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Peer Review

Review of: "Modelling of Quadcopter for Precision Agriculture and Surveillance Purposes"

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This paper offers a promising exploration of a quadcopter design for precision agriculture, highlighting both modeling and fabrication steps. The inclusion of a payload-based sprayer system and the authors' attention to aerodynamic stability are commendable. However, there are several critical areas where the paper could be strengthened:

Advanced Control Methodology

The authors rely on a PID-based approach to achieve trajectory stability. While PID controllers are standard in many UAV applications, agricultural spraying tasks often involve varying mass distributions and external disturbances such as wind gusts. A more nuanced, adaptive, or robust control framework (e.g., model predictive control or gain scheduling) would better account for the changing mass of the liquid payload and the dynamic flight conditions encountered in real-world fields.

Incomplete Experimental Validation

Although the authors provide a simulation-based stability assessment, the paper lacks rigorous flight-test data or quantitative benchmarks for controller performance. Merely "observing" stable flight behaviors is not enough. Including time-domain responses, overshoot/settling metrics, or frequency-response data would offer more concrete evidence of controller robustness.

Inconsistencies in Payload and Frame Specifications

There is some ambiguity between the stated 7 kg payload design goal and the final 5 kg frame concept. Clarifying these differences and discussing how structural materials (e.g., wood) might influence vibration damping, payload distribution, and overall flight dynamics would benefit future researchers.

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Wind and Environmental Disturbances

Precision spraying almost inevitably occurs in outdoor, uncertain conditions. The authors do not detail how external factors such as wind, ground effect, and hilly terrain might affect performance. Addressing these real-world complexities—either in the simulation or by suggesting appropriate sensors and feedback loops—would make the design more robust for agricultural deployment.

Flight Control Tuning and Parameter Estimation

The paper acknowledges calibration challenges (e.g., motor alignment, propeller attachment) but does not detail any systematic tuning or parameter-estimation procedures. For multi-rotor systems, especially large-payload drones, thorough motor-thrust characterization, center-of-gravity alignment, and inertia determination are crucial for reliable control.

Overall, the paper provides a valuable baseline for anyone venturing into UAV design for spraying applications. By enhancing the control methodology, offering rigorous experimental validations, and addressing real-world disturbances more explicitly, this work could stand as a more authoritative guide for UAV researchers and practitioners in precision agriculture.

Declarations

Potential competing interests: No potential competing interests to declare.