

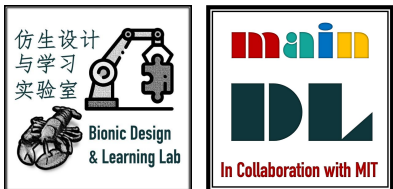
Visual Servo Grabbing Development Platform Based on Deep Learning

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Proposed Project Title Summary

We discuss a research project investigating the use of deep learning and convolutional neural networks to improve robotic grasping capabilities. The project aims to develop a visual grasping platform that can accurately position and capture objects using image information and predicted capture rectangles. The project will use open source datasets such as PASCAL VOC ImageNet and UCI Machine Learning Repository, and will focus on optimizing existing CNNs to fit different types of robotic arms and claws. The success of the grasping will be evaluated using force-closure analysis, and the evaluation objects will be transformed randomly before getting rendered. The project aims to improve the efficiency and accuracy of robotic grasping, with potential applications in various fields. Some readings recommended include Deep learning for visual understanding: A review - ScienceDirect and Real-time grasp detection using convolutional neural networks.

The problem that we will be investigating

- vision

rich in information & broad detecting range & well-established technology

- grab

multiple application



Some readings to be referred

Basic overview:

- [Deep learning for visual understanding: A review - ScienceDirect](#)
- [A Survey on Learning-Based Robotic Grasping](#)

Learning basic concept and techniques:

- [Real-time grasp detection using convolutional neural networks](#)
- [Dex-Net 2.0: Deep learning to plan robust grasps with synthetic point clouds and analytic grasp metrics](#)
- [Learning hand-eye coordination for robotic grasping with deep learning and large-scale data collection](#)
- [PickNet: Deep learning for graspable objects](#)

Finally, develop our visual grasping platform to more specific cases if possible.

Data we will use?

- We could have access to use some open source datasets
 - PASCAL VOC
 - ImageNet
 - UCI Machine Learning Repository

What method or algorithm are you proposing?

- Using the system based on convolutional neural network, the image information of the captured object is taken as the input, and the predicted captured rectangle is taken as the output, to complete the target object positioning, object attitude estimation, and capture detection。
- The focus of our work is based on the existing CNNs used to predict the grabbing rectangle, optimize them to fit different types of robotic arms and claws.

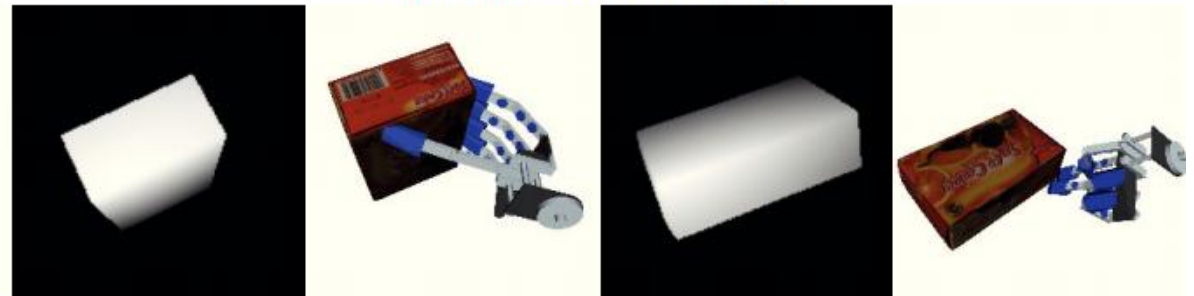
How will you evaluate your results?

- Using the full model of the object and the tool set **Simox**, force-closure analysis can now be performed. We consider the grasp a success, if it is a **force-closure grasp**.
- Evaluation is performed on objects, which have **not been used** for **training** before. Similar to the process of generating training data, the evaluation objects are **transformed randomly** before getting rendered.

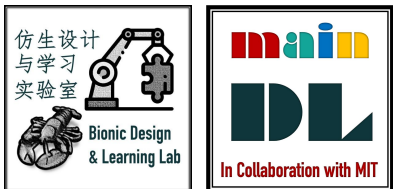
Force Closure Grasps



Non Force Closure Grasps



Thanks !



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