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: No update.
  - 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:
  - Read over Quest and Vest. — Done.
  - Write daily. — On-going.
  - Kitti tutorial. — On-going.
  - Kitti and Hilti dataset: low priority, use as control.
  - Develop object tracking and robust-to-truncation feature.
  - Get ROS environment up and running. I need to install Armadillo (C++) with a certain dependency configuration.

3 Progress

The following items are listed in the order of priority:

- Fellowship: No update.
- VPQEKF: Reza, Asif, and I went over the new QEKF results. Today, we met again and reviewed the code with Dr. Gans. Next, I will work on setting up ROS environment for the QuEst+VEst [**?**] part of the project but I am not sure why we need to use ROS as it runs

offline. I also initiate a push for adopting Docker across the board. Dr. Gans seemed very open-minded and we held an open discussion this morning, that is the reason I was late to our meeting today. Cody was not there so we will continue the discussion later. Moving forward, I will use docker for any ROS-related project. I will work on solution selection for QuEst+VEst, feature extraction, and the chaining step.

- DLO: Upon further reading, I realized that it was never my intention to fully simulate DLO's rather estimate their state dynamics and shape deformity efficiently and accurately. Currently, I am deriving state dynamics for an inverted pendulum with two degrees of freedom. My idea is to expand this notion to a *unit segment* with 2 rotational degrees of freedom. Elastic rods could be considered a chain of *unit segments* with identical properities representing an isomorphic elastic rod. Data-driven learning models can make clever use of physics-based simulation and constraint-satisfaction optimization. For example, a model could be trained on predicting largest unit segment while maintaining highest accuracy possible. This should result in increased computational efficiency as redundant segments are replaced with a single larger unit segment. Therefore, after the finals I will work on Unity tutorials and empirical dataset.
- 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