FIREFIGHTING DRONE

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Keywords:

FPV- First-Person View

GPS- Global Positioning System

UAV- Unmanned Aerial Vehicle

AFHDS- Automatic Frequency Hopping Digital System

Introduction:

Forest Wildfires: Wildfires that start in central forest areas are difficult to get to and by the time firefighters reach there with water tanks/ fire brigade vehicles the fires already spread to other areas.

Fires in high buildings: Fire fighting vehicles provide water for spraying on high building fires leading to heavy losses.

Fires in homes: Fire fighters need to manually get into homes and fire emergency areas risking their lives to put out those fires.

To help in all of the above situations we here propose to design a firefighting drone that can solve all these problems. The drone allows for easy fire extinguishing without risking life. Also, it can access forest areas in an instant which would require hours for fire trucks or humans to arrive at and instantly reach high building windows with fire extinguisher.

Our drone makes use of Foam casing PVC balls with dry chemical agents for extinguishing the fire instantly with a small blast. The system makes use of drones to deliver the fire extinguisher balls into the fire. On coming in contact with fire the balls explode with fire extinguishers to put out the fire.

Objectives:

The primary objective of the Fire Fighting Drone is to create an automated fire extinguisher that intelligently access forest areas in an instant. The system aims to achieve the following

goals:

To develop an unmanned aerial vehicle which can navigate and fly using hand held remote control operated by the firefighting employees from safer distance. To deploy a sensor-based system which can detect wildfire when the drone is flying.

2. To develop automated fire ball dropping mechanism which will drop and extinguish the

fire automatically if it is detected in the fire detection system.

Capable of detecting and extinguishing flames, disasters can be avoided with minimal risk to human life.

Methodology:

COMPONENTS:

1. PIXHAWK (flight controller):
2. FlySky FS-i6 Transmitter and Reciever:
3. Fire Extinguisher ball:
4. Propellers:
5. UTi120M (Thermal camera)
6. A2212 brushless DC motor
7. Orange 11.1V 3300mAh 25C 3S Lithium Polymer Battery Pack
8. Electronic Speed Controller (ESC)
9. DC 12V KK-P20/15 3KG Lifting Solenoid Electromagnet

Method of working:

1. Fire Detection:

   The fire extinguishing drone is equipped with advanced fire detection technology, such as thermal imaging or infrared sensors. It continuously scans the environment for signs of a fire, including heat signatures and smoke.

   2. Automated Response:

   When a fire is detected, the drone's on-board computer processes the sensor data and calculates the fire's location and coordinates.

   3. Take off and Navigation:

   The drone autonomously takes off from its launch point, quickly

ascending to a safe altitude. It uses GPS and mapping data to navigate to the precise location of the fire.

4. Deployment of Extinguisher Ball:

Upon reaching the fire's coordinates, the drone deploys a specially designed fire extinguisher ball. The ball is equipped with a high-pressure fire extinguishing gas canister.

5. Ball Release:

As the drone descends toward the ground, it releases the fire extinguisher ball at an appropriate height above the fire.

Results:

1. **Design and Development:** Create a robust and efficient drone capable of carrying and deploying fire extinguisher balls to combat fires.
2. **Fire Detection and Navigation:** Implement sensors and algorithms to detect wildfires and navigate autonomously or via remote control.
3. **Payload Deployment:** Develop a mechanism to carry fire extinguisher balls as a payload on the drone.
4. **Effective Fire Suppression:** Ensure that the fire extinguisher balls are dropped accurately onto the fire source, effectively extinguishing flames.
5. **Safety Enhancement:** Enhance firefighter safety by allowing the drone to assess fire scenes before human intervention.

Conclusions:

Using Fire Extinguisher Ball, fire in a particular area can be reduced and an entry or exit route can be created. The toxicity reports generated by the gas sensors can also help the firemen protect themselves. The cameras, sensors and other hardware used to make the drone are cost effective so that the drone would be affordable for the Fire-Fighter Department.

Description of the innovation in the project:

Our project represents a significant advancement in firefighting technology. Traditional methods often put firefighters in harm's way and are limited by the reach and mobility of human operators. Here's how project has overcome these limitations:

1. **Drone Usage:** The use of drones allows for a rapid, aerial response, reaching areas that may be inaccessible or dangerous for human firefighters. This increases the speed and efficiency of firefighting efforts.

2. **Class A, B, C Fires:** The ability to tackle Class A (combustibles), B (flammable liquids), and C (electrical equipment) fires broadens the range of incidents that can be addressed, making this a versatile solution.

3. **Live Monitoring:** The incorporation of a camera for live monitoring provides real-time situational awareness, enabling better decision-making and coordination during firefighting operations.

4. **Thermal Imaging:** The conversion of normal images to thermal images allows for the precise identification of ignition sources, even in visually challenging conditions. This enhances the effectiveness of firefighting efforts

5. **Firefighting Ball:** The use of a firefighting ball that explodes upon contact with fire provides an innovative and effective method of fire suppression. This reduces the time taken to extinguish fires and minimizes potential damage.

6. **Enhanced Safety:** By using a drone, the risk to human firefighters is significantly reduced. This not only enhances safety but also allows firefighting efforts to continue in conditions that would otherwise be too dangerous.

Future work scope:

The future scope of your project is promising:

1. **Advanced Sensors**: Incorporating more advanced sensors could improve fire detection and monitoring capabilities.
2. **AI Integration**: AI could be used to predict fire behavior, improving the drone's effectiveness and decision-making process.
3. **Autonomous Operation**: Enhancing the drone's autonomy could allow it to operate without human intervention, increasing efficiency.

4. **Collaborative Efforts**: Multiple drones could work together to tackle larger fires, improving response times and effectiveness.

Rescue Operations: The drone could be equipped with tools for search and rescue operations, expanding its use beyond just firefighting.