TUM

Master Thesis | Semester Thesis

Control for Stabilization of a Tethered Suspended Drone on a Moving Branch

Robotics, Control

Professorship of eAviation and Autonomous Aerial Systems

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Description

This project aims to develop control strategies for stabilizing a tethered suspended drone on a moving, oscillating branch without a fixed attachment point. Part of the eAvitation project for two years, it supports forest ecology and in-canopy data collection in collaboration with Imperial College London, EPFL, Bristol University, and EMPA Zurich.

Research focuses on understanding the drone-ring-tether system, its control architecture, and angle estimation sensor for GPS-denied environments. The goal is to enhance sensing and control for stable positioning despite unpredictable motion, using adaptive controllers and improved state estimation.

Indoor and outdoor tests will be conducted in a motion-tracking-equipped flight arena. While operational, the prototype may require maintenance, supported by a student community.

The project aims for publications in peer-reviewed journals and conferences.

Work packages

WP1 Understand the drone-ring-tether system, its control architecture, and angle estimation sensor.

WP2 Improve sensing and state estimation to compensate for oscillating and moving perching surfaces.

WP3 Develop adaptive control algorithms to stabilize the drone despite disturbances.

WP4 Conduct indoor and outdoor experimental validation.

WP5 Contribute to research publications in top-tier journals and conferences.

Tethered suspended drone stabilizing on an oscillating branch.

Requirements

- Student in a relevant field, e.g., robotics, control, mechanical, or aerospace engineering.
- Knowledge of drone dynamics and modern control system design.
- Experience with reinforcement learning is appreciated.
- Hands-on experience with hardware experiments and testing is beneficial.

Application

- CV and motivational letter.
- Transcript of records.
- Portfolio of projects.
- A brief description of your experience and research interests.

Timeline

Immediate start possible.