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# Enhancing Survival during Fire Accidents using Quad Copter

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**ABSTRACT**

Quad copters are unmanned Ariel Vehicle (UAV), generally a miniature model of helicopter lifted in the air using four rotors attached with propellers. The unmanned vehicles is widely used and it is one of the growing applications in various domains. It can be attributed to the ability of operating in inaccessible areas, reducing the human loss in major accidents, and making it easily accessible to dangerous conditions.

The main target of this paper is to explain the usage of drone in fire fighting accidents and its rescue. This paper focuses on the components that can be used for a fire fighting drone to reduce the overall weight and cost for developing the drone.

***Keywords:*** *Unmanned Aerial Vehicle (UAV),Fire Fighting Drones(FFD), Quad Copter(QC)*

## I. INTRODUCTION:

Currently, there is a lack of Unmanned Aerial Vehicles in India that are being used for extinguishing the fire or rescuing the people out of it. The damage that a fire accident causes is proportional to the size of the fire produced during the accident. Sometimes, during the accident nothing happens to the property and living beings, but it would be great to have a mechanism to eventually extinguish the fires that are difficult to control.

The main reason why our team decided to build a Quad copter that is integrated with the fire extinguishing ball release mechanism is because of all the advantages that it provides. Initiating with the fact that UAVs does not need require a pilot on board for flight. It will be easy to get to the places where human lives would be put in danger if entered. Another reason is that the process would be devoid of human errors on board. Of course, one thing that has to be taken into account as an advantage is that if any of the systems fail the UAV during flight ,it will be in a great risk of crashing, but those probabilities are too minimized when compared with probabilities of having a successful machine.

On the other hand, according to the Fire Services-National Disaster Management Authority Government of India reporting, in the year 2018, there were 37 people who are mostly students, were trapped in a forest fire while they are on a trekking expedition at **Kurangani Forest**, near Bodi in Theni district of Tamil Nadu. Helicopters of the Indian Air Force (IAF) along with the support of local police and forest department, put their hard work into rescuing the people who are in need of help. According to the source the Defense Minister tweeted that" *if the choppers can't land, the students will be airlifted".*

This fire extinguishing quad copter is built with the capability of reaching an higher storey in a building in very less time when compared to the actual method of lifting a fireman to that storey using a crane. This paper reveals on the prototype in order to help those that risk their life when a fire takes place and also the living beings that can be harmed and their surroundings, forests ,where fire occurs. It also helps in avoiding fires and also assists in extinguishing them.

Recent research in co-operative unmanned aerial system have received growing attention in both civilian and military applications since they can work without human assistance in both complicated and uncertain environments, which enables longer endurance. It can reach to those places where sometimes it is impossible for humans to reach. It can work for long hours without any problems. Even a person sitting in a wheelchair can contribute to help people who are stuck

in the building. There is no need of the physical fitness but the knowledge of operation is sufficient for the controller. It can reach in quick time when compared to the time taken by human beings to reach.

At present, the situation of firefighters is, they need to crawl into the buildings and look for survivors manually exposing their lives to risk. The drone is an easy mechanism that can be used to find out the victims in the hazard and find out the hotspots This helps to reduce the risk of lives of firefighters.

## II. DESIGN OF QUADCOPTER

### A. Components Specifications

**Frame:**

The frame used in the Quad Copter, is made of four plastic drilled rods with square cross-section. It is where four motors are fitted on each side and the two center plastic plates. The frame weight about 180g, the weight depends on the type of material that is selected to build the frame. The spacing between the centers of four mounted motors must be equal. The flight controller and the receiver can be mounted on a plate fitted to the center of the frame.

**ESC (Electronic Speed Control):**

The required ESC needed to run the applied motor is 30A.The 30 Amps Electronic Speed Controller (ESC) controls the speed of the motor and provides the appropriate measure of electrical power to the drone.

**Motors:**

The selection of the motor depends on the weight that has to be carried by it. The control algorithm has to be accurate in order to bring an stable flight. The amount of rpm per volt depends upon the QD weight and size.

The specification of the selected motor is

- 1400KV UAV brushless motor
- Ideal to work with 30A ESC (Electronic speed control)

**Propellers specification:**

The propellers blades is used to rotate and bring the thrust which rotates in either clockwise or anti clock wise direction.

**Battery:**

The battery is Li-Po battery (Lithium Polymer) i.e rechargeable battery. The selection of the battery depends on the capacity and battery discharge rate. In order to get the best lifetime and performance the choosing of battery plays a crucial role. The battery selection also depends on the size of the drone, no of motors and the type.

**Flight Controller:**

Flight Controller serves as a CPU for the drone i.e. It controls all the motors. The stabilization of the drone depends on the flight controller. It is a small circuit board with build in display and pin module for connecting the receiver and motor. It receives commands from the user & controls the motors in order stabilize the quad copter in air.

**Receiver:**

A receiver is the component that receives signals from the transmitter. Transmitter transmits the signal by receiving it from source of signal. The whole operation is done in a wireless manner. Whereas the receiver receives this wireless signal and passes it to the device.

**Fire Extinguisher:**

The common method of sprinkling water in the place where fire accident had took place proves its disadvantage in some places.

Usage of 'Carbon Tetrachloride' as the fire extinguishing material in either powder/gas form contained inside a Grenade Ball provides its advantage in using during fire accidents.

**Classes of Fire:**

Class A –combustible materials flammable solids like wood
Class B –flammable liquids: such as petrol, turpentine or paint
Class C –flammable gases: like hydrogen, butane or methane
Class D –combustible metals: chemicals such as Mg, Al, K
Electrical –due to electrical equipment

Note: Once the electrical item is removed, the fire changes class
Class F –due to cooking oils

**Hardware Implementation:**

Considering all the above specifications, a Quad Copter can be designed by following the below steps:
Step 1: Assembly of Quad Copter frame:
Plastic drilled rods called as arms are screwed on the bottom plate of the frame first then by flipping the frame, start screwing on the top plate. Now mount the plates for the motors.

Step 2: Mounting the motors & Electronic speed controllers:
Mount the motors on the mounting plates by using hex screws. Connect the ESC's wires to the appropriate motor wires. There exist particular connections for the motor to rotate in either clock or counter clock wise.

Step 3: Flight Controller setup:
Mount the flight controller board on the top of the frame. Now remove the red wires from ESC's except from one ESC because flight controller needs power from only one of the ESC.

Step 4:
Dump the code into the flight controller & make corresponding changes in the calibration to balance the Quad Copter.

## III. EXISTING SYSTEM

The existing system to put out the fire is water sprinklers, firefighting roots, extinguishers. The water sprinklers are suitable if the fire occurs in forest, but if it occurs in the Office Buildings where electronics would be present it would result in a damage of electronics. The Fire sensors present in the Quad Copter is used to sense the fire place and the automatic fire fighting mechanism is used to extinguish the fire at the sensed place, where the sensor senses once the flame reaches but it may not be the exact location where rescuing does not required. Here, extinguisher does not seem to reach the required potential. On the other hand, Thermo couple or Thermo Sensors are used to sense the fire place and the messages is passed over to the fire fighters.

## IV. PROPOSED SYSTEM

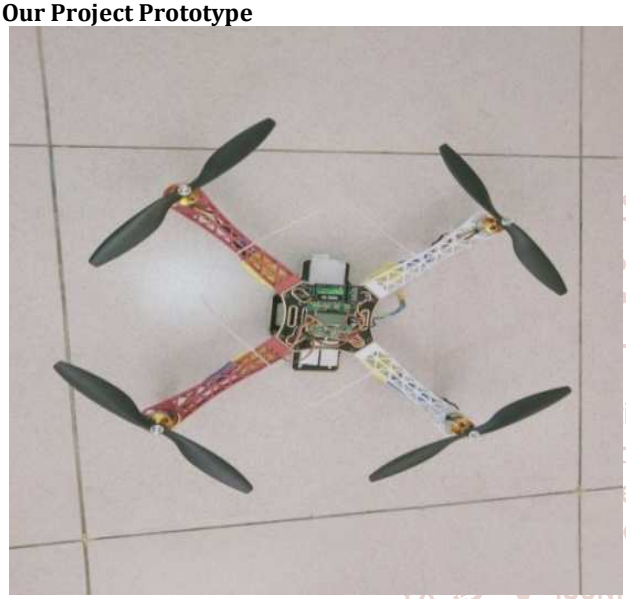
In order to overcome the above disadvantages mentioned, UAV is designed to reach the required potential to extinguish

the fire and rescue the people. Here, we use gaseous or powder fire extinguishing in order to reduce the destruction of electronic gadgets in the case of office building fire. Instead of using a fire sensor, the motor that rotates to release the extinguishing material containing grenade is calibrated with the flight controller so that it can be manually operated and thus the exact location where rescuing is need is reached without prior dropping of the grenade extinguisher

## V. CONCLUSION

This project clearly demonstrate the goals proving that small scale UAV are useful across broad range of applications. UAV is an economic and ecofriendly process that won't affect the human beings, animals and surrounding environment with unwanted pollutants. It is simple to use and easy to make it travel through uncertain places.

**Our Project Prototype**



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