Progress Report

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1 Specific Research Goals

- VPQEKF (—): On pause. Asif may look into it.

- DLO Manipulation Dataset (ICRA - Sept. 1st) - on-going.

2 To Do

- QEKF Paper - 30% extension (—):

- Implementation (—):

  - Noise issue: noise cannot be modeled - revisit
  - SfM: RQuEst cannot find solution – under investigation - HA-VOK?

- DLO Manipulation: (ICRA - Sept. 1st)

  - Work on the paper everyday – up-coming
  - ICRA 2022 RL workshops: gym, stable-baseline3, and RL zoo – on-going
  - Setup digital twin reinforcement learing setup:
    * Unity Robotics extension setup – on-going.
    * Design dynamic DLO data collection system.
    * Build work cell. – on-going
    * Collect data and create a dataset.
    * Define evaluation metrics.
    * Create a high frequency RGBD dataset with UV-frames and open-loop input control actions as the ground truth.
  - Real-Time Preception – on hold
  - Learning DLO Dynamics and System Identification
    * List feasible approached for learing DLO dynamics – done
    * Model dynamics and deformity in a latent space

3 Progress

The following items are listed in the order of priority:

- XEst (RAL —): No update.

- DLO State Estimation (ICRA - Sept. 15th): This week, I will work on the DLO environment [1] in Unity to extract state and input data and I am able to run tests and train a model. Now I am looking into how to use this environment with Koopman operator to perform system identification on the DLO. I have been doing Unity ML-Agents tutorials in order to figure how I can interact with the simulation using python script. I have extracted training configuration poses as well.

- Maicol (REU): He has been working on UR5 workcell. He should be finished by end of next.

- DoD SMART (Dec 1st.): I started the application.

- PyTorch Tutorials: Transfer learning.

References

[1] M. Yu, H. Zhong, and X. Li, "Shape control of deformable linear objects with offline and online learning of local linear deformation models," in *2022 International Conference on Robotics and Automation (ICRA)*, pp. 1337–1343, IEEE, 2022.