PROJECT ABSTRACT

Quadcopter Surveillance Drone with Camera using Arduino

Unmanned aerial vehicles have moved from military niches into civilian work: infrastructure inspection, crop surveying, disaster assessment, and aerial photography all rely on small multirotors.

01 Title

Quadcopter Surveillance Drone with Camera using Arduino

02 Introduction / Background

Unmanned aerial vehicles have moved from military niches into civilian work: infrastructure inspection, crop surveying, disaster assessment, and aerial photography all rely on small multirotors. Beneath the airframe lies a compelling control problem — keeping an inherently unstable quadcopter level with hundreds of corrections per second while streaming live video.

03 Problem Statement

A quadcopter without continuous electronic stabilization flips within a second of takeoff. This project builds a stable, camera-equipped surveillance platform from discrete components — calibrated propulsion, IMU-fused stabilization, a live FPV video chain, and safe LiPo power management.

04 Objectives

- Assemble an F450-class quadcopter with integrated power distribution.
- Calibrate four 30 A ESCs with identical throttle endpoints.
- Implement PID stabilization fusing IMU data hundreds of times per second.
- Integrate 5.8 GHz FPV video to a ground-station monitor.
- Establish a 2.4 GHz radio link for manual flight.
- Achieve stable hover with 8–12 minute endurance.
- Document safe-flight procedures and DGCA compliance notes.

05 Proposed System / Working

F450 frame (~450 mm diagonal) with power distribution. Four ~1000 KV brushless outrunners drive 10" propellers in counter-rotating pairs (2 CW / 2 CCW), canceling torque reaction. Each motor uses a 30 A ESC (SimonK/BLHeli) with identical throttle endpoints — without this, the drone yaws or flips on takeoff. The 6-axis IMU measures attitude several hundred times per second; a PID loop

compares desired vs. measured attitude, adjusting motor speeds to correct roll, pitch, and yaw. A 3S LiPo (11.1 V, 2200–5200 mAh) powers the craft with a low-voltage alarm and balance-charging discipline. The FPV camera feeds a 200–600 mW 5.8 GHz transmitter to a ground-station monitor.

Test flights show stable self-leveled hover, crisp stick response, and live FPV video. Evaluation covers hover stability, control response, video range, and endurance of 8–12 minutes — the most striking demo in the batch.

06 Technologies / Components Used

F450 quadcopter frame kit · 4× brushless outrunner motors + 10" propellers · 4× 30 A brushless ESCs · Flight controller board · FPV camera + 5.8 GHz video transmitter · monitor · 6-channel 2.4 GHz radio transmitter and receiver · 3S 2200–5200 mAh LiPo battery + balance charger · LiPo low-voltage alarm/buzzer · Connecting wires · bullet connectors · propeller adapters · thread-lock

07 Key Features

- F450-class quadcopter with integrated power distribution.
- 4× brushless motors with calibrated 30 A ESCs.
- 6-axis IMU flight controller, self-leveling PID stabilization.
- Live 5.8 GHz FPV video to ground-station monitor.
- 6-channel 2.4 GHz radio link.
- 3S LiPo with low-voltage alarm and balance charging.
- Safe-flight checklist and pre-flight documentation.

08 Applications / Use Cases

- Civilian quadcopters serve infrastructure inspection
- crop surveying
- disaster assessment
- construction monitoring

10 Conclusion

A test-flown, camera-equipped quadcopter with configuration files, PID tuning notes, and safe-flight procedures. Regulatory note: the 800 g–1.2 kg all-up weight places this build in the DGCA micro category, not nano — verify current DigitalSky requirements and fly only in open, permitted areas.