

# FIRE GUARD ROBOT

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## ABSTRACT

*Now a day's fire accidents are very common and somewhere it is very difficult for a fireman to keep an eye everywhere. It is not possible for any person to monitor continuously on places where these accidental fire may occur. But, robot can do that. Robot will detect fire automatically. Our robot will be mostly useful in mechanical industries. Our robot is capable for detecting fire by using smoke sensor and will also send notification to that particular user on android mobile.*

*After receiving notification, the user will operate our robot through smart phone. Our proposed robot has a water spray which has ability of sprinkling water. The sprinkler can be move to the desired direction. At the time of moving towards the source of fire it may happen that it will encounter some obstacles, for this, we will be using an ultrasonic Ranging Module, which will help to avoid obstacles coming in our way.*

*Communication between the mobile phone and robot will be done through Bluetooth. The application will be having GUI to control the movement of our robot. When mobile get will get connected to the Bluetooth for first time, it will set module name, baud rate. It is possible to implement Bluetooth communication between smartphones and micro-controller. Robot controlled through android can be used easily in daily life such as in laboratory, schools, college, homes, small companies, etc. The development of mobile application for Android in Android SDK is easy and free of cost.*

**Keyword :** - *Fire detection, Android SDK, Arduino Uno ,Fire automatically*

## 1. INTRODUCTION

Now a day's robots are being used for smart and accurate work. The robot vehicles are very useful in laboratory, construction area, warehouses and manufacturing company. Robots can also be used for heavy hardware work and can be controlled through applications.

Such type of application are being growing day by day. For analyzing different items, and for handling heavy materials robots can be used. Wireless navigation is also possible for moving robot on different locations, and can be controlled through android application. There is logic control mechanism which is used to control robot. That is Arduino programing language which can be used for processor. Arduino is an open-source electronics platform based on easy-to-use hardware and software.

Previously Fire Guard Robots were controlled by using different electronics devices and those devices are very costly. So, this reduces the scope of control of fire fighting robot. Afterwards, advanced techniques were implementing the same robot by using android application to control the actions of the robot. With the help of robots, fireman's g work really decreased and movements of robot are much effective.

By using an android application, user will receive notification and will be ready for extinguishing fire. This project is designed to build an android application which can control operations of the fire Guard robot. The user can send commands to robot through Bluetooth module which is placed on robot.

## 2. Literature survey

In 2017 Anjitha Krishnan et.al has designed 'GSM Based Fire Fighting Robot' [1]. Their robot detects the fire using four temperature sensors that continuously sense the temperature. If the temperature increases above the predetermined value, then the buzzer sounds to notify the contingency of fire, and at the same time a warning message will be sent to the corresponding mobile with the help of a GSM module provided to it.

In 'GSM Based Fire Fighting Robot', all the operations and movements of robot, as well as extinguishing methods is automatic. This feature is an advantage for processing implementation, but sometimes automatic system may not work exactly as we needed. FIRE GUARD ROBOT can help in overcoming this problem, by providing movements and directions manually according to User.

Vaibhav K. Shah (2013) et.al [2] discussed about design of a firefighting robot using embedded system. A robot capable of fighting a simulated household fire was built. It must be able to automatically navigate through a modeled floor plan while actively scanning for a flame. The robot can even act as a path guider in normal case and as a fire extinguisher in emergency.

In "firefighting robot using embedded system", The robot designed by them works only on a path which is already predefined, this can be an advantage for a small floor plan with restricted predicated path. But at the same time, it can be quite difficult to design this predefined path on all over floor. FGR can help in such cases, as there is no need of restricting path for implementation.

The intelligent 'tank robot' developed by Jimmy Hasugian et.al [3]. Tank robot was made from plastic, aluminum and iron. Robot components includes two servo motors, two DC motors, ultrasonic sensor, compass sensors, flame detector, thermal array sensor, white detector (IR and photo transistor), sound activation circuit and micro switch sensor. Robot is equipped with ultrasonic sensors and compass sensor to navigate in certain area to find and extinguish the flame, robot is equipped with a flame detector to detect the flame and a thermal array sensor to know the position of flame.

In "Tank robot", proposed robot was designed with many heavy components that are very expensive. The advantage of this robot is its stability, but at the same time making use of heavy material may cause issues in mobility. Fire Guard Robot can overcome this problem in a way that can help move faster as compared.

## 3. Methodology

The designing of FGR has different kinds of components such as Smoke sensor MQ02, Bluetooth module HC05, Arduino Uno, Motor Shield, DC Motor, Ultrasonic Ranging module, Flame sensor. Smoke sensor MQ is used for gas or smoke detection. Flame sensor is used for flame detection. Ultrasonic Ranging module is used for detection of various obstacle. HC-05 is used for Bluetooth Serial Port Protocol designed for setting up transparent wireless serial connections. It can be used in a Master or Slave configuration. Arduino Uno is an open-source platform used for electronics projects. It consists of both a physical programmable circuit board which referred to as a microcontroller and a piece of software, or IDE that runs on computer, used to write and upload computer code to the physical board. Motor Shield is a dual-motor controller for Arduino. Based on the L298 H-bridge, it can drive DC motors up to 2A per channel. It is used to drive the FGR simultaneously.

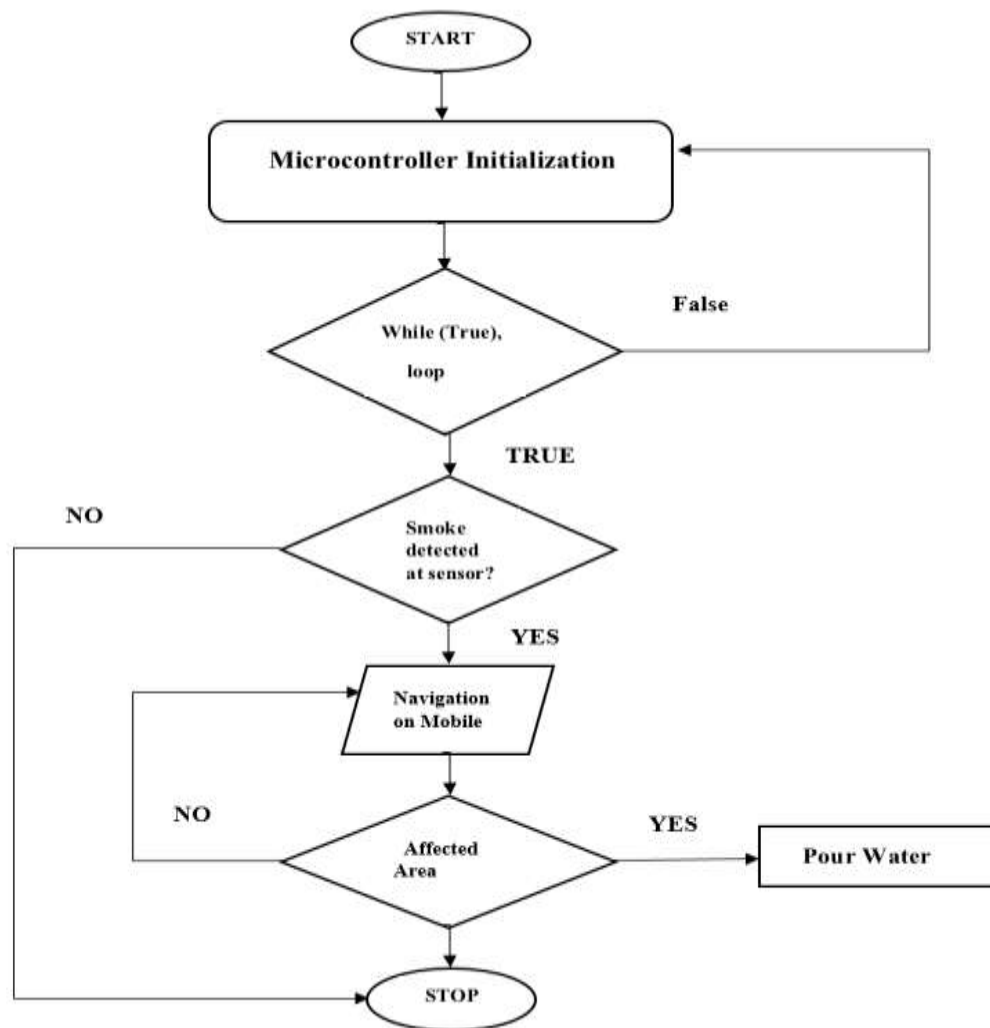
### 3.1 WORKING

Once the microcontroller initializes, the FGR will continue to sense the smoke and flame through the smoke sensors and flame sensors respectively. As soon as smoke or flame detected a buzzer is used and added for indication of smoke detected or flame detected. Through the buzzer indication, user would come to know about fire mishap. User will be connected to robot through Bluetooth connectivity which is done by making use of hc05bluetooth module. User will have full access to robot for providing directions and commands. Robot may encounter some barriers in path, for avoiding obstacles, ultrasonic ranging module is used which continuously search for obstacles in path. through the Bluetooth connectivity, connected user can operate FGR by using android

application All directions will be manual and according to users. The user can transmit command like moving right, left, backward and forward to FGR through Bluetooth module.

The ATmega32P microcontroller execute commands as well as Motor Shield are used to control DC motor. As soon as FGR reaches the affected area, there is a water sprinkler mounted on robot body, which can be accessed through android application that can help reduce fire or smoke. After sprinkling of water to the affected area the FGR will stop.

### 3.2 FLOWCHART



All the process start from mobile application command to microcontroller execution. Smoke detector detects smoke and sends a notification, then mobile application can be used for providing navigation and to sprinkle water on brunt area. It works according to condition that is shown in given flow-chart.

### 3.3 COMPONENTS

1) Bluetooth module HC05

#### Specifications

- Serial Bluetooth module for Arduino and microcontrollers.

- Operating Voltage: 4V to 6V (generally +5V).
- Follows IEEE 802.15.1 standardized protocol.
- Range: < 9m.
- Works with Serial communication (USART) and TTL compatible.
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth.

## 2)Smoke sensor MQ

### Specifications

- Operating Voltage is +5V.
- Can be used to Measure/detect LPG, Alcohol, Propane, Hydrogen, CO and even methane.
- Preheat duration 20 seconds.
- Can be used as a Digital or analog sensor.

## 3)HC-SR04 Ultrasonic Sensor

### Specifications

- Operating voltage: +5V.
- Theoretical Measuring Distance: 2cm to 450cm.
- Practical Measuring Distance: 2cm to 80cm.
- Measuring angle covered: <15°.

## 4)Arduino Uno

### Specification

- ATmega32P– 8 bit AVR family microcontroller.
- Operating Voltage 5V.
- Analog Input Pins 6 (A0 – A5).
- Digital I/O Pins 14 (Out of which 6 provide PWM output).
- Flash Memory 32 KB (0.5 KB is used for Bootloader).
- SRAM 2 KB.
- EEPROM 1 KB.

## 5)DC Motor

### Specifications

- DC supply: 4 to 12V.
- RPM: 300 at 12V.
- Motor diameter: 36mm.
- Gear head diameter: 37mm.

## 6)Motor Shield

### Specifications

- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- High-Noise-Immunity Inputs
- Output Current 600 mA Per Channel

## 7)Flame sensor

Specifications

- Working voltage: 3.3v - 5v
- Detect range: 60 degrees
- Digital/Analog output
- On-board LM393 chip

**4. CONCLUSION**

FGR is enabled with such features, that are simple in implementation. FGR makes use of an Arduino Uno kit, which helps one gain accuracy and cost effectiveness is achieved largely. As studied in literature survey, we have found certain advantages of robots, and some drawbacks. As one common drawback with most of the robots was that the whole process of implementation was automatic. That is from process of detecting smoke to final fire extinguishing method, all were automatic. FGR can help to overcome such drawbacks, as commands and directions are fully user accordingly. As far as future scope is concerned monitoring camera can be added for viewing the arena and GSM can be added for providing notification to the connected android mobile.

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