Progress Report

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1 Specific Research Goals

- VPQEKF (April 1st): Work on the paper.
- DLO Manipulation Dataset (September - ICRA)

2 To Do

- QEKF Paper - 30% extension (April 1st):
  - Edit VEst section and add updates.
- QEKF Implementation (Feb. 15th): - Done
  - Test on multiple datasets - Done
- QEKF/QuEst+VEst Implementation (Feb. 28th):
  - Implement QuEst 5-point (Feb. 28th) - On-going
  - Implement VEst (Feb. 28th)
  - Address scale factor (depth-scale) issues
  - Address "hand off" issue when objects enter or leave field of view
  - Real-time streaming images for real-time operation (optional)
  - Experiments
  - Feature point extraction
  - Noise issue: noise cannot be modeled
- DLO Manipulation:
  - Related work literature review
  - Real dataset + paper (September 2022 - ICRA):
    - Watch IROS manipulation workshop videos.
    - Design, discuss and build a data collection and test rig (on-going)
    - Purchase DLO samples for data collection
  - Unity dataset
    - Recreate virtual duplicates of physical test material
    - Model dynamics and deformity

3 Progress

The following items are listed in the order of priority:

- VPQEKF (April 1st, 2022): I continued working on rewriting QuEst code. I finished the data handler module for KITTI dataset but have trouble with running the SURF detector routine. I couldn't find a binary version of OpenCV with SURF compiled-in. Next, I will install latest version of OpenCV from source. Apparently, as of September 2020 the patent on SURF has ran out. I have done this previously when I was trying to set the ROS environment that code had created. Moreover, I read on *Radial distortion* and *Tangential distortion* coefficients and how they relate to the *distortion vector*. This is important if you try to convert calibration code and parameters between Matlab and OpenCV based source codes. Additionally, I stumbled upon [1] which is a feature built into Numpy as a solution to the non-unique Quaternion solution. I discusses this with Dr. Gans and we both thinks it is best if I finish rewriting the code first.
- DLO Manipulation: No update.
- NBV-Grasping Project: No update.
- PyTorch Tutorials: Transfer learning.
- Pose Estimation: I will need it for DLO segment localization.

4 Intermediate Goals - Fall 2021:

- QEKF: Finish paper.
- UR5e: Do the tutorials.

References

[1] I. Y. Bar-Itzhack, "New method for extracting the quaternion from a rotation matrix," *Journal of guidance, control, and dynamics*, vol. 23, no. 6, pp. 1085–1087, 2000.