

3D Modeling and Design of a Tilt-Rotor UAV for Trajectory Optimization and Energy-Efficient Flight

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Abstract

Energy inefficiency and rising carbon emissions remain key challenges in aviation due to the reliance on predefined, non-adaptive flight trajectories. This study proposes the design of a Tiltrotor UAV framework that allows dynamically adjust and control three- dimensional flight paths to improve fuel efficiency and reduce emissions under varying aerodynamic and operational conditions. A tiltrotor VTOL UAV model is designed to evaluate the performance of optimized trajectories under realistic flight scenarios. The developed platform will allow the AI optimization system to test and compare fuel- efficient trajectories, evaluate performance metrics, and validate control responses under different flight conditions. Using this UAV as a test platform provides a realistic, high-fidelity system where the predictive AI algorithms can be executed, evaluated,

Keywords

Modeling, Trajectory, Optimization, Energy-Efficient Flight