Performance Assessment Framework for Multirotor UAV Microgravity Platforms

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Motivation

- Any multirotor UAV (MUAV) can enter and maintain the state of free-fall to create a microgravity environment
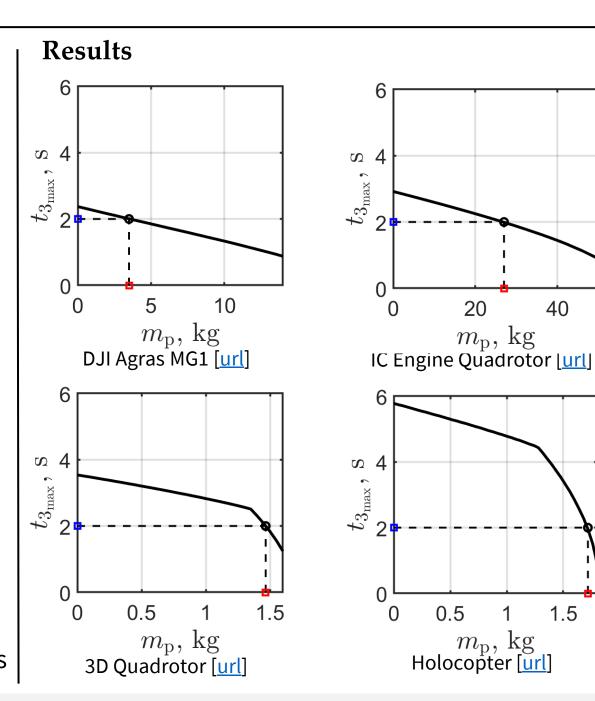- Need to assess the performance of a MUAV as a microgravity platform

Objectives

- Introduce microgravity performance measures for a MUAV
- Develop a framework to estimate the maximum microgravity duration ($t_{3_{max}}$) capability of a MUAV for a given payload mass (m_p)

Methodology

- Microgravity duration for a MUAV depends on its maximum achievable climb and descent speeds
- Use microgravity maneuver kinematics and propeller performance models to compute maximum climb speed
- Maximum descent speed is computed based on safe landing speed and maximum propeller power availability

Conclusion

- Many existing MUAVs have microgravity duration greater than 2 seconds

Results

DJI Agras MG1 [url]

IC Engine Quadrotor [url]

3D Quadrotor [url]

Holocopter [url]