Vision Quadchart

26/02/24

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

Progress summary

65 days before May 1st

Updates

- Dataset:
  - Dataset download from 16 regions
- RC:
  - Prepared data ready for RCnet, ready to train on N salient data regions
- LD:
  - Customized Yolo loss function
  - Prepared training datasets from mass data download
  - Training LD for 16 regions on top salient landmarks at different scales

Blockers

- Computing resources for LD training
  - ECE Community Compute Clusters
  - Pittsburgh Supercomputing Center
  - ROBO Cluster

Weekly Plan

- Vision
  - Continue training experiments with pruning
  - Deploy trained models onto Jetson for GNC integration
  - Improve mAP of RCnet - finetune hyperparameters

Interface dependencies

- Integrating image passing pipeline with GNC/avionics

Vision

- **Dataset**
  - Downloaded data from 16 polarized regions -> Dataset Download Report
  - Created YOLO datasets for 16 regions (train, val, test from different sources/years)
- **Training**
  - **RC:**
    - Prepared new larger dataset ready for RCnet, ready to train on N salient data regions
  - **LD:**
    - Customized YOLO loss function with an additional MSE (centroid pixel error) loss
      - Weighted using box weight
    - Customized YOLO validator batch/class metrics tracking throughout training
      - MSE per class
      - Batch average
    - Training a base LD net with for 16 regions on top salient landmarks at different scales
    - Script for evaluating trained models: MSE, missed, extraneous detections
    - Pruning landmarks after training

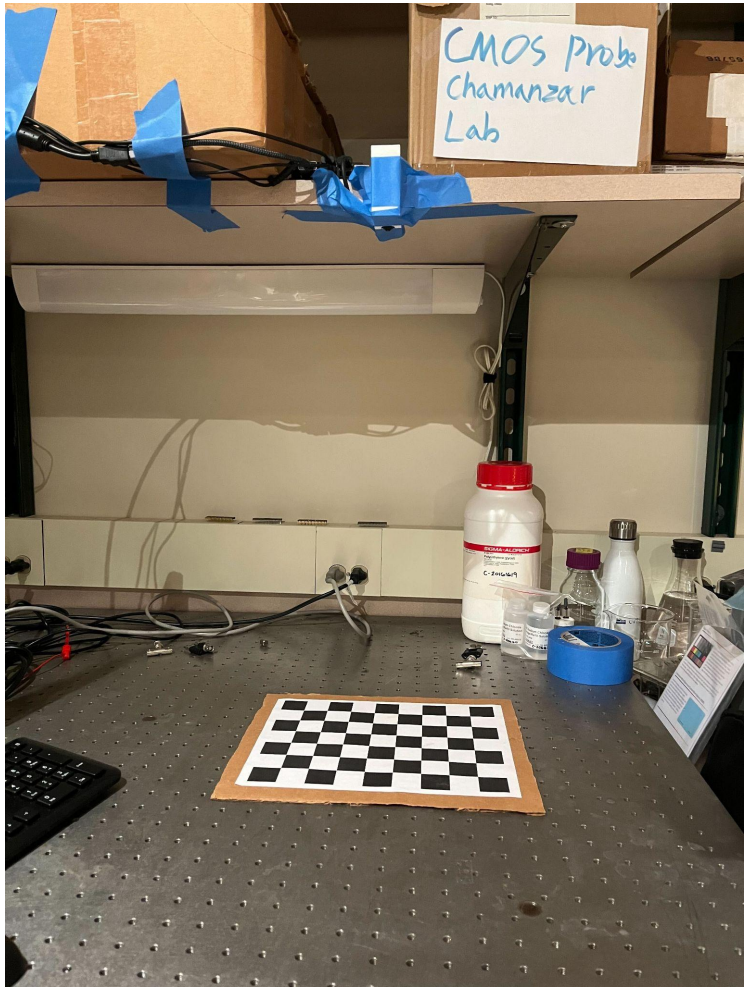
Calibration

Achievements:

- Finished the calibration test with optical table settings
  - The result is reasonable than before
  - Camera mounts are prepared

Next Step:

- Do multiple calibration and get the average, compare with the spec
  - Try with the mount equipments
  - Solid chessboard



Calibration

Color correction

Achievements:

- Finished data collection, and a test for color correction

Problem found:

- The images taken is vague
  - How to adjust the focal length of a CMOS camera?