

Dongmyeong Lee

University of Michigan, Ann Arbor, MI
+1 (734) 492-2981, domlee@umich.edu
domlee.info , [GitHub](#) , [LinkedIn](#)

RESEARCH INTEREST

Robot Perception, Simultaneous Localization and Mapping (SLAM), Semantic Mapping, Sensor Fusion

EDUCATION

University of Michigan Ann Arbor, MI
Master of Science, Mechanical Engineering Sep. 2021 – Current

- Advisor: [Jessy W. Grizzle](#), Director of Michigan Robotics Department
- GPA: 4.0 / 4.0
- Subjects: Computer Vision / Motion Planning / Machine Learning / Self-Driving Cars / Probability and Random Process / Linear System Theory / Matrix Methods for Signal Processing / Mathematics for Robotics

Seoul National University Seoul, Korea
Bachelor of Science, Mechanical & Aerospace Engineering Mar. 2011 – Feb. 2017

- Major GPA: 3.9 / 4.3
- Awarded National Science and Engineering Scholarships for full semesters
- Subjects: Mechatronics System Design and Laboratory / Principles of Flight Vehicle Control / Introduction to Sensors / Mechanical Product Design / Design, Manufacturing Process and Laboratory

Aalborg University Aalborg, Denmark
Exchange student in Mechanical Engineering Sep. 2015 – Dec. 2015

PUBLICATION

1. “Long Term Multi-Destination Autonomous Navigation Without HD Maps”, Jinze Lu*, **Dongmyeong Lee***, Rui Chen, Qi Dai, Dianhao Chen, Maani Ghaffari, Jiunn-Kai Huang, and Jessy W. Grizzle, *preparing for Journal of Field Robotics, 2023* (* co-first author) [[Video](#)]
2. “Informable Multi-Objective and Multi-Directional RRT* System for Robot Path Planning with Multi-threading Markov Clustering”, **Dongmyeong Lee**, Yingwen Tan, Vishnu Desaraju, Jiunn-Kai Huang, and Jessy W. Grizzle, *preparing for International Journal of Robotics Research (IJRR), 2023* [[GitHub](#)]
3. “Informable Multi-Objective and Multi-Directional RRT* System for Robot Path Planning”, Jiunn-Kai Huang, Yingwen Tan, **Dongmyeong Lee**, Vishnu Desaraju, and Jessy W. Grizzle, *submitted to IEEE International Conference on Robotics and Automation (ICRA), 2023* [[Paper](#)] [[GitHub](#)] [[Video](#)]

RESEARCH EXPERIENCE

Long Term Multi-Destination Autonomous Navigation without HD Maps [[Video](#)]
Research Assistant in Biped Robotics Lab, Prof. Jessy W. Grizzle May. 2022 – Current

- Built an autonomous navigation system for the bipedal robot exploiting a predefined topological map

- Built a whole pipeline of localization system including particle filter utilizing the inner product structure of an reproducing kernel Hilbert space (RKHS)
- Parsed [OpenStreetMap](#) files to utilize in the global route planning and particle filter for localization
- Calibrated extrinsically LiDARs and cameras with a target-based method
- Projected LiDAR points to images and assigned labels to each point by using SVM to generate semantic point clouds
- Implemented a RTK-GPS to achieve centimeter accuracy localization as ground truth for the outdoor experiment

Wall Feature Extraction using LiDAR for Indoor Navigation

[\[GitHub\]](#) [\[Video\]](#)

Research Assistant in [Biped Robotics Lab](#), Prof. [Jessy W. Grizzle](#)

Sep. 2022 – Current

- Implemented slope-based obstacle filtering and RANSAC to segment ground and ceiling
- Implemented RANSAC to filter high-probability wall points that perpendicular to the floor
- Implemented Bresenham's line algorithm to cluster the point clouds corresponding to same walls

Curb Feature Extraction using LiDAR for Outdoor Navigation

[\[GitHub\]](#) [\[Video\]](#)

Research Assistant in [Biped Robotics Lab](#), Prof. [Jessy W. Grizzle](#)

Apr. 2022 – Sep. 2022

- Developed curb feature extraction method utilizing the geometric characteristic
- Implemented RANSAC to find the transformation between current LiDAR frame and the ground
- Implemented slope-robust ground segmentation through propagation method
- Implemented 3D end-point down-sampling with Ramer–Douglas–Peucker algorithm to reduce the false positive curb features caused by noise points

Informable Multi-Goal and Multi-Directional RRT* path planning system [\[Paper\]](#) [\[GitHub\]](#) [\[Video\]](#)

Research Assistant in [Biped Robotics Lab](#), Prof. [Jessy W. Grizzle](#)

Dec. 2021 – Current

- Built a ROS system so that users can select multiple destinations and receive the global path that visit all destinations
- Implement graph partitioning method to train the boundary vertices that can help with navigating challenging topology
- Proposed an anytime informable multi-objective and multi-directional RRT* (IMOMD-RRT*) algorithm to find paths connecting multiple destinations. This operation results in an undirected, weighted, and connected graph
- Developed the ECI-Gen solver that combines an enhancement of the cheapest insertion algorithm and a genetic algorithm to determine the visiting order of the destinations on the connected graph in polynomial time (essentially a relaxed traveling salesman problem)
- Developed a method of finding a reference path that can help the planner navigate through challenging topology exploiting Markov clustering
- Demonstrated that prior knowledge (such as a pre-defined path for robotics inspection) can be readily and inherently integrated into the IMOMD-RRT*
- Evaluated the system comprised of IMOMD-RRT* and ECI-Gen on various large-scale graphs (more than one million nodes) built for real world applications
- Compared ECI-Gen with [OR-Tools](#) developed by Google on various size of undirected, weighted, and connected graph
- Implement multiplication of sparse matrices with multiple threads
- Wrote the manuscript

Optimization of Target Placement for Extrinsic Calibration between Camera and LiDAR [\[GitHub\]](#)

Research Assistant in Biped Robotics Lab, Prof. Jessy W. Grizzle

Sep. 2021 – Dec. 2021

- Implemented Canny edge detection and RANSAC to determine target vertices in image
- Implemented Grunert's method to compute an initial guess of 3D target vertices in LiDAR frame from 2D image corners in image coordinate
- Developed 2D to 3D target pose estimation in camera frame that robust to an intrinsic parameter noise by utilizing the known geometric information of the target
- Implemented optimal pose estimation of the target in LiDAR frame by exploiting L_1 -inspired fitting error between the point clouds and the target's known geometry
- Implemented best-fitting rigid transformation that aligns corresponding target vertices in LiDAR frame and Camera frame using SVD

PAST PROJECT

Trajectory Optimization for Autonomous Vehicle in Simulation Environment

[\[GitHub\]](#)

Team Leader

Fall 2021, Ann Arbor, MI

- Developed a controller for an autonomous vehicle to drive on a pre-defined track avoiding randomly generated obstacles
- Implemented receding horizon trajectory optimization with the nonlinear bike model

Vehicle type classification in images from a game engine

Team Leader

Fall 2021, Ann Arbor, MI

- Augmented image dataset to train the model
- Implemented VGG16 CNN architecture for vehicle classification

WORK EXPERIENCE

Samsung Electronics Co.,Ltd.

Suwon, Seoul

Mechanical Engineer, Consumer Electronics

Feb. 2017 – Apr. 2021

- Developed and designed home electronics
- Led team brainstorming and ideation activities for new product and usability improvement
- Managed mass production manufacturing in Malaysia and Thailand
- Developed and set up injection molding processes, systems, and workstation
- Produced prototype to review assemblability and quality issues

TECHNICAL SKILLS

Programming	C++ (familiar with multi-threading and realtime systems), Python, MATLAB, Julia
Libraries	ROS, Eigen, PCL, OpenCV, Pytorch, tbb
Manufacturing	Knowledge of Injection Mold and Press Die, Manufacturing Practices
Others	CAD (Siemens NX, SolidWorks), Manufacturing Practices, Video editing