FABRICATION AND TESTING OF FIRE FIGHTING UAV WITH DIFFERENT MECHANISM

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ABSTRACT

As technology evolves and grows, it becomes more difficult for fire departments to deal with city strategies. One of the challenges fire fighters face is getting to the top of tall buildings. Fire fighters need heavy and cumbersome equipment to get to the top floor and sometimes cannot be dispatched on time due to accidents in big cities. The solution to this world is to use fire fighting aircraft (UAVs) to reach floors quickly and efficiently; it can also provide fire extinguishers for better visibility and use fireballs to slow the spread of fire. In this paper, an excellent fire fighting aircraft design with fire fighting gun launching and lowering mechanism has been developed and successfully tested. Night vision cameras were installed on the drones to provide assistance to the fire fighters. Waste machine is activated by mobile wifi frequency and use website to activate waste machine. We evaluated the drone's behaviour for stability and functionality.

Keywords: fire, drone, fireball, drop mechanism, shooting mechanism, night vision, mobile wifi frequency, stability and functionality.

INTRODUCTION:

With the growth of technology and massive city development fire fighting services have become more challenging these days because of big city building. the fire-fighter are facing is reaching the top of the floor of building so we use UAV with shooting and dropping mechanism it helps the fire fighters to achieve the top flower of the building and find the fire and shoot the fire extinguisher ball. It helps to control the fire and it's slow down the spread of fire using fire extinguisher ball. It can also provide a better vision for the fire fighting team

The fire extinguishing Ball gets activated within 3-10 seconds in contact with the Flame. For unmanned aircraft system (UAS) we have to use such system which can carry for long distance and capable to extinguish the Fire. We decided to use fireball for this project work. The fire extinguisher is compressed with dry ammonium dihydrogen phosphate, which is a dry fire extinguisher. When the ball comes into contact with fire for about 2 seconds, it works like a firework, the ball explodes, detonating the chemical powder has been included. With fires lit for craft, the fires affected partners and society. The remote sensing technology concept proposed by can be used in all groups in monitoring, control, control, forecasting and fire fighting. It can be used for groups up to 8 feet.

WHY WE USE HEXCOPTER

- Powerful and capable of carrying heavy loads
- Drones with fewer motors can reach higher altitudes
- Rotor remains stable even if damaged
- Even on windy days, it is stable

- Pilots enjoy greater maneuverability and higher speeds
- we can add more payload and accessories for hexacopters

FIRE EXTINGUISHER BALL

Fireball is based on high technology with more solutions than traditional fire extinguishers. It is easy to use and provides permanent protection as it is activated automatically in the presence of flame without human intervention. The ball has a diameter of 15.2 cm and a weight of about 1.5 kg.

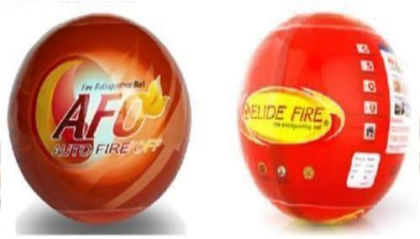


Figure 2: Fire extinguisher ball

MATERIALS REQUIRED FOR SHOOTING AND DROPPING MECHANISM

1. **ESP32**: ESP32 Development board is a low-footprint, minimal system development board and can be easily inserted into a solder less breadboard.

2. **5V RELAY**: The 1 Channel 5V Relay Board Module is connected to esp32. Each one needs 15mA - 20mA driver current and eqipped with high current relay: DC 5V / 10A, AC 250V / 10A

3. **SPRING**: The spring plays the important role in shooting mechanism. The spring creates force of the pressure to the ball in the shooting mechanism's.

4.**BATTERY**: AA batteries are used here.It features a rectangular prism shape that utilizes a pair of snap connectors which are located at the top of the battery.

5 ALUMINIUM FRAME: ALUMINIUM is one of the strongest and lightest metal and its also low cost of production and easy to handle. it is made up of a aluminium square shape frame for carrying a 1.5 kg fire extinguisher ball for the purpose to reach the fixed target and drop the fire ball to reduce the fire from the fire place

6. ELECTRO MAGNET: DC 12V KK-P50/30 60KG Lifting Solenoid Electromagnet has a metal core and coil, which is used to attract magnetic objects using current-induced magnetic effect while only using current. This compact device has high power and reliability. The structure and design of the release of residual magnetism after power failure is also one of its special features.

PROCEDURE OF SHOOTING MECHANIAM

- the shooting mechanism is made up of pvc barrel to carry a fire extinguisher ball
- the mobile wifi network and a designed website is used for sending and receiving activation the signal
- by clicking shooting button on the designed website in the mobile, the shooting activation method is done.
- in the shooting mechanism esp32 board receive a signal from the mobile and trigger the 5v relay for push liver in the shooting mechanism
- the liver uses spring force to shoot the fire extinguisher ball to achieve the accuracy

Figure 3. Shooting Mechanism

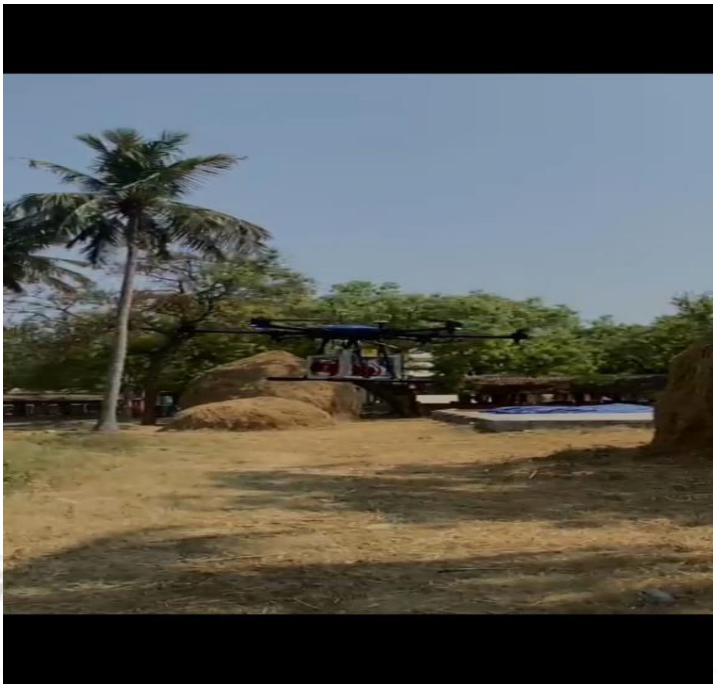
DROPPING PROCEDURE

- dropping mechanism is made up of magnetic coil which is surrounded by the magnetic field in the aluminium liver
- the mobile wifi network and a designed website is used for sending and receiving activation the signal
- by clicking shooting button on the designed website in the mobile, the shooting activation method is done.
- in the shooting mechanism esp32 board receive a signal from the mobile and trigger the 5v relay for push liver in the dropping mechanism
- when the magnetic field is on, the hexcopter carry a fire extinguisher ball
- when the magnetic field is off , the liver will open and drop the fire extinguisher ball

Figure 4 Assembly of Dropping Mechanism

RESULT

Testing of shooting and drooping mechanism in hexacopter is successfully done. We achieve the stability and can control the fire in the accuracy area. A fire fighting UAV with shooting and dropping mechanism has been designed and developed in this study where it can carry up to two fire-distinguisher balls and act as the surveillance to help fire fighters monitor the area. In the performance evaluation, hardware and software tests related to the operation of the UAV and the shooting mechanism were carried out functionality. where the hardware and software components were tested. Upon the computation of the result, the average passing rate is 97.22%. During these tests, the we identified that controlling the UAV is challenging, and weather conditions can affect the drone's performance; It explains the failure to shoot the target while flying.The battery's duration on the ground was longer than when the drone was flying because the components required the battery's full support.



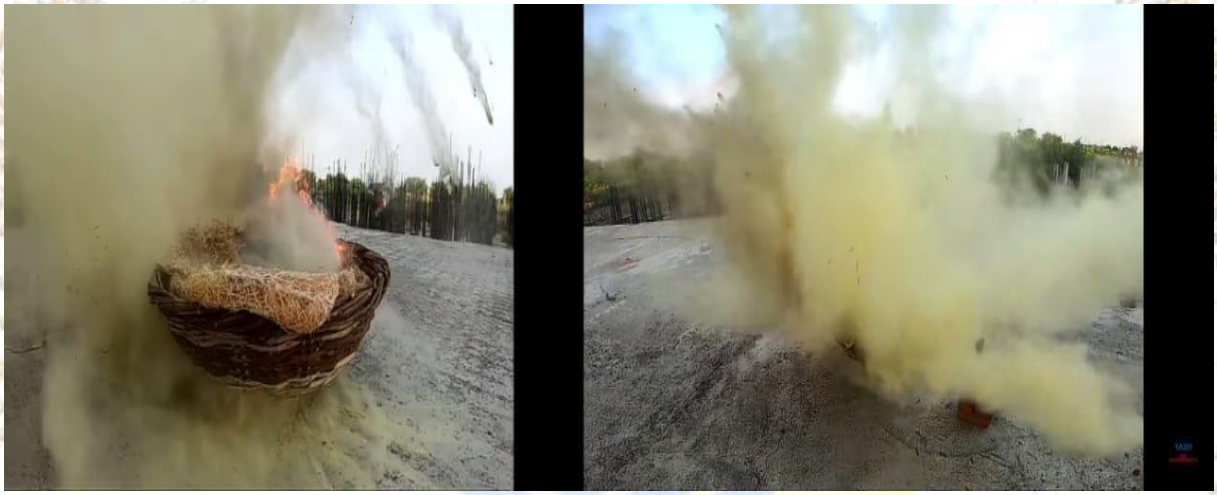


Figure 7 Fire ball explosion

CONCLUSION

With the completion of this project, the Hexacopter UAV was successfully designed and built. This drone has a special design of fire fighting and distribution equipment (using PVC material) from Class A to Class C. Use a night vision HD camera with live video and 5.8 GHz radio frequency (RF) signals to help firefighters aim and extinguish fires. In this study, mobile wifi networks and web are used to send and receive activation signals. The signal is used to operate the launch and descent; It also causes and controls the movement of the drone. Integrated gyroscope and GPS module to stabilize the drone's flight. In this test, the equipment, shooting, interference and other functions of the drone were tested during flight and the overall pass rate was 98.22%. One of the challenges encountered during testing is the drone's sensitivity to weather conditions, which can affect the accuracy of its shots at the target. Therefore, an expert person should be the controller of the drone. Moreover, these fire -extinguisher balls can only be used to aid firefighting challenges in smart cities and not recommended as a standalone solution. For future works and to improve this study, researchers may use 3D printing for the shooting mechanism to carry.

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