Progress Report

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Robotic Vision Lab

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1 Specific Research Goals

- VPQEKF (IROS - Mar. 1st): Work on the paper.
- DLO Manipulation Proposal: Work on a personal statement.

2 To Do

- Fellowship - DLO:
  - Unity dataset
  - Real dataset
  - Develop a well-written personal statement. — On-going.
  - Seek other graduate fellowship opportunities. — On-going.
  - Develop multiple versions of research and personal statements for submission to different opportunities.
- PVQEKF (Paper deadline March 1st.):
  - Setup ROS environment – (1) – due 12/7
  - Restore github access
  - Replace EKF with QEKF – (2) – due 12/7
  - Feature point extraction:
  - Depth to scale
  - BigC (where we solve Q+V together) –¿ regarding depth scale issue
  - Quat: switching problem is fixed
  - 35 solutions (start here)
  - Noise issue: noise cannot be modelled
  - Chaining step: when feature points come in and out of the frame dependency configuration.

3 Progress

The following items are listed in the order of priority:

- Fellowship: No update.
- VPQEKF: Dr. Gans, Cody, and I met and discussed QuEst+Vest side of the paper and went over the code. In the next two weeks and perhaps after finals, I will 1, resolve the pending issue with environment setup, and 2, replace the EKF implementation with my latest QEKF module. There is currently an issue with my setup or it could be due to a lack of proper installation documentation where I can not build the ROS package. This is the same issue where I got stuck and had to move on in the summer. I asked Jerry for help and he kindly tried with no success. During the meeting on Tuesday, I brought up the idea of rewriting the code and Dockerizing the ROS environment. We are considering omitting the ROS portion of the code in order to make the IROS deadline and to use timestamps instead. Cody and Dr. Gans seemed open-minded and somewhat intrigued with the idea of *containers* as a technology. We discussed using Unity for deep learning data acquisition tasks [1].
- DLO: I have been reading papers with derivation, simulation, and code on controlling double inverted pendulum. There are two main approaches to this problem, *the LaGrange-Euler formulation* and *Robust Lyapunov Control Function*. I successfully derived, simulated, and controlled a single inverted pendulum in simulation by deploying the *LaGrange-Euler* approach. For the double inverted pendulum, I plan on using *Robust Lyapunov Control Function*.
- 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.
- Active Learning.
- 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.