

CS/ME 410 QUADROTOR DESIGN AND CONTROL

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Office hours (Tuesdays 10:45a to 12:45p), or by email appointment

Objective

- Real time embedded control for an autonomous electromechanical system
- Quarter long project (broken into 10 lessons):
 - Build a quadrotor from commodity parts (provided)
 - Create the software for controlling quadrotor (high and low level programs)
 - Autonomous flight
- Note: You need to be able to code in C well.

Autonomous flight (final goal)



Class format

- Introduce goals/milestones for the day
- Work in teams of 2 to accomplish these goals.
 - Make sure partner has overlapping availability outside class hours.
- We will provide assistance if you get stuck.
- Demonstrate completion of milestone(s) before next class (preferable during class).
 - 20% penalty if milestones are shown after start of next class
- Last 10 min of class for putting equipment away, no milestone checkoffs
- Report due by 9am day of next class, submit on canvas

Grades

Grades are equally weighted (1/3, 1/3, 1/3) based on 3 factors:

1. Participation
2. Weekly description PDF and C file (submitted on Canvas before 9am day of next class) which includes:
 - a. Text description of what you did, 400 words max! This should be your own text, not the same as your teammates or just repeating from the slides.
 - b. Task assessment answering the following 3 questions (a few sentences each)
 1. What went well
 2. What did not go well, why?
 3. What will you change for next class.
 - c. Team member effort report, describing the percent effort (should add up to 100%) you and your teammates contributed, and on what parts. This will be kept confidential. Don't just say we contributed equally on all.
 - d. FULLY documented / readable code (not zipped). Code should keep the function and variable structure given.
3. Weekly milestone completion (must be completed before start of next class, no un-excused late submissions!)

Code

- Work submitted must be created by you or by your partner when you are working with them to create it.
 - Not acceptable to submit work that you did not actively participate in creating.
 - If needed, the first few min will be used to merge you and your partners code from last week.
 - Do not use AI tools such as ChatGTP or Copilot.

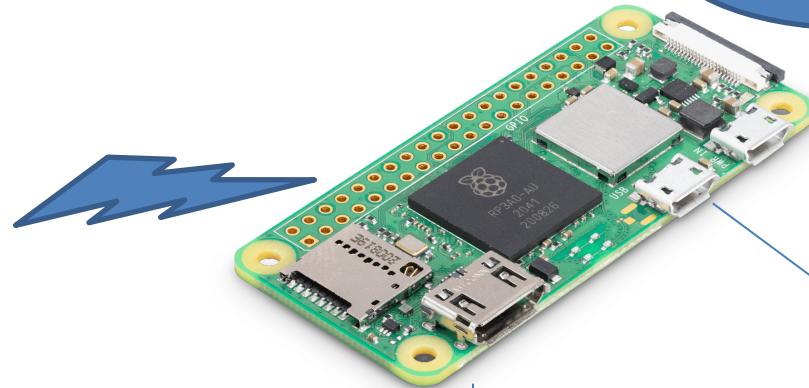
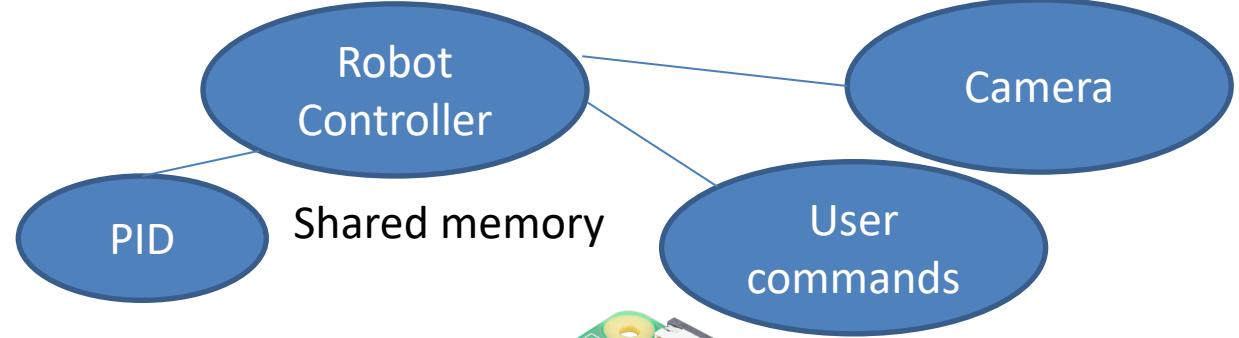
Damage and Safety

- Damage:
 - 1-2 spare quadrotors worth of parts.
 - Replace loaned parts by next week's class.
- Grade penalty for unsafe behavior (starting at 5% for the day's work)

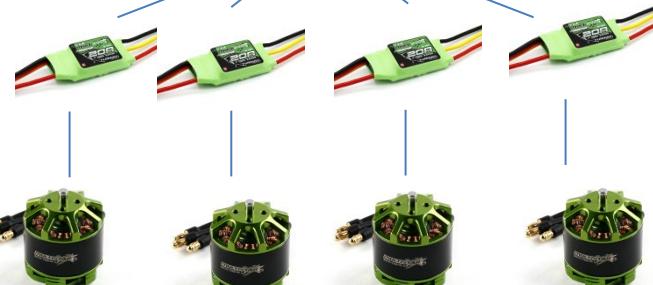
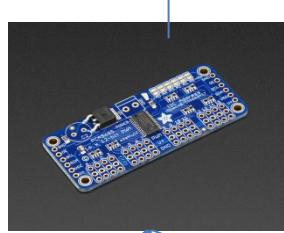
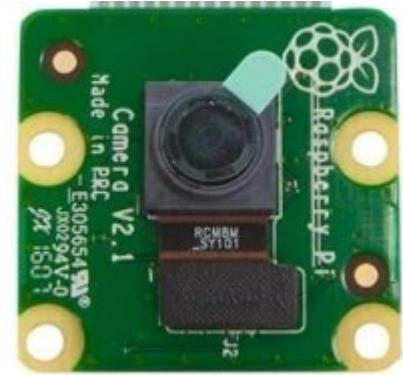
After hours

- Locker for each team
- Never leave your locker open or unlocked after class hours.
- Garage is open 9am-9pm M-F
- You can take your items home with you, but as a team you are responsible to bring all hardware to class.
- This room is available:
 - During class time and office hours.
 - When not already scheduled 9am-9pm M-F
 - Do not use other rooms or cafe space in garage.

System plan:



I2C



Class schedule*

1. IMU, IMU calibration
2. IMU filter and safeties
3. Build robot, P control of Pitch
4. PID control of Roll, Pitch, Yaw
5. Joystick control of RPYT
6. Flight and tuning
7. Flight
8. Camera integration, Yaw control
9. XYZ, yaw position control
10. Autonomous position hold competition

Class absence

- Don't come to class if sick. Email me when you are out sick.
- When recovered, catch up by:
 - Completing missed milestones on your own
 - Show missed milestones before next class
 - Office hours
 - By appointment

More info:

- Practice flying quadrotor, you are required to buy one to practice, starting next week



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- Teams today should have 2 registered students