Rintaroh Shima

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EDUCATION

Northwestern University   **Evanston, IL**
M.S. in Robotics   *September 2022 – December 2023*

Case Western Reserve University   **Cleveland, OH**
B.S. in Mechanical Engineering | Cum Laude   *August 2017 – December 2021*

EXPERIENCE

Motiv Space Systems, Inc.   **Pasadena, CA**
Robotics Software Engineering Intern   *June 2023 – September 2023*

- Established a simulation environment in C++ that mimics hardware setup, including modeling a brushless DC motor in the ros2_control hardware abstraction for actuator physics
- Implemented a cascaded PID system with position, velocity, and current loops in the hardware abstraction to simulate the motor controller
- Architected a tuning GUI using Python and PyQt, enabling real-time modification of PID parameters for motion control loops

Lincoln Electric   **Mentor, OH**
Mechanical Engineering Intern – Plant Engineering   *May 2021 – August 2021*

- Modified design of machine guarding, using Solid Edge, to resolve quality and safety issues
- Designed a cart to ease the process of moving and emptying an iron oxide hopper

Lincoln Electric   **Euclid, OH**
Mechanical Engineering Co-Op – Machine R&D   *September 2020 – December 2020*

- Designed sheet metal and bracketry for the industrial products group; created associated drawings using Solid Edge
- Developed CAD assembly prints for a new 300-amp inverter; released part orders to build a prototype for validation testing

PROJECTS

Semantic Mapping for Wheelchair Navigation   *Spring, Fall 2023*

- Created a real-time mapping system for power wheelchair users, enabling them to view, save, and autonomously navigate to semantically-identified landmarks using a tablet
- Trained YOLOv8 on a custom dataset for detecting doors and tables, and wrote a ROS 2 wrapper for the model to obtain real-world coordinates of detected objects relative to the camera
- Engineered a GUI in Python for tablet use, designed to complement map visualization in Foxglove Studio; incorporated features for displaying and saving detected landmarks, and provided user control to cancel navigation
- Constructed a semantic labeling pipeline in ROS 2 and C++ that manages coordinate transformations and publishes distinct markers in the map for detected doors and tables

Stereo Visual Odometry   *Spring 2023*

- Built visual odometry for a stereo camera setup in Python using the KITTI dataset, leveraging OpenCV to extract and match features as well as generate disparity maps
- Employed RANSAC to determine 3D rigid body transforms between frames, achieving vehicle position and orientation estimations with less than 66m drift at loop closure

3D Simultaneous Localization and Mapping (SLAM) and Object Detection for Jackal Navigation   *Winter 2023*

- Integrated RTAB-Map, Nav2, and YOLOv7 into the Clearpath Jackal unmanned ground vehicle, equipping it with perception, localization, and mapping capabilities for navigation
- Brought up the robot to a running state on ROS 2 Humble, which is currently not supported
- Filtered noisy LiDAR data, using C++ and PCL, to generate a more refined occupancy grid map

Extended Kalman Filter SLAM from Scratch   *Winter 2023*

- Implemented EKF SLAM and landmark detection with unsupervised and supervised learning, using ROS 2 and C++, on TurtleBot3 in simulation
- Wrote a kinematics and control library for differential drive robot and created a custom simulator to evaluate the effectiveness of the SLAM algorithm

Balloon Volleyball with a 7-DOF Robot Arm   *Fall 2022*

- Developed software in ROS 2 to allow the Franka Emika Panda robot to track the balloon in real space, predict where the balloon will fall, move to that location before the balloon, and push it up
- Designed a perception pipeline, using Python and OpenCV, to determine the 3D location of a moving balloon

SKILLS

- **Software:** Python, C++, C, MATLAB, Git, Linux, OpenCV, PCL, CMake, Docker, Unit Testing
- **Robotics:** Robot Operating System (ROS/ROS 2), Gazebo, RViz, Foxglove Studio
- **CAD:** Solid Edge, SolidWorks
- **Language:** Japanese (native proficiency)