

# Progress Report

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Robotic Vision Lab

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## 1 Specific Research Goals

- VPQEKF (ICRA - Sep. 14th) – Probably won't finish till IROS 2022 deadline.
- AFRL Proposal:
- Fellowship: Work on next week.
- NBV-Grasping (IROS - Mar. 1st)
- Universal pose estimation or a novel and superior approach.

## 2 To Do

- Catch up on my reading list.
- PVQEKF:
  - Write equations in LaTeX with description.
  - Develop object tracking and robust-to-truncation feature.
  - Get ROS environment up and running. – Next: I need to install Armadillo (C++) with a certain dependency configuration.
- AFRL: Controls and DNN research.
- Real-time pose estimation demo.
- NBV-Grasping:
  - Update URDF and Xacro files for UR5e to include a sensor, sensor mount (with offset), and the gripper. – Next
  - 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.
  - Learn and implement GraspIt package.

### 3 Reading List

- Leveraging feature uncertainty in the pnp problem [1].
- Normalized objects [2].
- NASA papers [3].

### 4 Progress

The following items are listed in the order of priority:

- VPQEKF: I worked on the H matrix and improved the results significantly. I think the way I prepared groundtruth data was erroneous.
- NBV Grasping Project: No updates.
- Fellowship: No update.
- PyTorch Tutorials: Transfer learning.
- Pose Estimation: On pause.
- SD Team: No update.
- EE Autonobots: No update.

### 5 Immediate Plans - Summer 2021:

The following items are listed in the order of priority:

- UTARI: Dr. Gans' pose and velocity estimation paper.
- NBV-Grasping:
- Pose estimation: Survey paper.

## 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

- [1] 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.
- [2] 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.
- [3] NASA, “Nasa technical reports server (ntrs).” <https://ntrs.nasa.gov/>, 2020. (Accessed on 05/07/2021).