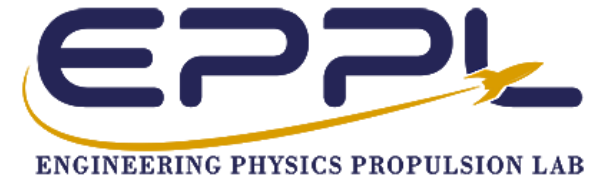


CubeSat Control Platform + ACTIV

10/24 Meeting

EMBRY-RIDDLE
Aeronautical University



General Updates/Reminders

Student Research Symposium is on **November 15th** in the union

- If you haven't already, please respond to the poll in Discord regarding session selection
- The goal is to show up with working demos of the inverted pendulum and ACTIV (1-DoF) as well as the assembled expanded 1U CubeSat
- As it's the 21st century, we should also make use iPads/monitors to display renders or supplement inverted pendulum demonstration (plot PID controller after demo)

[Justin]: IMU Class

Progress completed this past week

-IMU class structure is complete and nearly applicable

-Written in accordance with SOLID principles to allow for straightforward manipulation of the class

Goals for next week

-Tune IMU class to mitigate incorrect gyro offsets (it currently is calibrating to the incorrect offset and quickly immediately loses accuracy)

-Integrate IMU class and Simple_PID Python package with Dylan's ODrive torque control code to control pendulum

-Store pendulum arm angles in database to easily plot PID algorithm

Anticipated Challenges

-Working with new bookworm RPi OS update, particularly with installing python packages

Clean Code
>
Spaghetti

[Justin]: IMU Class, Application Example

```
1  import InertialMeasurementUnit
2  import time
3
4
5  IMU1 = InertialMeasurementUnit()
6  while True:
7      angle_x, angle_y, angle_z = IMU1.get_euler_angles()
8      print(f"Roll: {angle_x:.2f}, Pitch: {angle_y:.2f}, Yaw: {angle_z:.2f}")
9      time.sleep(0.1)
```

[Justin]: Required Motor Torque Analysis

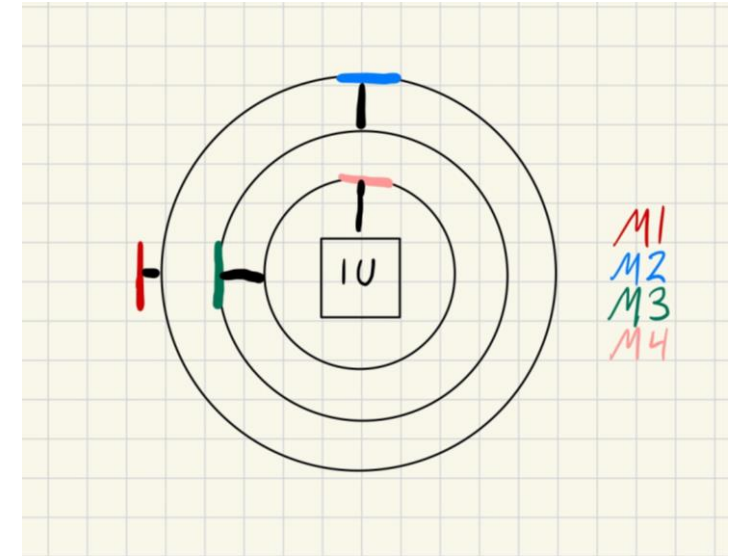
Progress completed this past week

-Wrote MatLab script which determines torque required for each of the four motors in ACTIV

-Idealized ACTIV to three hoops of negligible thickness, homogenous mass distribution, and varying mass and radii along with a central CubeSat

-Motor numbering scheme is increasing in order from outer rings to inner ring

-R80 (rated torque of 1.2 Nm) will be sufficient for outermost ring while R60 (rated torque of 0.75 Nm) will suffice, if not be overkill, for motors 2 and 3. An R-series motor may not be necessary for motor 4.



Goals for next week

-Purchase motors pending informal peer review of torque determination script

-Begin designing ring/CubeSat and ring/ring rotary unions.

Anticipated Challenges

-None

Motor 1 torque required:	0.636 Nm
Motor 2 torque required:	0.323 Nm
Motor 3 torque required:	0.125 Nm
Motor 4 torque required:	0.010 Nm

[Isaac] 2DOF and 3DOF CubeSats

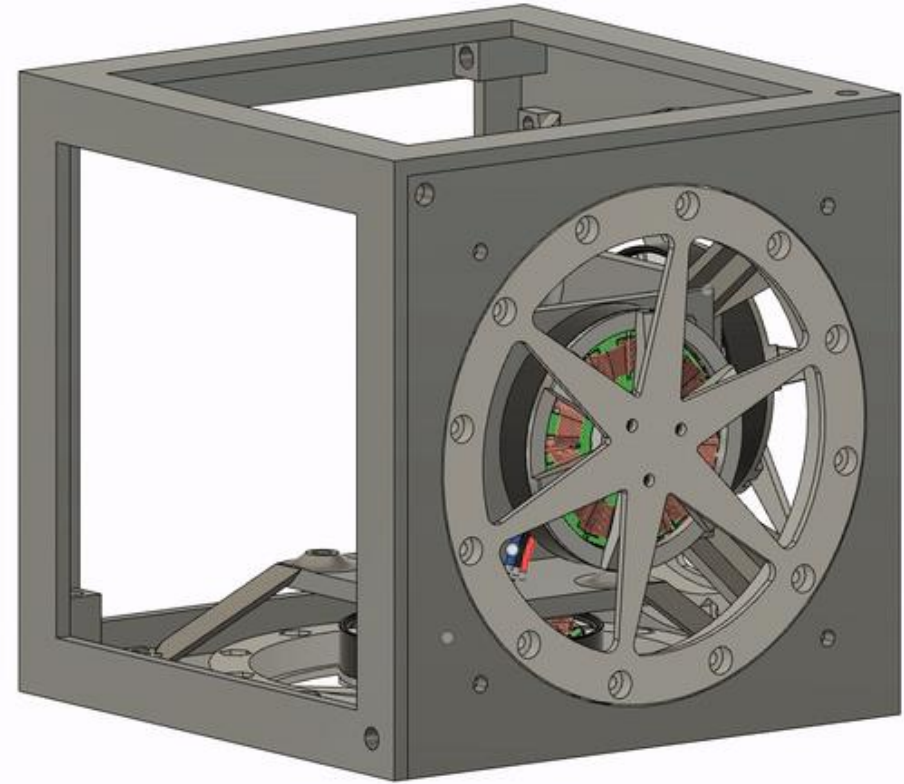
Progress completed this past week

- Remade cube for 2-piece modular design
- remade pizza table to have diagonal legs
- remade reaction wheel to go onto cubesat

Goals for next week

- print cubesat and parts

Anticipated challenges



Press <esc> to end animation

[Dylan] + [Embrace Fall]

Progress completed this past week

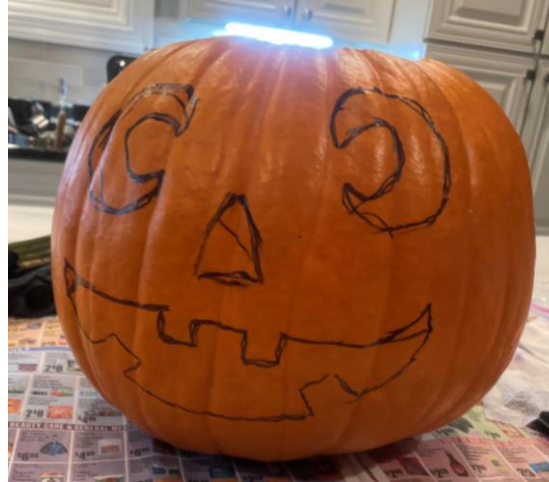
- I picked a pumpkin
 - Then carved the pumpkin
- I also picked some apples
 - Then made apple Pie

Goals for next week

- Work on ACTIV Motor Torque Calcs w/ Justin
- Get CAN Control
 - Torque Control
 - Controlling multiple motors at once
- Create Database to store
 - IMU data
 - Motor Data
- Implement simple PID on Inverted Pendulum w/ Justin
- Work on Website for live streaming data visualization
 - Maybe get unity sim integrated
- Work with Justin/Ryan on Clean Code

Anticipated challenges

- I have stupid exams this week :(



[Ella] + [Inverted pendulum]

Progress completed this past week

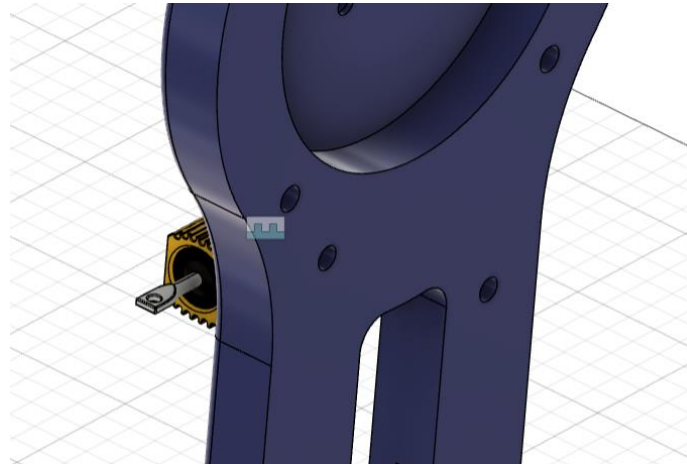
- Added updates to arm of pendulum
- Assembled second pendulum together

Goals for next week

- Talk to Justin

Anticipated challenges

- Edited the wrong arm so had to start the process over



[Jacob] + [Gyroscope Rings & Camera Stuff]

Progress completed this past week

- Discussed image processing with a legit engineer. Found some code that may be a useful beginning for an onboard camera.
- Came up with a weak idea for the gyroscope, need to put more time into that.

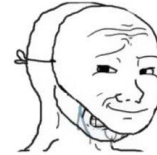
Goals for next week

- Come to a conclusion on the slip ring/gyroscope layout.
- Research more about how real satellite use their cameras for attitude determination.

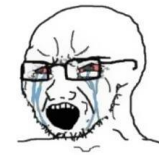
Anticipated challenges

- Getting familiar with python.

DESIGNERS



Look, we have similar ideas.



No! You stole my idea.

PROGRAMMERS

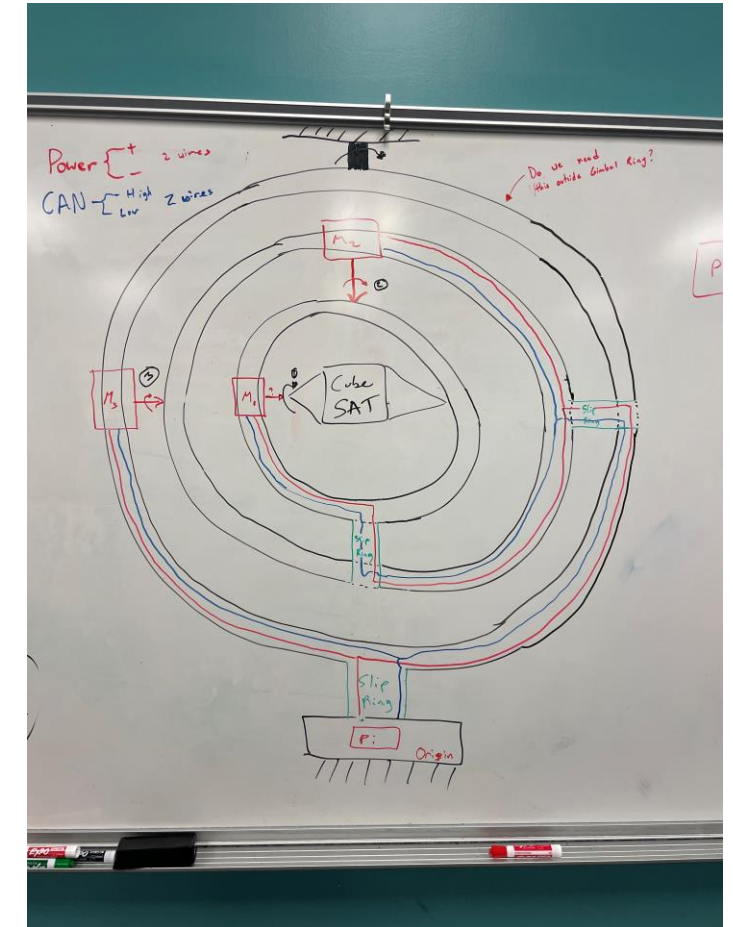


Man, I stole your code.



It's not my code.

boredpanda.com



[Ryan] + [Software]

Progress completed this past week

- Continued to work on new software structure

Goals for next week

- Get code to workable level with IMU/tilt
- Finalize structure with placeholders and post to github

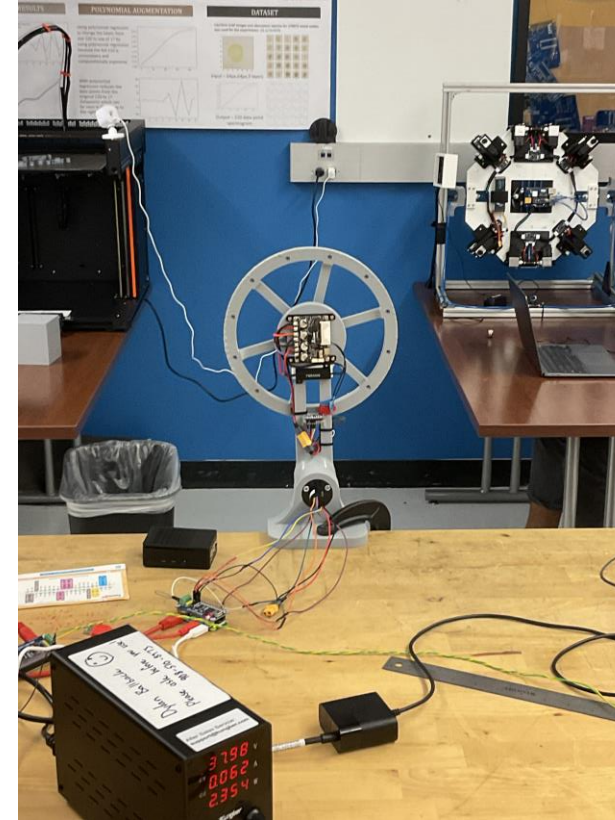
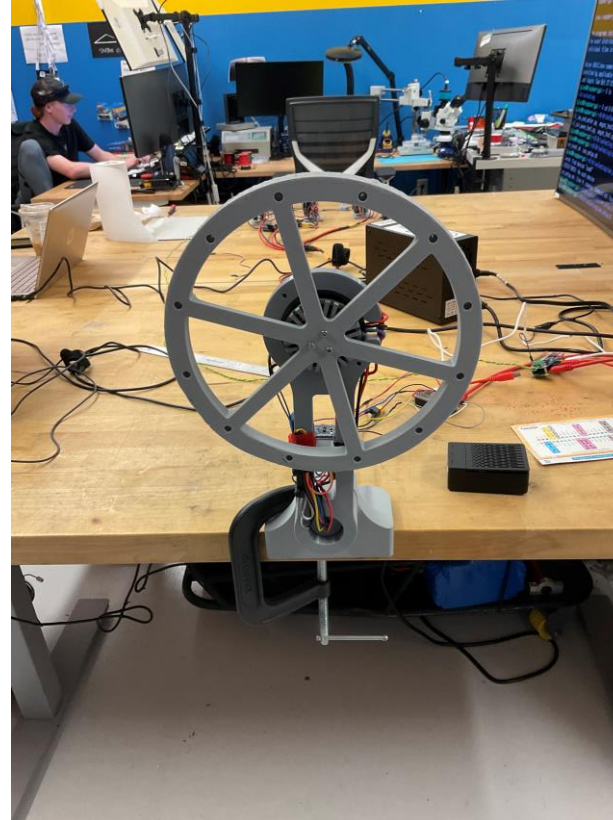
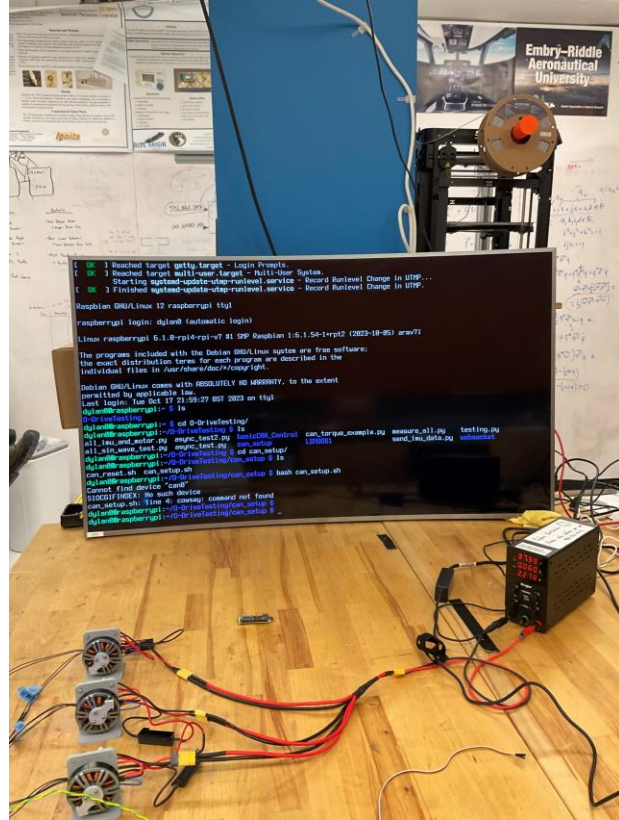
Anticipated challenges

- Time/Complexity



[Relevant]

Visual System Updates



[Assignee] + [Task Title]

Progress completed this past week

-[Discuss progress]

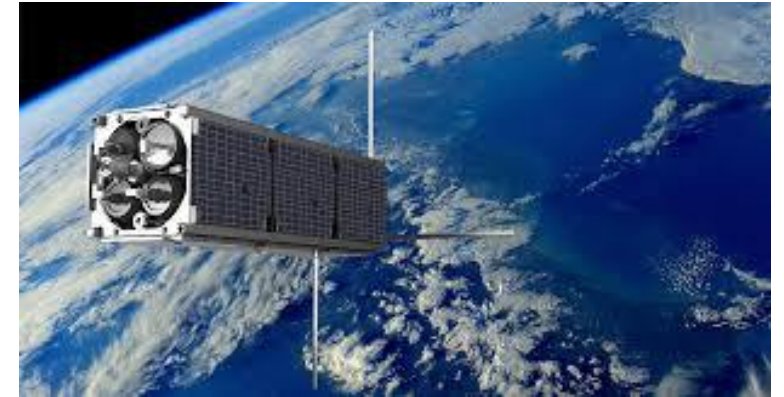
-Highlight based on: Complete, >50%, <50%

Goals for next week

-[Discuss goals]

Anticipated challenges

-[discuss challenges, request assistance if needed]



[Relevant photos if needed]