6D Pose Estimation

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Abstract

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1. Introduction

The goal of 6D pose estimation is to predict a $SE(3)$ matrix for a given object with respect to the camera. This has significant applications to grasping tasks [**?**] [**?**], and autonomous navigation [**?**]. In this work we hope to replicate the results in [**?**] and to further extend the results if time allows for it.

1.1. Project Description and Goals

TODO: Explain different parts of the project, extensions

1.2. Member Roles

[**?**] nicely splits the architecture of the model into multiple different parts. These parts will be split amongst the group members where each group member will be in charge of a given part.

1.2.1 Semantic Segmentation

Sanjeev is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.2.2 Dense Feature Extraction - 3D point cloud

Zihao/Jiaxuan is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.2.3 Dense Feature Extraction - Dense Color image feature embedding

Zihao/Jiaxuan is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.2.4 Pixel-wise Dense Fusion

Jiaxuan is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.2.5 6D Object Pose Estimation

Sanjeev/Justin is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.2.6 Iterative Refinement

Justin is responsible for this part. TODO: Give a brief sentence or 2 on what this is.

1.3. Resources

TODO: Add images from YCB-Video dataset [**?**]. Add images from LineMOD Dataset (Find citation). Toolbox for using this data is available at this github page. Python/Pytorch for implementation.

1.4. Reservations

TODO: Read paper, outline problems we may face and setup a minimum goal. (Possible stretch is to get it working on a real robot)

1.5. Relationship to Background

TODO: Talk about your background

Justin Wasserman is a first year grad student in ECE with an interest in robotics and computer vision. Currently his research is related computer vision and motion/path planning related to a biologically inspired system (see https://cyberoctopus.csl.illinois.edu/ for more). This work is currently not related to his research project, but it could relate to tasks that the biologically inspired system may need to complete such as grasping and navigation. Justin is familiar with a few learning frameworks such as PyTorch [**?**], Nengo [**?**], and Tensorflow [**?**]. He has contributed to open source projects related to learning packages including PyTorch's computer vision action recognition datasets, Bindsnet [**?**], and his own personal, open-source projects that incorporate these packages.

References