Progress Report

Bardia Mojra

January 28, 2022

Robotic Vision Lab

The University of Texas at Arlington

1   Specific Research Goals

- VPQEKF (April 1st): Work on the paper.

- DLO Manipulation Dataset (September - ICRA)

2   To Do

- QEKF Paper (April 1st):

  - Related work
  - Introduction
  - QuEst + VEst description
  - QEKF description
  - Experiments
  - Conclusion

- QEKF/DR Implementation (Feb. 2st):

  - Finish updating QEKF code
  - Add Vicon data as ground truth
  - Test on multiple datasets

- QEKF/QuEst+VEst Implementation (Feb. 11th):

  - Integrate and confirm update QEKF works
  - 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):

* Design, discuss and build a data collection and test rig (ongoing)
* Define DLO classes and specs
* 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:

- Dead Reckoning (Feb. 2nd, 2022): I am almost done updating the QEKF module. After this, I will update QuEst+VEst implementation.

- VPQEKF (April 1st, 2022): I need to start working on feature points extraction done by Quest+Vest code [1].

- DLO Manipulation: I designed a test fixture for the DLO data collection paper and submitted the BOM for purchase. Moreover, I purchased several wires from Home Depot; they are 3' long and in 4 types. All the wires are for contruction applications and that is all they had. It might be best if we keep the test objects easily available and selected the objects from Home Depot and specific to car manufacturers. Nonetheless, I will pursue solutions to the general handling, routing, and insertion problems regarding DLO manipulation.

- 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] K. Fathian, J. P. Ramirez-Paredes, E. A. Doucette, J. W. Curtis, and N. R. Gans, "Quest: A quaternion-based approach for camera motion estimation from minimal feature points," *IEEE Robotics and Automation Letters*, vol. 3, no. 2, pp. 857–864, 2018.