HAWK EYE

T. Bharat Kumar, S Uday Prasad, K. Vijay Goud, Student Department of Electronics and Communication EngineeringSreenidhi Institute of Science and TechnologyHyderabad, Telangana India
N. Siva Ganesh, Assistant ProfessorDepartment of Electronics and Communication EngineeringSreenidhi Institute of Science and TechnologyHyderabad, Telangana India

Abstract:
This project proposes the use of drone-based monitoring as a solution to enhance the effective monitoring of public spaces. The aim is to develop a comprehensive system that combines the latest drone technology. The proposed system will be capable of monitoring large areas, capturing high-resolution images and video, and visualizing the data in real-time. The system will identify and flag potential threats such as unattended bags, suspicious behaviour, and unauthorized access to restricted areas. This will enable security personnel to respond to potential threats in a timely and efficient manner.The project will involve the development of a custom drone platform with advanced sensors such as high-resolution cameras, LIDAR, and thermal imaging. The platform will also be equipped with GPS and obstacle avoidance systems for safe and reliable operation in complex environments.The project will include the development of a software application for the management and analysis of data captured by the drones. The proposed system has the potential to significantly improve public safety and security in crowded public spaces such as airports, shopping malls, and sporting events. It will reduce the reliance on human operators and improve the speed and accuracy of threat detection, enabling faster response times to potential threats.In conclusion, this project proposes the development of a drone-based monitoring system with advanced sensors for monitoring and threat detection. The system has significant potential to enhance public safety and security in public spaces and can be adapted to a wide range of applications.

Key words: UAV(Unmanned Aerial Vehicle), ESC(Electronic Speed Controller),Flight-Controller, Yaw, Pitch,Roll, Degrees of Freedom.

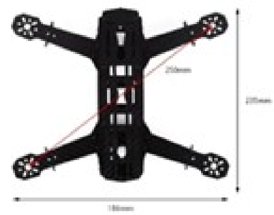
Unmanned aerial vehicles (UAVs), commonly referred to as drones, are flying robots that may be remotely piloted by a human operator or that can fly on their own using sensors and software installed onboard. Drones may be equipped with a range of sensors and cameras to carry out a number of activities. They come in a variety of sizes, shapes, and combinations.The military, agriculture, photography, videography, search and rescue, and surveillance are just a few of the fields in which they are employed. Additionally, they are employed in environmental monitoring, infrastructural inspection, and scientific investigation.Typically, a drone's chassis retains all of the

different parts, including the motors, propellers, batteries, flight controls, and sensors. The drone's "brain," the flight controller, is responsible for handling the many sensors and software onboard, regulating the motors, stabilizing the UAV, and controlling the motors.The drone may be controlled via a remote control or a mobile device linked to the drone's onboard Wi-Fi network. Depending on the size of the drone and the battery power, they can fly for varied lengths of time. While some drones have a limited flight period, some have a longer flight time.Technology advancements that have made them more accessible, simple to use, and capable of carrying out a larger range of activities have contributed to their increased appeal in recent years. Drone users must, however, abide by airspace, privacy, and safety rules and regulations, and their usage is subject to limitations and restrictions.

PARTS DESCRIPTION.

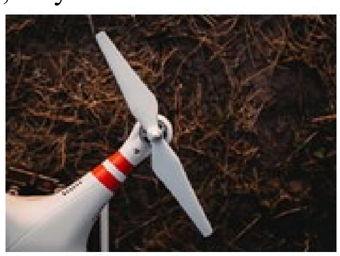
- Parts of Drone:

1. Frame: The drone's body, or frame, is what all the other parts are attached to. Aluminium, carbon fibre, and plastic are just a few of the materials that may be used to create frames.



2. Motors: Typically, a drone has four motors—one for each rotor. The thrust required to launch and maintain the drone's altitude is produced by the motors.

3. Propellers: The motors are placed with the propellers, which rotate to produce lift and thrust. Depending on the drone's design, they come in various sizes and forms.



4. Electronic Speed Controllers (ESCs): Each motor's speed and direction are managed by the ESCs, which are linked to the motors. To keep the drone steady while in flight, they communicate with the flight controller.

5. Flight controller (Hex Pixhawk): The drone's flight controller, which controls all the other parts, is its brain. To stabilize the drone and manage its motions, it uses the sensor data.

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6. Battery: The flying controller, motors, and other components all receive power from the battery. LiPo and Lithium-Ion batteries, for example, are two battery kinds that may be used by drones.

7. GPS module: The drone's GPS module enables it to locate itself and navigate using GPS coordinates. For autonomous flying and navigation, this is especially helpful.

8. The FlySky FS-i6 employs the trustworthy Automatic Frequency Hopping Digital System (AFHDS) spread spectrum technology and is a fantastic entry-level, low cost 6-channel 2.4 GHz transmitter and receiver. The programming on the FlySky FS-i6 is easy to use and has a high-quality feel. Quadcopters, multi-rotors, helis, and airplanes may all be controlled using this device.

9. Camera: Many drones have a camera or other image technology that enables them to take pictures and films while in the air. To provide steady and fluid footage, the camera can be fixed to a gimbal.

DRONE ASSEMBLY.

1. Compile the parts: Compile all the parts required to construct the drone. This comprises the batteries, the flight controller, the frame, the motors, the propellers, the sensors, and the camera (if used).
2. Mount the motors: Use screws and bolts to secure the motors to the frame. Make sure they are properly positioned and firmly fastened to the frame.
3. Attach the propellers: Make sure the propellers are appropriately orientated and firmly secured before attaching them to the engines.
4. Install the flight controller: Connect the motors and ESCs to the flight controller after mounting it to the frame. The drone's brain, the flight controller, is in charge of steering and stabilizing the aircraft while it is in flight.
5. Connect the sensors: Connect the various sensors, such as accelerometers, gyroscopes, and barometers, to the flight controller. These sensors help the drone maintain stability and altitude.
6. Install the battery: Connect the fly controller, ESCs, and battery after mounting the battery to the frame. Make sure the battery is balanced on the frame and is attached firmly.
7. Mount the camera (if applicable): If the drone has a camera, put it to the frame using a gimbal to provide steady, fluid video.
8. Configure the flight controller: Optimize the flying characteristics of the drone by configuring the flight controller's parameters, such as PID tuning.
9. Test the drone: Once the drone has been put together and set up, test it to make sure all of the parts are functioning properly. This involves putting the flying controller, sensors, motors, and camera (if used) through their paces.

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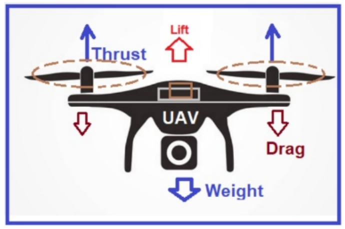
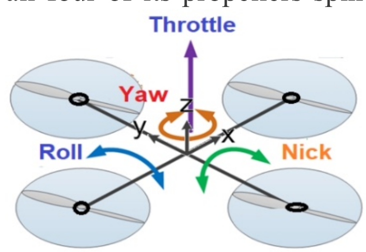
DRONE MECHANICS.



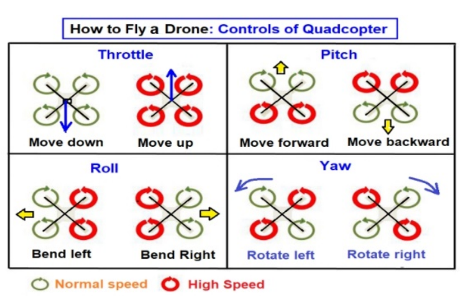
Based on the relationship motion between four propellers, drone movement is divided into four categories:

- Throttle,
- Pitch,
- Roll,
- Yaw

- **Throttle/ Hover:** up and down movement of the drone is called throttle
  - The drone will go downward if all four propellers rotate at their usual pace.
  - The drone will rise if all four of its propellers spin more quickly. This is referred to as drone hovering.



- **Pitch:** movement of a drone about a lateral axis (either forward or backward) is called pitching motion
  - The drone will go forward if its two back propellers are operating at a high rate of speed.
  - The drone will go in the opposite direction if its two front propellers are operating quickly.
- **Roll**: movement of a drone about the longitudinal axis is called rolling motion
  - The drone will go in the left direction if two of the right propellers spin quickly.
  - The drone will go in the appropriate direction if two of its left propellers are spinning quickly.
- **Yawn:** the rotation of the head of the drone about the vertical axis (either the left or right) is called Yawning motion
  - If two propellers of a right diagonal run at high speed, then the drone will rotate in an anti-clockwise direction
  - If two propellers of a left diagonal run at high speed, then the drone will rotate in a clockwise direction.



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CONFIGURING DRONE.

A drone's configuration and calibration are crucial elements in making sure it runs safely and efficiently. The fundamental stages for setting up and calibrating a drone are listed below:

1. Assemble the drone: The drone should first be assembled in accordance with the manufacturer's instructions. This entails fastening the propellers, setting up the batteries, and fastening any extras, such a camera or GPS unit.
2. Install the flight controller software: Most drones are equipped with a flight controller, which controls the drone's stability and flying. Connect your drone to your computer after downloading the necessary software.
3. Configure the flight controller: Customizable options in the flight controller software will allow users to modify the drone's behavior. This covers the settings for the yaw, pitch, roll, and throttle controls. Set these parameters according to your tastes and the sort of flying you intend to conduct.
4. Calibrate the sensors: Gyroscopes and accelerometers are only two of the sensors the flight controller makes use of to keep the drone stable and manage its flight. To get reliable results, these sensors must be calibrated. In order to calibrate the sensors, according to the manufacturer's recommendations.
5. Calibrate the compass: To guarantee that the headings it offers are correct, the compass on the drone must also be calibrated. In order to do this, you must rotate the drone in a particular pattern while according to the guidelines in the flight controller software.
6. Test the drone: It's time to test the drone in a secure, open location once it has been constructed, setup, and calibrated. Verify that the drone maintains steady flight and responds to your inputs as intended.
7. Make adjustments: You might need to make additional changes to the flight controller settings or sensor calibrations if the drone is not acting as you would anticipate. Up till the drone is operating properly, repeat the calibration and testing process.

In order to ensure that a drone runs safely and efficiently, configuration and calibration are essential tasks. You may enhance the drone's performance and reduce the possibility of mishaps by according to the manufacturer's instructions and taking the time to calibrate the sensors and flight controller settings.

IMPLEMENTATION OF DRONE IN THE FIELD USING MACHINE PLANNER.

Unmanned aerial vehicles (UAVs) and other robotic systems may plan and carry out autonomous missions using a software program called mission planner. In the realm of aerial robotics, such as for drones and other UAVs, it is frequently employed.By entering waypoints, flight trajectories, and additional information like camera settings, altitude, and speed, the program enables users to plan missions. Additionally, users may keep an eye on the status of tasks in real-time and make revisions as necessary.

Some of the features commonly included in mission planner software are:

1. Mission planning: Creating and editing mission plans for UAVs or other robotic systems.
2. Real-time monitoring: Real-time tracking of the car's status, including its location, altitude, speed, and battery life.
3. Data collection and analysis: gathering and processing mission-related data, such as images, videos, or sensor readings.

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4. Mapping and GIS integration: Integrating to produce maps and show data, use geographic information systems (GIS).
5. Simulation: missions are simulated before being carried out in actual situations to lower risk and boost efficiency.

Mission planner software is frequently used by experts in fields including agriculture, surveying, and construction as well as by enthusiasts interested in aerial robots.

In conclusion, the utilization of UAV monitoring systems in public places, offers numerous benefits for enhancing surveillance and security. Furthermore, in the future, machine learning algorithms can be trained on large datasets to improve their accuracy and robustness in recognizing various objects, behaviors, or patterns in public spaces. This enables UAV monitoring systems to adapt and learn over time, enhancing their ability to detect suspicious activities or identify specific objects of interest. The combination of UAVs and machine learning algorithms also facilitates proactive surveillance and preventive measures. By continuously monitoring public areas and applying predictive analytics, the system can identify potential risks or areas of concern, allowing for timely interventions to prevent security breaches or other undesirable events. However, it is important to address privacy concerns when deploying UAV monitoring systems in public places. Safeguards should be in place to ensure the responsible and ethical use of collected data, adhering to privacy regulations and protecting individuals' rights.In summary, the integration of UAV monitoring systems with machine learning algorithms holds great potential for improving surveillance and security in public places. This combination enables autonomous analysis, real-time threat detection, and proactive surveillance, leading to enhanced situational awareness and more effective management of public safety.

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