

Progress Report

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1 To Do

- PVNet implementation: Test and document, learn and rewrite.
- Implement pose estimation: Keypoint uncertainty, understand RANSAC.
- Look into methods of generating uncertainty data.
- Pose Estimation Server: On pause.
- Vision-based robotic grasping from object localization, object pose estimation to grasp estimation for parallel grippers - a review, [1]: Will read after PVNet implementation.

2 Reading List

- [2]
- [3]
- [1]

3 Progress

The following items are listed in the order of priority:

- NBV Grasping Project: I met with Chris this week to discuss my role in his new project. As discussed, I reinstalled Ubuntu and ROS on my workstation. Next, I will design a mount for Intel RealSense D415 to be install it on UR5. Our goal is to submit the paper to ICRA 2022 with submission deadline of September 14, 2021. If it gets rejected, we will make appropriate changes and submit it to IROS 2022 with submission deadline of March 1, 2022.
- Joe, Chris, and I will hold weekly meeting to form a robotics team. I am not sure if this involves NBV Grasping Project.
- UTARI: I accepted Dr. Gans' offer for this summer. I am thinking maybe I was too frank.
- Pose Estimation: I will scale back to semantic segmentation for now.

- PyTorch: I started doing some tutorials on PyTorch.
- YCB Dataset [4]: Start with YCB data and look into Berk Calli's work.
- Normalized Objects [5]:
- Implement features from PoseCNN, DOPE, and BayesOD. - On pause.

4 Plans

The following items are listed in the order of priority:

- Pose Estimation in Simulation [6]: Use Nvidia Isaac SDK for in-simulation pose estimation training.
- Look into domain randomization and adaptation techniques.
- Project Alpe with Nolan: On pause for right now.
- UR5e: Finish ROS Industrial tutorials.

5 2021 Goals and Target Journals/Conferences

- Submit a paper on pose estimation with uncertainty to ICIRS.
- Get comfortable with TensorFlow and related Python modules.
- Keep writing.

References

- [1] G. Du, K. Wang, S. Lian, and K. Zhao, “Vision-based robotic grasping from object localization, object pose estimation to grasp estimation for parallel grippers: a review,” *Artificial Intelligence Review*, pp. 1–58, 2020.
- [2] L. Ferraz Colomina, X. Binefa, and F. Moreno-Noguer, “Leveraging feature uncertainty in the pnp problem,” in *Proceedings of the BMVC 2014 British Machine Vision Conference*, pp. 1–13, 2014.
- [3] K. He, X. Zhang, S. Ren, and J. Sun, “Deep residual learning for image recognition. corr abs/1512.03385 (2015),” 2015.
- [4] B. Calli, A. Singh, A. Walsman, S. Srinivasa, P. Abbeel, and A. M. Dollar, “The ycb object and model set: Towards common benchmarks for manipulation research,” in *2015 international conference on advanced robotics (ICAR)*, pp. 510–517, IEEE, 2015.
- [5] H. Wang, S. Sridhar, J. Huang, J. Valentin, S. Song, and L. J. Guibas, “Normalized object coordinate space for category-level 6d object pose and size estimation,” in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2019.
- [6] Nvidia, “Nvidia isaac sdk — nvidia developer.” <https://developer.nvidia.com/Isaac-sdk>, 2021. (Accessed on 02/05/2021).