GNC Progress Documentation

Week 1 (Jan 13 - Jan 17)

Subsystem Progress

- Decided short term goals for the subsystem
- Decided the global state-machine execution relevant to ADCS in FSW

Individual Progress

Karthik Karumanchi

- Identified a potential IC for RW to replace the STM32, motor driver and encoder
- Caught up to RW work from the previous semester
- Worked with FSW team to decide on the state-machine for FSW

Derek Fan

- Added additional unit tests for corner cases: Issue #63
- Removed software conflicts with CircuitPython: Issue #82
- Conceptualized the remaining ADCS task structure in FSW

Arvind Car

- Caught up to Vision work from the previous semester/year

Amaar Quadri

- Created and set up the GNC-Payload repo, moved all relevant code there
  https://github.com/cmu-argus-2/GNC-Payload/issues/2
- Helped other team members get up to speed on orbit determination codebase
- Began looking into earth engine downloader for creating datasets
  https://github.com/cmu-argus-2/GNC-Payload/issues/16

(Contributors not signed up for the course)
Pedro Cachim

- No progress

Frederik Markus

- Caught up to Vision work from previous semester/year

Week 2 (Jan 20 - Jan 24)

Individual Progress

Karthik Karumanchi
- Placed order for a sensorless FOC chip
- Started translated MEKF implementation to FSW
    - Added gyro, sun sensor and magnetometer ([Issue #75](#))
    - Added an orbit propagation function ([Issue #89](#))

Arvind Car
- Set up scripts to train and evaluate the RCnet and LDnet pipelines, and converted absolute paths to relative paths in the code base (Issue [#13](#) and [#14](#)) (https://github.com/cmu-argus-2/GNC-Payload/tree/Merged_Vision_Pipeline)

Amaar Quadri
- Set up a google cloud project for earth engine downloader, wrote a bash script to create a basic dataset, and copied the dataset to the workstation https://github.com/cmu-argus-2/GNC-Payload/issues/16
- Got image simulator + ML inference + NLS OD pipeline working https://github.com/cmu-argus-2/GNC-Payload/issues/20

(Contributors not signed up for the course)
Pedro Cachim
- Merged MEKF to main (w/ Tushaar's help). Joined MEKF/attitude controller simulations: PR #47
- Work on RW/magnetorquer controller: PR #49
- Added option to initialize sim spin-stabilized/sun-pointed: PR #49

Frederik Markus
- Worked on implementing the vision training ground and better understanding what already exists for eedl. On the GNC-Payload repo: PR #18 and issues #9, #14, #16, #17
- Started implementing the filter pipeline (at the moment only position and velocity) No PR yet for this.

Derek Fan
- Tuned controller parameters in SIL for sun-pointing task

- Working on restructuring ADCS app: Issue #94

Week 3 (Jan 26 - Jan 31)

Individual Progress

Karthik Karumanchi
- Calibrated MCF8315C sensorless FOC chip for RW speed control ([Issue #4](#))
    - RW speed control works on the dev kit. Actual board yet to be designed
- Ran a magnetorquer - magnetometer settling time analysis ([Issue #134](#))
    - Data collection frequency was too low and the test needs to be re-run

Arvind Car
- Incorporated Salient Region Analysis code to add more regions ([commit](#))

Amaar Quadri
- Downloaded new dataset with lower cloud cover
- Debugging OD pipeline
- Bug fixes in vision inference code

(Contributors not signed up for the course)
Pedro Cachim
- PR#49: RW controller, Sun Sensor eclipse function
- PR#52 (in the works): gravity gradient torque, plotting cleanup, aerodrag torque, dynamic perturbation fixes

Frederik Markus
- Helped Amaar on his eedl PR
- Set up tooling on the GNC-Payload codebase
- Worked on combined state filter

Derek Fan
- Tested ADCS task on mainboard–fixed library and task-related issues.
- Began fixing numpy-ulab and other circuitpython-related discrepancies (e.g. matrix multiplication)

Week 4 (Feb 03 - Feb 07)

Individual Progress

Karthik Karumanchi
- Ran Reaction Wheel for 3 days at max speed without issues
    - Spoke to Adrian and made a plan for a RW board
- FSW progress:
    - Architecture for the ADCS task with an MEKF (Issues #75, #94)
    - Orbit propagation module to propagate position between GPS (Issue #89)
    - Both tasks above linked to PR #102

Arvind Car
- Identified 40 salient regions for the vision pipeline using the saliency script
- Downloaded training images for the 40 salient regions

Amaar Quadri
- More bug fixes in vision inference code
- Refactor OD pipeline to allow easily replaying data https://github.com/cmu-argus-2/GNC-Payload/issues/33
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(Contributors not signed up for the course)
Pedro Cachim

Frederik Markus
- Working on the combined state EKF
- Some bug fixes

Derek Fan

Week 5 (Feb 10 - Feb 14)

Individual Progress

Karthik Karumanchi
- Merged Attitude control stack to the new ADCS architecture (PR [#148](#))
    - Centralized logging for debug and for potential future downlinking
    - Fixed bugs identified with a working GPS module

Arvind Car
- Trained RCnet on new Salient Regions (Issue [#13](#) and [#14](#))
- Bug fixes with RCnet (single class encodings -> multi-class encodings) (Issue [#56](#))
- Modified training scripts to log more data (to be used to refine/eliminate regions)

Amaar Quadri
- Finish vision inference code cleanup (led to several bug fixes and some good conversations about interfaces between training and inference), currently in review
  https://github.com/cmu-argus-2/GNC-Payload/issues/27
- Create ability to test OD pipeline with ground truth landmark bearing measurements
  https://github.com/cmu-argus-2/GNC-Payload/issues/43
- Preliminary code review on EKF position estimation
  https://github.com/cmu-argus-2/GNC-Payload/issues/5
- High-level code review of vision training ground code
  https://github.com/cmu-argus-2/GNC-Payload/pull/54
- Begin planning camera class updates
  https://github.com/cmu-argus-2/GNC-Payload/issues/49

(Contributors not signed up for the course)

Pedro Cachim
-Licensing

Frederik Markus
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Derek Fan