ISSN (O) 2321-2004, ISSN (P) 2321-5526

IJIREEICE

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 11, November 2021

DOI: 10.17148/IJIREEICE.2021.91101

DESIGN AND FABRICATION OF INFERNO UAV USING RF

Magesh Kumar M[1], Jai Preetham M[2], Murugan S[3], Vignesh S[4], Usman Ali S A[5]

[1]Assistant Professor, Aeronautical Engineering, Hindusthan College of Engineering and Technology, Coimbatore, Tamilnadu

[2,3,4,5]UG - Aeronautical Engineering, Hindusthan College of Engineering and Technology, Coimbatore, Tamilnadu

Abstract: According to NCRB, a total of 18051 fire accidents have been reported in 2019.These are mainly due to the short circuiting of circuits and gas cylinders. Overall of the accidents are residential area based.

We can also infer that there has been a significant rise in the probability of fire accidents on the skyscrapers in the recent years. With our current methodology we are not much equipped to extinguish fire in such elevated areas. Unfortunately, in most of the accidents the tolls seem too high. Most of them have lost their belongings and in some cases there has been loss of their faithful beings and even their close ones.

In order to tackle this circumstance, we have come up with a solution which even saves the life of the firefighters who fight the fire at their lives at stake. In our project we have used the principles of aviation, radio frequency to bring up with a drone well equipped with anti-fire measures such as fire sensor, laser targeting, autonomous inspections using GPS etc. are some of the features which is used to detect the fire and to put it off .

Our project, with its sensor will detect the fire and produce an alarming sound and sends a signal to the aviator, with this the first phase is completed, then without further ado, the drone will release a sphere of mono ammonium phosphate combination which gets explode and the compound diffuses, thus preventing the casualties and the spread of fire.

Additionally, the project has an anti-collision system using ultrasonic and auto-return system which has the ability to return to the aviator if the connection is lost using GPS. And the ultrasonic what we are using will guide the drone without getting hit by any of the object on the time of return. This drone is equipped with 360kv motor which can provide maximum thrust of 3kg and we have used four of them and the total thrust is about 12kg and it has stand by time of 25min in air and if the battery is at critical condition the drone tends to return to the aviator. Furthermore, the drone is economical as it built in a small budget.

Keywords: Drone, Modelling, Fire Extinguisher

1. INTRODUCTION

A drone, in technological terms, is an unmanned aircraft. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASes). Essentially, a drone is a flying robot that can be remotely controlled or fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with on-board sensors and GPS.

In the recent past, UAVs were most often associated with the military, where they were used initially for anti-aircraft target practice, intelligence gathering and then, more controversially, as weapons platforms. Drones are now also used in a wide range of civilian roles ranging from search and rescue, surveillance, traffic monitoring, weather monitoring and firefighting, to personal and business drone-based photography, as well as videography, agriculture and even delivery services. In our project we include it to extinguish fire and provide fastest means of extinguishing the fire.

We have included sensors and connect it to the IOT where we use to receive the information in our phone and the drone has an ability lift the pay load of 5kg, hence it could carry the extinguish ball drop it to the core of the fire where it could extinguish it within 3-5 sec this would save lot of lives and its fast when compared to other methods of extinguishing.

The drone has a range of 900 meters where the controller can be safe from fire and control easily. It has a fly time about 7minutes where it could do its work properly.

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2. EXPERIMENTAL METHODS OR METHODOLOGY

Drones can be **equipped with thermal cameras** to see in the low light-dark conditions, detect irregularities on various infrastructure ie. solar panels, inspect insulation on buildings, and even check for hot spots in burning buildings. For public safety having a drone in the sky during an active large fire, search & rescue operation, or post-fire assessment is the only way to get a **full understanding of the current conditions** and to ensure the safety of the fire team.

In order to tackle this circumstance, we have come up with a solution which even saves the life of the firefighters who fight the fire at their lives at stake. In our project we include it to extinguish fire and provide fastest means of extinguishing the fire. With better scene monitoring more accurate assessment of burning structures with a drone can be done to have a **better understanding of the status of the fire** before firefighters are even ready to enter the blaze.

We have included sensors and connect it to the IOT where we use to receive the information in our phone and the drone has an ability lift the pay load of 5kg, hence it could carry the extinguish ball drop it to the core of the fire where it could extinguish it within 3-5 sec this would save lot of lives and its fast when compared to other methods of extinguishing. This drone is equipped with 360kv motor which can provide maximum thrust of 3kg and we have used four of them and the total thrust is about 12kg and it has stand by time of 25min in air and if the battery is at critical condition the drone tends to return to the aviator. Payload drop systems can be easily attached to a drone to **allow it to drop off various equipment.**

Drones give firefighters a bird's-eye view of the terrain and even help them determine where a fire will move next, so they can make swift decisions about where fire crews should go and which residents need to be evacuated.

Piloting an aircraft over a raging fire puts both pilots and crew at risk. Plane and helicopter crashes accounted for 24% of deaths attributed to firefighting between 2006 and 2016, according to the U.S. Forest Service.

Fig 1. Fire Extinguish by Drone

Drones that are equipped with infrared cameras can peer through smoke, while using sensors for wind direction and other weather variables to better anticipate how wildfires will spread. Tiny drones can whip through canyons and other confined spaces whereas helicopters often can't fly low enough to capture the necessary high-resolution footage

However, managing a 24/7-drone fleet over our massively huge forestlands will be no small undertaking. Surveillance drones will likely be a separate operation from the fire-suppression drones.

Extinguishing a fire under several layers of tree canopy will also be a challenge. Every kind of tree will likely require a different navigation strategy, and some densely covered grounds may be entirely unreachable until it's too late.
Operating future drone day and night through inclement conditions like wind, hail, and rain will require an enormous effort. But so does a full-frontal attack on a fire by smokejumpers, bucket-bearing helicopters, and slow lumbering slurry bombers that each dumped more than 2,000 gallons of red chemical fire retardant on a formerly pristine mountainside.

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3. RESULTS AND DISCUSSION

3.1 FIRE EXTINGUISHER BALL:

Extinguishing ball is having dry chemical powder (DCP). Dry chemical is a dry chemical extinguishing agent used on class A, class B, and class C fires. It uses a specially fluidized and siliconizedmono ammonium phosphate powder. ABC dry chemical is usually a mix of mono ammonium phosphate and ammonium sulfate, the former being the active one. The mix between the two agents is usually 40–60%, 60-40%, or 90-10% depending on local standards worldwide. The USGS uses a similar mixture, called Phos Chek G75F.

Fig.1. Fire Extinguisher Ball

3.2 MOTORS:

We have used 930kv motors with a pair of 3 where two is CW (counter clockwise) & CCW (counter clockwise), the motor can give up a thrust of 5kg and it has ability to carry a payload of 3kg and the fly time of 8min.

Fig.2. Motors

3.3 FRAME:

The frame is made up of high quality nylon fibre where it has high resistivity of pressure and it could resist fire and excess heat and it could sustain high pressure.

Fig.3. Frame

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3.4 ESC (ELECTRONIC SPEED CONTROLLER):

We are using 30A esc to control the motor where it is more than sufficient to control the motors.

Fig.4. Esc (Electronic Speed Controller)

3.5 BATTERY:

We use 3300mah 11.4V 25c batteries which give the backup time of 8 minutes.

Fig.5. Motors

3.6 SERVO MOTOR:

It is used to control the extinguisher ball in the target location. It has a torque of 2kg.

Fig.6. Servo Motor

3.7 EXTINGUISHER BALL:

A **fire extinguisher** is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire brigade. Typically, a fire extinguisher consists of a handheld cylindrical pressure containing at agent that can be discharged to extinguish a fire. Fire extinguishers manufactured with non-cylindrical pressure vessels also exist but are less common.

Fig.7. Extinguisher Ball

3.9 TRANSMITTER:

In electronics and telecommunication, a transmitter or radio transmitter is electronic device. which produces radio waves with an antenna The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves

Fig.9. Transmitter

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3.10 GPS SYSTEM:

The **Global Positioning System** (**GPS**), originally **NAVSTAR GPS**, is a satellite-based radio navigation system owned by the U.S government and operated by the U.S space force. It is one of the global navigation (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS Signals.

The GPS concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. Any drift from time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise.

Each GPS satellite continuously transmits a radio signal containing the current time and data about its position. Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

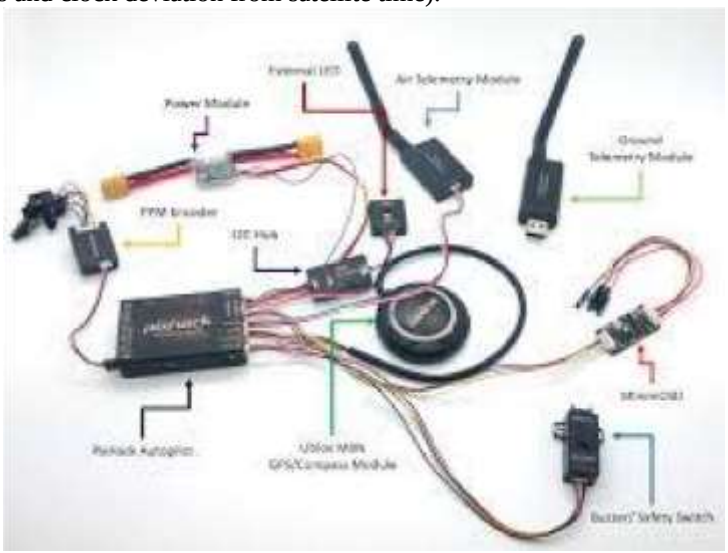

Fig.10. Transmitter

CONCLUSION

I would like to conclude my report with my future development plan of including gun system and long range fire detection system. If this system includes in our fire department it would definitely save lot of time and money. this method is very much faster than any of the method. This will save 85% percentage of train accidents. In future we have planned to include launching method in the drone to break through the windows of the buildings. And a laser targeting system to 100% accuracy for targeting an area to extinguish the fire. To advance the application of GPS in drone and include thermal viewing camera on it.

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