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Peer Review

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

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Peer-Review Submission

Summary of the Article

The manuscript titled *"Modelling of Quadcopter for Precision Agriculture and Surveillance Purposes"* presents the development and simulation of a mathematical model for a 7kg quadcopter with spraying capabilities. The authors derive the translational and rotational equations of motion for a 6-degree-of-freedom system, incorporating parameters such as motor thrust, drag, torque, and payload weight. The model is implemented in MATLAB Simulink, and the simulation output illustrates system responses under varying flight conditions. The stated goal is to apply this model to optimize quadcopter-based agricultural operations, including spraying and surveillance. While the modeling approach aligns with standard UAV dynamics, the manuscript seeks to contextualize it within agricultural applications.

1. Abstract

- **Objectives & Contributions**: The abstract states that a mathematical model for a 7kg quadcopter with payload and spraying capability was developed and simulated. However, it **does not clearly specify the objectives achieved** by the model. Please explicitly state, e.g., whether the intent was to demonstrate trajectory stability, confirm spray distribution uniformity, or optimize power use.
- **Importance and Novelty**: Clarify the **new value** this model contributes over extant work (e.g., comparison with existing models or unique simulation outcomes).
- **Future Work**: Include follow-up steps—e.g., *Will you test the algorithm and simulation in real-world field trials?*

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- **Metrics**: Define the **quantitative metrics** for trajectory stability and spray distribution used in the simulation (e.g., overshoot, settling time, RMS error).

2. Introduction

- **Data currency**: Replace outdated population/farming stats (e.g., "above 7 billion") with current figures ("above 8.2 billion in 2024").
- **Tone polishing**: Replace phrases like "lack of" with **"limited"** or **"insufficient"**, which are more academically appropriate—as in the third paragraph.
- **Organization & readability**:
  - Introduce **section numbering** (e.g., 1.1, 1.2) for better structure.
  - The introduction runs long; consider **splitting paragraphs** into discrete themes (e.g., UAV in agriculture vs. quadcopter modeling).
- **Sources**: There are numerous statements lacking citations—ensure **all factual claims** are referenced.

3. Figures, Equations & Formatting

- **Images**: Several figures (e.g., Figures 3, 5–7) suffer from **low resolution**. Enhance clarity.
- **Equation formatting**: Rewrite column vectors compactly (e.g., ε = [x y z]^T) instead of using tall block formats for space efficiency.
- **Label consistency**: Verify all figure references and axis labels (e.g., Figure 6 axis labels should be XYZ, not YYZ).
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4. Mathematical Model & Assumptions

- **Model clarity**: The modeling section appears to be a standard derivation without new innovation.
  - **Assumption listing**: Explicitly state simplifications (e.g., rigid frame, neglecting aerodynamic drag, sensor noise).
  - **Derivation detail**: Provide justifications or references for key formulas, particularly the torque model (τ = b*...) and inertia matrix values.
- **Comparative context**: Compare your approach with established quadcopter modeling methods. (See appropriate references in the literature.)
- **Simulation method**: The simulation section is brief—please specify the simulation algorithm (e.g., PID, LQR), solver settings, sampling rate, and simulation duration.

5. Results & Practical Applications

- **Quantitative results**: Replace vague statements ("stable trajectory") with **numeric performance metrics**: e.g., max deviation, settling time, percentage uniformity of spray.
- **Discussion depth**: The conclusion notes propeller/motor misalignment, but the severity of these issues and their impact on performance is not quantified.
- **Future field validation**: Strongly recommend you include a plan to **test the model in practical scenarios** on a farm—e.g., prototype flight tests, measurement of actual spray patterns under wind conditions.

6. Overall Assessment

- This work currently reads as an **introductory or undergraduate-level modeling exercise**, lacking innovation and depth.
- To merit publication in a peer-reviewed journal, you need:
  - Clear novelty (e.g., new control algorithm, payload dynamics model, field-tested drone performance)
  - Stronger validation (lab or field test results)
  - Comparisons with existing quadcopter models and practical utility

7. Minor Technical Edits

- Correct language (e.g., "attitude" vs. "altitude" misused, see the line after equation 1).
- Align payload mass (5 kg vs. 7 kg) consistently across the manuscript.
- Standardize abbreviations and introduce them once (e.g., UAV, DOF).
- Ensure figure references align (e.g., Figure 5 vs. Figure 4 mislabel).
- Add 2020+ recent references to support claims and validate model relevance.

Recommendation: "Major Revision" before acceptance for publication

Feedback Summary:

This manuscript has a solid foundation in mathematical modeling, but **to elevate its publication worthiness**, it requires:

- Clear articulation of objectives and novelty in the abstract
- Structural improvements and updated data in the introduction

- Enhanced simulation detail and a practical validation plan
- Objective performance metrics and comparative analysis

With these improvements, the paper could make a modest contribution to the field of UAV-based precision agriculture.

Declarations

Potential competing interests: No potential competing interests to declare.