

Progress Report

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1 Specific Research Goals

- Pose Estimation: Implement and improve.
- NBV-Grasping.
- Pose estimation survey.
- Universal pose estimation.

2 To Do

- Catch up on my reading list.
- Pose Estimation:
 - Read [1], up to chapter 5.
 - Key point feature extraction: ORB, SIFT, SURF.
 - Read VEst [2]. - Done
 - Implement QuEst in Python.
 - Survey: I need start working on this.
 - Evaluate various pose estimation methods: PnP, QuEst, and else.
 - PVNet implementation: Paused. Working on a simple pose estimation for now.
- NBV-Grasping:
 - Update URDF and Xacro files for UR5e to include sensor, sensor mount (with offset), and the gripper.
 - Add movement constraints for tables and scenes.
 - Write two IK functions for gripper and sensor, one for each. It should plug-in with MoveIt configurator.
 - Research and implement point-cloud data to training TensorFlow models.
 - UR5e in simulation: Joe might consider.
 - Learn and implement GraspIt package.
- MSI Fellowship: On pause.
- Look into methods of generating uncertainty data.

3 Reading List

- VEst [2] - Done.
- Vision-based robotic grasping from object localization, object pose estimation to grasp estimation for parallel grippers - a review [3] - On-going.
- NASA papers [4]
- Leveraging feature uncertainty in the pnp problem [5]
- Berk Calli's YCB [6]
- Normalized objects [7]
- Roadmap [8]

4 Progress

The following items are listed in the order of priority:

- Pose Estimation: I am working my way through [3]. It covers many topics in both Pose Estimation and Grasping but it does not go deep into Pose Estimation methods and could be written better. It provides a general view and I am using the information structure they provided for my survey paper. So far, I have been making annotations and taking notes.
I read Objectron [9] and will use their assessment of the current datasets for my survey paper.
- QuEst [10]: I still need to implement this in Python.
- VEst [2]: I finished reading the paper and discussed it with Dr. Gans. He answered many of my questions which helps a lot.
- NASA MSI Fellowship: Need to read more NASA papers.
- PyTorch Tutorials: Transfer learning:
- NBV Grasping Project: I finally fixed a compilation bug that I had been working on since last week. It was preventing us from using ROS Noetic, which was a major problem. I am working URDF file now.

- UTARI: I will be working on my reading list, from what I received from Dr. Gans. I think he sees what I see when it comes to the importance of Lie Algebra. Our discussion helped me understand some of the differences between Essential Matrix and Homography pose estimation techniques and more.
- Implement features from PoseCNN, DOPE, and BayesOD. - On pause.

5 Immediate Plans - Summer 2021:

The following items are listed in the order of priority:

- Pose estimation:
- NBV-Grasping:
- UTARI:

6 Intermediate Goals - Fall 2021:

- Pose estimation: I must be finished with implementation, perhaps make some improvements, and should be working on a paper for ICRA or CVPR.
- Scene understanding and active learning: After pose estimation, I want to expand my research into scene understanding and active learning in the context of advanced manufacturing.
- ARIAC: Once I am up to speed, I will do the ARIAC workshops/tutorials and will talk to Jerry about possible contributions.

References

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