic circuit that products a periodic, oscillating electronic signal, often a sinewave or a square wave. Oscillators convert DC from a power supply to an AC.



Fig. 7: Crystal oscillator [9]

#### DC motor

DC motor converts direct current electrical electricity into mechanical power. It depends on the forces produced via magnetic fields. DC motors have some inside mechanism.



Fig. 8: DC motor [10]

## Motor shield

The Arduino Motor Shield is a dual full bridge driver L298; which is premeditated to drive inductive loads such as relays, solenoids, DC and stepping motors. By using these two DC motors can drive with Arduino board, controlling the speed and direction of each one independently.

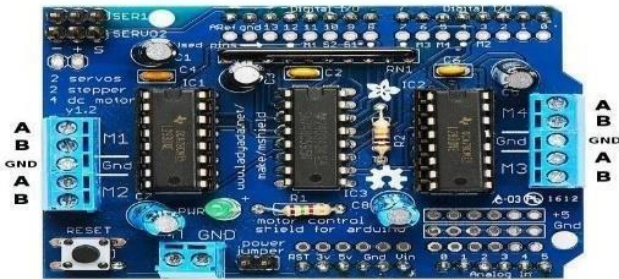


Fig. 9: Motor shield [11]

## Voltage regulator

A voltage regulator is planned to repeatedly maintain a constant voltage level. Depending on the project, it may be used to regulate one or more AC or DC voltages.



Fig. 10: Voltage regulator [12]

## 4. BASIC WORKING PRINCIPLE

The robot uses a microcontroller to receive an input signal from an android device using an android application. To drive all the components 5v dc and 12v dc is required. The project uses HT12E encoder which converts 4bit data to serial output which is then fed to the BLUETOOTH module for transmitting the same to be received by the receiver BLUETOOTH module the output of which is fed to HT12d the serial decoder IC, the output of which is fed to the controller. The transmitting cease of the microcontroller is linked to the cellular therefore while a specific button is pressed the program achieved delivers corresponding 4bit facts which are then transmitted serially at port 1. The data so received at the receiver end of port 1 operates the motor through motor driver as required being inter faced from the microcontroller output port 2. 5v Dc out of the 12v available from regular I C 7805 is fed to the controller, decoder, the motor driver IC L239D pin 8 for operation of the motor.

## 5. DESIGN AND FABRICATION

Analyzing the needs of the robot in order to be able to satisfy the requirements and to be able to achieve its goal which is to detect a lit candle in a house model and extinguish it in the shortest possible time so a fast-reliable robot which body is able to lift all the hardware and at the same time it should be as light as possible in order to remain fast. an easy shape that could navigate through the house while avoiding obstacles. There have two initial ideas concerning the shape of the robot: 1- 3-wheeled pyramid-shaped robot where each of the rear two wheels had a motor in order to facilitate the

steering process while the front wheel is just a free roller wheel. 2- Build the robot on a chassis of a car with the 4-wheel concept of the car, one motor and same steering way just like in remote-controlled cars.

After thinking, the idea of the 4-wheel car had settled with because of it had some advantages over the other design; it will help to maintain the balance of the robot despite the speed of the motor, and if there were some inaccuracy in the robot body, it will not cause any problems. Two levels of glass sheet had made on the chassis to give more to place the hardware used in the robot, and those two levels are lifted by the help of a piece of iron connected to the chassis.

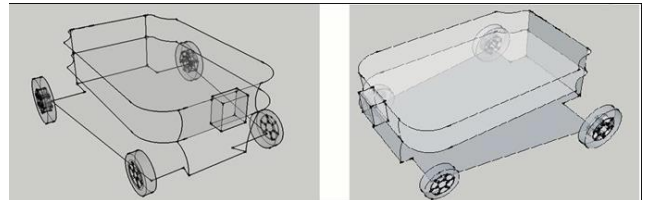


Fig. 12: Design of the Robot



Fig. 13: Fabricated Robot



Fig. 14: Internal Circuit Diagram



Fig. 15: The robot in extinguishing fire

## 6. THE CONTROLLER APP

This is the controller app that controls the robot, its direction and takes the robot to the fire affected place. It then starts the pump to throw water to extinguish fire.

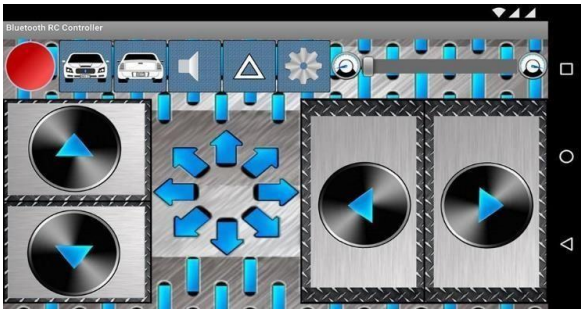


Fig. 16: The controller app layout

## 7. CONCLUSION

The project presents a firefighting robot using Bluetooth technology and it is designed and implemented with AT32 Arduino in embedded domain system. Experimental work has been out carefully. This method is highly advantageous for security purpose and industrial purpose. At present, the robot is capable of throwing water at a high flow rate only. At the future, the robot will also capable of throwing water with controlled robotic arms and the object detections using a camera on it. It can be used as further extensions of the project to achieve all the features. Many sensors like Ultrasonic sensors, Smoke sensors, Temperature sensors, UVTRON sensors etc. can also be used which will make the robot more efficient. Further in future, we can use the GSM modem also.

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