

# RF CONTROLLED FIRE FIGHTING ROBOT WITH HIGH PRESSURE WATER SPRINKLER

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**ABSTRACT:** Nowadays, many places such as schools, colleges and Our proposed project aims to develop an Arduino controlled fire fighter robot that can be used to extinguish the fire through remote handling. The vehicle consists of a water tank along with a pump which can throw water when needed. The system uses an Arduino Uno microcontroller board for this purpose. The Infrared receiver on the vehicle is used to receive the amount of flame. These values are used to find the location of the fire. These are then fed to the motors responsible for controlling the vehicle movements in front, back, left and right directions. The IR sensor is interfaced with an Arduino Uno microcontroller for this purpose. The microcontroller after receiving input commands operates the motors through a driver IC for vehicle movements. The use of android has one more advantage in addition to improved GUI. It also uses a sprinkler which is used to spray water with a desired pressure. It allows use of the Bluetooth technology for communication allowing the vehicle to operate in a good range from the device. The system can also be later enhanced through the use of a wireless camera to be used for monitoring purposes.

**Keywords-** RF controller,.Regulated power supply, Relay, Pump

## 1. INTRODUCTION

A Robot is a programmable device which can be used to perform various challenging tasks. we have designed RF based Fire Fighting Robot that can be operated wirelessly and more efficiently. The use of robots is more common today than ever before. Fire extinguisher Robot that can detect and extinguish a fire on its own. With the invention of RF based Fire Fighting robot, people and property can be saved at a much higher rate with minimum damage caused by the fire. The Fire Fighting Robot is designed and implemented in a small floor of a house, extinguish the fire with the help of the water. Fire extinguishing is a challenging task for fireman due to physical limitations. Therefore, this RF based Fire Fighting robot is very useful for fire fighters. This efficient Fire Fighting robot can be used for such high-risk task of extinguishing fire. Our task is to design and build a prototype system that loaded with a water pump and this water pump is connected through plastic pipe to the water tank placed outside. Robots are designed to remove the human factor from labor intensive or dangerous work and also to act in inaccessible environment and also aims at decreasing the air pollution. The RF based Fire Fighting robot is capable to accurately locate the position of the flames

by actively scanning the entire area and obstacles so that the fire which has more potential to spread fire can be detected and extinguished faster which reduces the possibility of fire getting spread and save property from the damage.

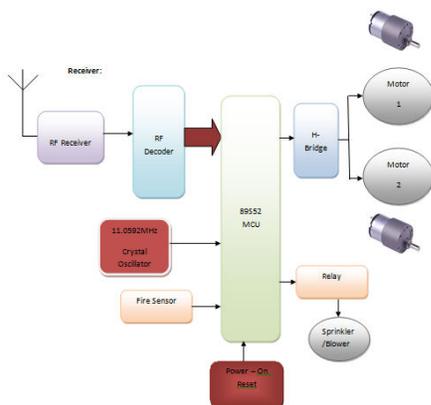


Fig.1: Example figure

The flat form for this project is based on Embedded System. An Embedded system is a special-purpose system in which the computer is completely encapsulated by the device it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few predefined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, so the cost savings may be multiplied by millions of items. An embedded system is a special-purpose computer system designed to perform a dedicated function. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded

system comprises of both hardware and software. Embedded system is the fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. Embedded technology is implemented to perform a specified task and the programming is done using assembly language programming or embedded C. Ours being a developing country the power consumption is increasing on large scale to meet the growing need of the people.

## 2. LITERATURE SURVEY

### 2.1 Flashover Voltage Prediction of Composite Insulators Based on the Characteristics of LeaNage Current:

Effective prediction of flashover voltage (FOV) of insulators is an important approach to the prevention of pollution flashover accidents. In order to predict the FOV of insulators and prevent pollution flashover accidents, first, a large number of artificial pollution tests, which simulate the impact of contamination level and hydrophobicity classification (HC) on FOV and leakage current, have been investigated. Second, based on the experimental data, the relationship between the FOV and contamination level, HC, has been obtained; the four characteristics of leakage current, namely, the entropy of pulse amplitude (S), the maximum pulse amplitude (I<sub>h</sub>), the energy ration (K) and the energy (E), have been extracted. They jointly reflect how severe the contamination level and the HC of composite insulators are from different perspectives. Third, the variation laws between the four characteristics and the contamination level, HC, have been obtained. Finally, the FOV prediction least squares-support vector machines (LS-SVM) model has been presented, in which the four characteristics

are used as the inputs of model, and the FOV is used as the output of model. The prediction results are basically consistent with the test results. Therefore, the model is acceptable to predict the FOV of composite insulators and is of significance for the prevention of pollution flashover accidents.

### ***2.2 Prediction of Flashover Voltage of Non-ceramic Insulators under Contaminated Conditions:***

This paper describes the development of a theoretical model to predict flashover voltage of nonceramic insulators. The model is based on reignition and arc constants that have been derived from electric field simulations and experimental data of flashover voltage and surface resistance measurements. New and field-aged silicone rubber and ethylene propylene diene monomer rubber samples were evaluated. A good correlation of the calculations from the model with experimental data has been demonstrated.

### ***2.3 Studies the Effect of Equivalent Salt Deposit Density on LeNage Current and Flashover Voltage of Artificially Contaminated Disc Insulators:***

Reliable operation of transmission and distribution system depends on the life of the insulator. In overhead line the operation of the insulator is mainly influenced by pollution (contamination) level of that place. Flash over voltage and leakage current of the insulator are mainly influenced by the pollution level. Hence it is important to study influence of different pollutants on flashover voltage and leakage current of an insulator in polluted areas. This paper presents the flashover voltage and leakage current for artificial NaCl and KCl salt deposit layers at various Equivalent Salt Deposit Density (ESDD) level. The difference on flashover voltage and leakage current of polluted disc insulator have been studied by using

solid layer method. The tests show that there are some differences on leakage current and flash over voltage characteristics, and the influences vary on both of specimens using different salt like KCl and NaCl. In this paper also an attempt has been made to develop an equation to estimate the flashover voltage and leakage current by using curve fitting method.

### ***2.4 Non Linear Regression Model to Predict Flashover of Nonceramic Insulators:***

This work is based on the application of non-linear regression analysis technique to develop a model for prediction of flashover voltage of non-ceramic insulators (NCIs). The superiority of nonlinear model over a linear model is demonstrated. Surface resistance measurement and flashover experiments were performed with field aged samples. This work finds applications in distribution class insulators and can be extended for higher voltage class of insulators.

### ***2.5 A Novel Method for Prediction of Flashover of In-service EPDM Insulators:***

A new approach is presented to predict the flashover of EPDM (ethylene propylene diene monomer) NCI (nonceramic insulators) in service based on the measurement of surface resistance in the laboratory. This method is shown to be more accurate in predicting flashover of NCI when compared to conventional ESDD (equivalent salt deposit density) measurement. A critical value of surface resistance that will result in a flashover has been determined which is useful for assessing the condition of in-service NCI with respect to flashover.

### ***Quaternary Phosphonium Sulfonate Fire Retardant and Synthesis Method and Use Thereof:***

The invention provides a quaternary phosphonium sulfonate fire retardant and a synthesis method and use thereof. The structural general formula of the fire retardant is as shown in a formula (I) in the specification, wherein R1 and R2 are one of C1-C24 alkyl, C2-C24 alkenyl, C3-C24 cycloalkyl, C4-C24 aryl, and C4-C24 substituted aromatic of which the substituent group contains N, O or P. The fire retardant is prepared from sulfonyl chloride, alcohol, an organic phosphorus compound and the like as raw materials by reaction in two steps. The synthesis condition is mild, operation is simple and convenient, and yield is high. Meanwhile, the fire retardant has good heat stability, and has good flame retardant efficiency when being applied to a plurality of polymers, UL-94 of the obtained PC fire-retardant composite material achieves the V-0 grade, UL-94 of the obtained POE fire-retardant composite material achieves V-2 grade, and meanwhile, good chemical and thermal properties are kept.

### 3. IMPLEMENTATION

The common conventional firefighting methods involve fire brigades, portable fire extinguisher (hand held) and sprinklers. These conventional methods consume lot of time to reach the place of the mishap like the fire brigade must be deployed from the fire station and should get through the traffic and reach the fire struck area, the portable extinguisher is also no gift because it is generally place at one off the corners of the building which may be difficult to reach and it needs constant maintenance. On the other hand, the sprinkler and smoke detector set up is very non reliable method because the sprinkler pipes have any defect may not provide enough pressure and it is suited to cover large areas.

The proposed model is able to detect presence of fire using flame sensor and calculates object distance using ultrasonic sensor and moves the robot to fire accident location. It contains gear motors and motor driver to control the movement of robot. When it detects fire, it communicates with microcontroller (Arduino MEGA) and the robot will move towards the fire affected area. The fire extinguisher is mounted on the robotic vehicle which is then controlled over the wireless communication so that it extinguishes the fire automatically.

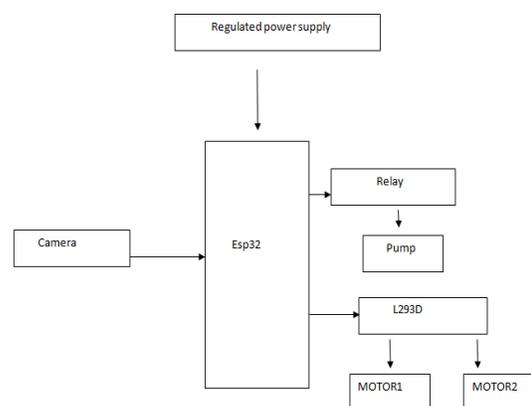


Fig.2: Block diagram

#### POWER SUPPLY:

All digital circuits require regulated power supply. In this article we are going to learn how to get a regulated positive supply from the mains supply.

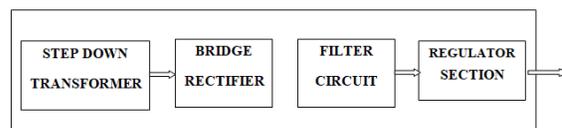


Fig.3: Power supply

**TRANSFORMER:**

A transformer consists of two coils also called as “WINDINGS” namely PRIMARY & SECONDARY. They are linked together through inductively coupled electrical conductors also called as CORE. A changing current in the primary causes a change in the Magnetic Field in the core & this in turn induces an alternating voltage in the secondary coil. If load is applied to the secondary then an alternating current will flow through the load. If we consider an ideal condition then all the energy from the primary circuit will be transferred to the secondary circuit through the magnetic field.

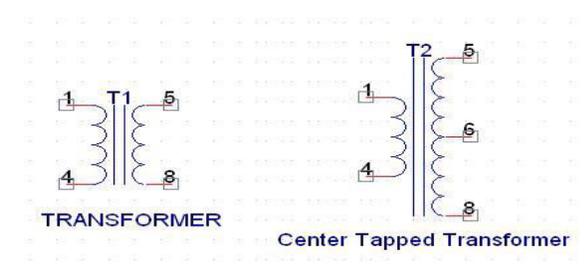


Fig.4: Types of transformers

**RECTIFIER:**

A rectifier is a device that converts an AC signal into DC signal. For rectification purpose we use a diode, a diode is a device that allows current to pass only in one direction i.e., when the anode of the diode is positive with respect to the cathode also called as forward biased condition & blocks current in the reversed biased condition.

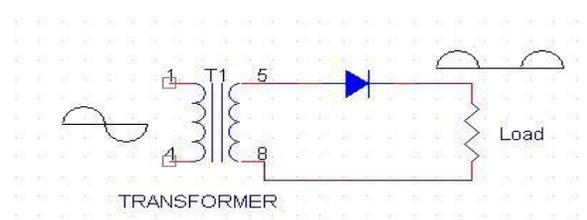


Fig.5: Rectifier

**HALF WAVE RECTIFIER:**

This is the simplest type of rectifier as you can see in the diagram a half wave rectifier consists of only one diode. When an AC signal is applied to it during the positive half cycle the diode is forward biased & current flows through it. But during the negative half cycle diode is reverse biased & no current flows through it. Since only one half of the input reaches the output, it is very inefficient to be used in power supplies.

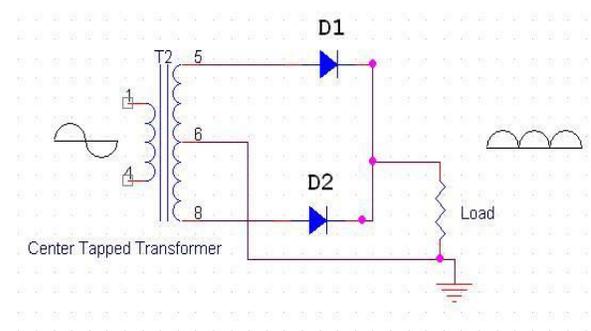


Fig.6: Half wave rectifier

**FULL WAVE RECTIFIER:**

Half wave rectifier is quite simple but it is very inefficient, for greater efficiency we would like to use both the half cycles of the AC signal. This can be achieved by using a center tapped transformer i.e., we would have to double the size of secondary winding & provide connection to the center. So, during the positive half cycle diode D1 conducts & D2 is in reverse biased condition. During the negative half cycle diode D2 conducts & D1 is reverse biased. Thus, we get both the half cycles across the load. One of the disadvantages of Full Wave Rectifier design is the necessity of using a center tapped transformer,

thus increasing the size & cost of the circuit. This can be avoided by using the Full Wave Bridge Rectifier.

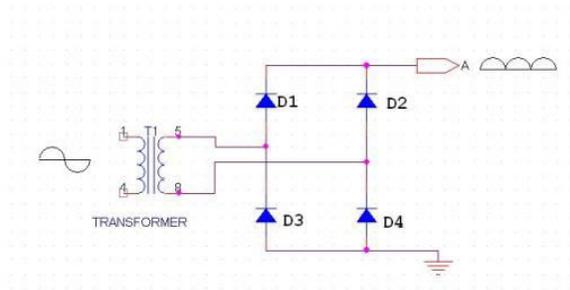


Fig.7: Full wave rectifier

#### 4. EXPERIMENTAL RESULTS

There are many prospects of fire in any far away area or in an industry. For example, in cotton mills, garments go-downs, and fuel storage tanks, electric leaks may consequence in immense fire and also damaged. In some cases, fire accidents may cause heavy losses both financially and by taking lives.

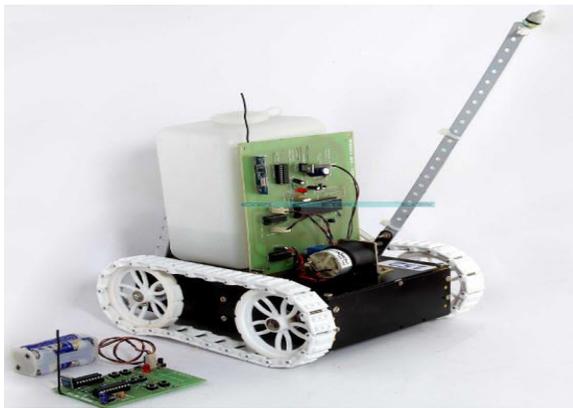


Fig.8: Firefighting robot

Firefighting robotic vehicles are very helpful to guard wealth, human lives, and surroundings. This robot is built with an embedded system. It is capable of directing alone on a displayed floor while dynamically scanning the flames of fire. These robots are designed in such a way that it hunts a fire, &

soaks it before the fire could spread out of range and control.

This type of robot will work with firefighters faster or later, thus really reducing the danger of damage to victims. Apart from this, it will also help generate interest along with the inventions in the field of robotics while working towards a functional and available solution to protect lives and moderate the danger to property.



Fig.9: Side view of fire fighting robot

#### 5. CONCLUSION

An Autonomous Fire Fighting robot has been successfully built. Fire-fighting robot can be easily and conveniently used and operated automatically when any fire incident occurs in educational, industrial and hospital areas to save human life. Firefighting Robot comprises of numerous sensors and motors, and has small in size, less in weight, with rechargeable batteries, in result it requires less space. Prototype provides us greater efficiency to detect the flame, temperature and gas presented in the affected area. As a conclusion, the project entitled "RF Based Fire Fighting Robot with High Pressure Water Sprinklers" has archived its aim and objective successfully.

## 6. FUTURE SCOPE

All its moving actions forward, backward and sideward are also being performed. By the water pump system arranged in it can splash the water on the fire. This robot can be operated from shorter distance to larger distance. The smart camera which is fixed to this robot can monitor the surroundings. This project helps in further development in firefighting. It backs the firemen while doing their work. This paper also helps in understanding the concepts in fighting with the fire and tells the importance of this field. By making advancements to this project without the intervention of the human, the robot has to cease the fire which is our future scope.

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