Advanced Motion Planning for VTOL UAVs

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Introduction

- **Objective:** Develop a motion planning algorithm for VTOL UAVs with dynamic mode transitions between fixed-wing and VTOL modes.
- **Relevance:** Enhance UAV efficiency and maneuverability, applicable in various fields like logistics, agriculture, and search & rescue.

Methodology

- **Path Planning:** Implement the RRT* (Rapidly-exploring Random Trees) algorithm to generate feasible paths in complex environments.
- **Mode Transitions:** Develop logic for switching between fixed-wing and VTOL modes based on mission requirements.
- **Trajectory Generation:** Use mathematical models to create smooth, kinematically feasible trajectories.
- **Simulation Only:** Validate the algorithm using ROS, Gazebo, and PX4 for accurate simulation and testing. No hardware implementation.

Deliverables

- **Comprehensive Report:** Documenting the motion planning algorithm, mode transition logic, and simulation results.
- **ROS Package:** A fully functional ROS package containing the motion planning algorithm and associated nodes.
- **Simulation Demos:** Demonstrations of the UAV performing complex maneuvers with mode transitions in Gazebo, PX4, and ROS2, showcasing motion planning.
- **Presentation:** Summary of findings and potential real-world applications of the developed algorithm.