1/04/24

Demonstrating Visual-Inertial A&OD & On-Orbit Edge Computing

Progress summary

30 days before May 1st

Updates

- **FSW**
  - Functional camera interface that can:
    - store and retrieve time stamped images
    - check operational status and logs different errors
    - Adjust exposure time of camera
    - Check for blinding from the sun
  - Worked with avionics on low-level faults detection and handling for critical components
- **Estimation**
  - Continued experimenting with openstartracker
    - Explored tools to generate simulated night sky images to be used for testing
    - Used Arducam to capture images of the night sky on top of Flagstaff hill, couldn't capture images of stars
    - Continued testing of openstartracker with synthetic night sky images generated from different tools
  - Initial testing of MEKF with satellite playground.jl, working

Blockers

- Unable to capture images of stars with Arducam
  - Testing dependent highly on clear skies. Been difficult
  - Might need access to really dark skies to be able to capture usable images

Weekly Plan

- FSW development
  - Continue development of camera interface and integrate with other subsystems
- Estimation
  - Try again to capture images with arducam, use different method to change exposure time, analog gain of the camera
  - More rigorous testing of openstartracker using simulated night sky images

Interface dependencies

Testing with Simulated Night Sky Images

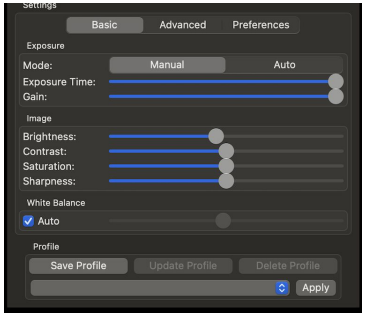
Tool	Notes	Calibration data using openstartracker	Inference using openstartracker
star_simulator	Allows adjustment of focal length, camera pixel size	Yes	No
lost	Lots of customization, noise, camera specifics, more realistic images	Yes	Initial testing yielding accurate results.
Stellarium	No imaging system only customization option, tied to telescope	-	-
Kstars	Preliminary configuration didn't generate results, needs more troubleshooting	-	-

Next steps:

- Generating simulated images through lost most promising
- Continue generating more images and testing with it

Actual Night Sky Images captures with Arducam

1. Sky was clearest on Friday, captured images on Flagstaff fill. Nothing visible in arducam images, even after post processing. Phone could capture images of stars.
2. Played around with exposure time, analog gain, brightness, hue, saturation, white balance values of the camera.
    a. Used a Camera controller app in Mac to do that
    b. Provides scales to adjust from min to max values



Next steps:

- Use v4l-utils to modify camera parameters. Set specific values, more control over camera
- Try again on a clear night