YIBO CAO

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EDUCATION

Carnegie Mellon University ***Pittsburgh, Pennsylvania, United States***

Master of Science in Mechanical Engineering-Research based(major in Robotics), **GPA:** 3.78/4.00 *2018fall - 2020summer*

Relative Courses: Deep Learning; Machine Learning; Computer Vision; Computer Graphics; Robot Localization and Mapping; Engineering Optimization; Linux and Open Source

Tsinghua University ***Beijing, China***

Bachelor of Engineering in Department of Precision Instrument, **GPA**: 3.48/4.00, **Senior GPA:** 3.74/4.00 *08/2014 - 06/2018*

SKILLS

- Research Area: Three Dimensional(3D) Robot Perception
- Professional Knowledge: Deep Learning, Machine Learning, Computer Vision, SLAM
- Computer Skills: Python, C++, Tensorflow, Pytorch, MATLAB, SolidWorks

INTERNSHIP EXPERIENCE

BITO Robotics, Inc. *06/2019 - 08/2019*

Perception Engineer Intern *Pittsburgh, Pennsylvania, United States*

- Developed a CNN based semantic segmentation algorithm for 3D LiDAR point clouds using Tensorflow.
- Conducted semantic segmentation for both indoor and outdoor environments.
- Refined the proposed neural network structure as well as data processing approaches in multiple ways.
- Implemented the semantic segmentation algorithm into the company's mobile robot by ROS.

RESEARCH

Real Time Semantic Segmentation for 3D LiDAR point clouds | Biorobotics Lab, Carnegie Mellon University

Advisor: *Howie Choset, Professor in Robotics Institute* *03/2019 - present*

- Designed a novel multi-perspective neural network aiming at doing semantic segmentation for 3D LiDAR point clouds.
- Enhanced the semantic segmentation performance by cooperating with LiDAR odometry.
- Conducted multiple algorithm refinements such as voxelization, changing internal structure and applying external modules.
- Integrated the segmentation algorithm into a Hexapod robot, allowing it to do real-time semantic segmentation.

Graph-based Semantic Segmentation for 3D point clouds | Biorobotics Lab, Carnegie Mellon University

Advisor: *Howie Choset, Professor in Robotics Institute* *12/2019 - 02/2020*

- Wrote a functional API for 3D point cloud data processing, specially designed for graph-based network.
- Collaborated with other group members on building a graph network structure based on *DGCNN*.
- Customized a hexapod robot to let it be able to use this graph-based segmentation algorithm.

Depth Prediction with Monocular Images and 2D Laser Scans | Biorobotics Lab, Carnegie Mellon University

Advisor: *Howie Choset, Professor in Robotics Institute* *08/2019 - 09/2019*

- Collaborated with group members on building a neural network for pseudo-LiDAR generation based on *Monodepth2*, using monocular images and 2D laser scans.
- Conducted a series of experiments and results analysis.

Modular Perception Box for mobile robot | Biorobotics Lab, Carnegie Mellon University

Advisor: *Howie Choset, Professor in Robotics Institute* *02/2019 - 03/2019*

- Designed and fabricated a modular perception box that has integrated LiDAR, RealSense camera and Intel NUC.
- Collaborated with a senior group member on integrating the box with SLAM functions.

PROJECTS

Comparison of *ORB-SLAM2* and *DeepVO* | Robot Localization and Mapping, Carnegie Mellon University *10/2019 - 12/2019*

- Collaborated with group members on implementing *ORB-SLAM2* and *DeepVO (deep-learning-based visual odometry)*.
- Conducted analysis and comparison between *DeepVO* and the visual odometry in *ORB-SLAM2*.

Object detection for LiDAR point clouds | Computer Vision + Biorobotics Lab, Carnegie Mellon University *02/2019 - 03/2019*

- Manually generated the LiDAR point clouds with a mobile robot and labeled the objects in bird's eye view projections.
- Implemented the *YOLO* object detection network and tested it with the manually labeled data.

Position analysis of robot arm's end-effector | Biorobotics Lab, Carnegie Mellon University *09/2018 - 03/2019*

- Implemented and optimized an iterative Gaussian Process Regression (GPR) algorithm to analyze the end-effector position of a high DoF (degree of freedom) industrial robot arm, achieving prediction error below 0.068mm.
- Analyzed iterative GPR results by implementing other machine learning methods, such as SVR (Support Vector Machine Regression) and Bayesian Inference.