

Lab overview: Autonomy in flight

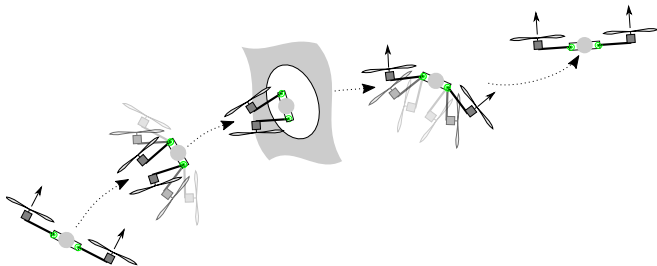
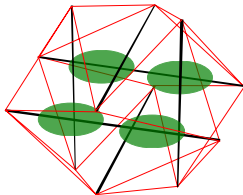
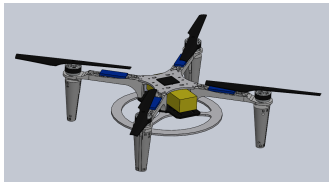
October 16, 2018



Design for challenging environments

Exploit angular momentum with a stationary platform

- ▶ Quadcopter with momentum wheel
- ▶ Trade off: Better stability vs Greater weight



Experiments

See video at https://www.youtube.com/watch?v=XcZh4_J4yGM

Video

See video at

https://www.youtube.com/watch?v=MSvoQT__c9U&t=4s

ME 136: Introduction to Control of Unmanned Aerial Vehicles

(Fall 2018, Prof. Mark Mueller, 3 units, undergrad elective)

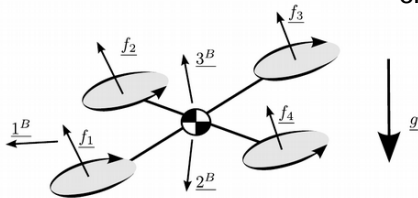
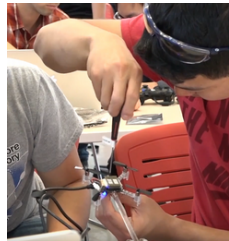


You will learn

- 3D modeling
- Dynamics, sensors
- Estimation & Control

You will do (team of 3, take-home hardware+labs)

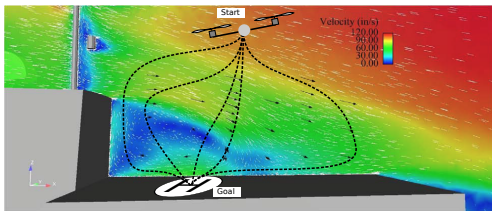
- Implement closed-loop feedback (C++ on microcontroller)
- Compete against classmates in flight!



Enrollment is capped – Listed prereqs are flexible
Open to all majors – More <https://tinyurl.com/UAVClass>

Ongoing work

- ▶ Motion planning through highly complex flow fields¹
- ▶ Precise maneuvers in constrained spaces
- ▶ Underwater/Aerial Vehicles



¹Image adapted from Mora (2014). "Flow field velocity on the flight deck of a frigate". In: Proceedings of the Institution of Mechanical Engineers, Part G:

Fire Research Group

Possible projects:

- ▶ Highly localized fire extinguisher (e.g. embers):
 - ▶ Thermal camera to detect hot spots
 - ▶ Water jet
 - ▶ Automatic refilling