Eungchang Mason **Lee**

Robotics Researcher · UAV Autonomy · Exploration · SLAM · Active SLAM

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About Me

I am a robotics researcher developing end-to-end autonomy for UAVs that can operate reliably in large-scale, GNSS-denied, and unstructured environments. My research spans exploration, robust sensor-fusion-based odometry, and active SLAM, with an emphasis on field-deployable systems for mapping, inspection, and reconnaissance.

I have developed and deployed integrated UAV systems spanning perception, planning, and control through multiple research projects and autonomous-robot competitions.

Demonstrations and open-source implementations are available on my Github and Youtube .

Experience

Carnegie Mellon University (CMU) — *United States*

Visiting Postdoctoral Researcher, Robotics Institute, AirLab — *Jul. 2026 - **Current***

- Funded by KIAT through a researcher appointment at the Machine Learning Big Data Research Institute, Korea University.

Korea Advanced Institute of Science and Technology (KAIST) — *Rep. of Korea*

Postdoctoral Researcher, School of Electrical Engineering, Urban Robotics Lab — *Aug. 2025 - Jun. 2026*

Military Service — *Rep. of Korea*

Signaller, Republic of Korea Army — *Mar. 2013 - Dec. 2014*

Education

Korea Advanced Institute of Science and Technology (KAIST) — *Rep. of Korea*

Ph.D. in School of Electrical Engineering, Urban Robotics Lab — *Mar. 2021 - Aug. 2025*

- Dissertation: Degeneracy-Robust LiDAR-Inertial Odometry and Topological Exploration for Autonomous UAVs toward Enhanced Indoor and Outdoor Mapping and Navigation

Korea Advanced Institute of Science and Technology (KAIST) — *Rep. of Korea*

M.S. in School of Electrical Engineering, Urban Robotics Lab — *Mar. 2019 - Feb. 2021*

- Master's thesis: Exploration with Active Loop-Closing toward Large-Scale 3D Mapping for Unmanned Aerial Vehicle

Kyungpook National University — *Rep. of Korea*

B.S. in School of Electronics Engineering — *Mar. 2012 - Feb. 2019*

- Graduated with top honors, **GPA: 4.23/4.3**, **rank: 2/354**

Honors & Awards

2020 - 2025	**Best paper awards**: Five conference papers and one journal paper	
2026. 06	**First prize**: 2026 Nothing Stands Still Challenge	*United States*
2022. 10	**Only one team that finished the course**: Autonomous Flight Competition in Battlefield Situations	*Rep. of Korea*
2019. 12	**3rd prize/424**: AIRR AlphaPilot (Lockheed Martin & The Drone Racing League)	*United States*
2019. 07	**1st Place - MSIT Minister's Award**: 2019 AI R&D Grand Challenge – Control Intelligence Track	*Rep. of Korea*
2019. 02	**Grand prize**: The Right Person of University (SmartKey-Kyungpook National University)	*Rep. of Korea*
2019. 02	**2nd prize/354**: Best Graduates of The Year (Kyungpook National University)	*Rep. of Korea*
2018. 11	**MathWorks Korea special prize**: R-BIZ Challenge Turtlebot3 Autorace (ROBOTIS & MathWorks Korea)	*Rep. of Korea*

Professional Service & Activities

Associate Editor (AE) for Localization and Mapping - IEEE International Conference on Robotics and Automation (ICRA), 2026. 09 - **Current**

Co-Chair of Competitions and Challenges Committee - IEEE International Conference on Robotics and Automation (ICRA), 2026. 05 - **Current**

Associate Editor (AE) - IEEE Robotics and Automation Letters (RA-L) (SCIE), 2026. 07 - **Current**

Associate Editor (AE) - Intelligent Service Robotics (ISR) (SCIE), 2025. 09 - **Current**

First-author Publications

([†]: Co-first author)

International Journal Papers

1. **E. M. Lee**, K. C. Marsim, and H. Myung, "LODESTAR: Degeneracy-aware LiDAR-inertial odometry with adaptive Schmidt-Kalman filter and data exploitation," *IEEE Robotics and Automation Letters (**RA-L**)*, 2026

International Conference Papers

1. **E. M. Lee** and S. Scherer, "When does Doppler help? degeneracy-aware Doppler weighting via state-conditioned sensitivity for LiDAR–radar–inertial odometry," ***Submitted to** 2027 IEEE International Conference on Robotics and Automation (**ICRA**)*, **Under review**
2. **E. M. Lee**[†], C. J. Park[†], and H. Myung, "SSF-Exploration: Safe segments forwarding-based seamless replanning and tracking for fast UAV exploration," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2025
3. **E. M. Lee**, D. Youn, and H. Myung, "THE-Planner: Topological and hierarchical exploration path planner for fast 3D mapping of outdoor structures with UAVs," in *Proc. IEEE International Conference on Ubiquitous Robots (UR)*, 2023
4. **E. M. Lee** *et al.*, "CEO-MLCPP: Control-efficient and obstacle-aware multi-layer coverage path planner for 3D reconstruction with UAVs," in *Proc. International Conference on Robot Intelligence Technology and Applications (RiTA)*, 2022
5. **E. M. Lee**, J. Jeon, and H. Myung, "TROT-Q: Traversability and obstacle aware target tracking system for quadruped robots," in *Proc. Asian Control Conference (ASCC)*, 2022
6. C. Kim[†], **E. M. Lee**[†], J. Choi, J. Jeon, S. Kim, and H. Myung, "ROLAND: Robust landing of UAV on moving platform using object detection and UWB based extended Kalman filter," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2021
7. **E. M. Lee**, D. Seo, J. Jeon, and H. Myung, "QR-SCAN: Traversable region scan for quadruped robot exploration using lightweight precomputed trajectory," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2021
8. **E. M. Lee**, J. Choi, H. Lim, and H. Myung, "REAL: Rapid exploration with active loop-closing toward large-scale 3D mapping using UAVs," in *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, 2021
9. **E. M. Lee**, D. Choi, and H. Myung, "Peacock Exploration: A lightweight exploration for UAV using control-efficient trajectory," in *Proc. International Conference on Robot Intelligence Technology and Applications (RiTA)*, **Best Paper Award**, 2020
10. **E. M. Lee**, and H. Myung, "Analysis on the performance of VIO according to trajectory planning of UAV," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2020
11. **E. M. Lee**, I. Wee, T. Kim, and D. H. Shim, "Comparison of visual inertial odometry using flightgoggles simulator for UAV," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2019

Domestic Papers

1. **E. M. Lee** and H. Myung, "Degeneracy-robust LiDAR-inertial odometry with adaptive Schmidt-Kalman filter," in *Proc. Institute of Control, Robotics and Systems (ICROS)*, **Best Paper Award**, 2025
2. **E. M. Lee**, J. Lee, C. Park, S. Lee, T. Kim, and H. Myung, "Adaptive data exploitation-based robust multi-LiDAR-inertial odometry for UAVs," in *Proc. Korea Robotics Society Annual Conference (KRoC)*, 2025
3. **E. M. Lee**, I. M. A. Nahrendra, J. Choi, S. Lee, and H. Myung, "Autonomous flying drone for unmanned reconnaissance in battlefield situations," in *Proc. Korea Robotics Society Annual Conference (KRoC) RED Show*, **Best Work Award**, 2023
4. **E. M. Lee** and H. Myung, "Two-Stage optimization-based energy-efficient coverage path planner for 3D reconstruction," in *Proc. Korea Robotics Society Annual Conference (KRoC)*, 2023
5. **E. M. Lee**, D. Lee, H. Lim, S. Song, and H. Myung, "Non-uniform motion target tracking system for UAVs," in *Proc. Korea Robotics Society Annual Conference (KRoC)*, 2022
6. **E. M. Lee** *et al.*, "Development of a 3D mapping system including object position for UAV with a RGB-D camera in an unknown and GNSS-denied environment," in *Proc. Institute of Embedded Engineering of Korea 2020 Fall Conference (IEMEK)*, **Best Paper Award**, 2020
7. **E. M. Lee**, I. Wee, T. Kim, S. Moon, and D. H. Shim, "Analysis on visual-inertial state estimation (VINS-mono) for drone using FlightGoggles simulator," in *Proc. The Korean Society for Aeronautical and Space Sciences 2019 Spring Conference (KSAS)*, 2019
8. **E. M. Lee**, S. Han, Y. Jin, W. Shin, J. Yun, and S. M. Lee, "Image based visual servoing for tracking control of a mobile robot," in *Proc. IEMEK Symposium on Embedded Technology (ISET)*, 2018

Co-authored Publications

International Journal Papers

1. K. Jung, **E. M. Lee**, T. Oh, and H. Myung, "ASPIRE-VINS: Adaptive spline-based visual-inertial navigation system with robust 3D measurement residuals," *IEEE Robotics and Automation Letters (**RA-L**)*, 2026
2. D.-U. Seo, J. Jeon, **E. M. Lee**, and H. Myung, "GaussianFlow SLAM: Monocular Gaussian splatting SLAM guided by GaussianFlow," *IEEE Robotics and Automation Letters (**RA-L**)*, 2026
3. H. Lim, B. Kim, D. Kim, **E. M. Lee**, and H. Myung, "Quatro++: Robust global registration exploiting ground segmentation for loop closing in LiDAR SLAM," *International Journal of Robotics Research (**IJRR**)*, 2024
4. I. M. A. Nahrendra, C. Tirtawardhana, B. Yu, **E. M. Lee**, and H. Myung, "Retro-RL: Reinforcing nominal controller with deep reinforcement learning for tilting-rotor drones," *IEEE Robotics and Automation Letters (**RA-L**)*, 2022
5. M. Oh, E. Jung, H. Lim, W. Song, S. Hu, **E. M. Lee**, J. Park, J. Kim, J. Lee, and H. Myung, "TRAVEL: Traversable ground and above-ground object segmentation using graph representation of 3D LiDAR scans," *IEEE Robotics and Automation Letters (**RA-L**)*, **2022 RA-L Best Paper Award**, 2022
6. Y. Kim, B. Yu, **E. M. Lee**, J. Kim, H. Park, and H. Myung, "STEP: State estimator for legged robots using a preintegrated foot velocity factor," *IEEE Robotics and Automation Letters (**RA-L**)*, 2022
7. J. Jeon, S. Jung, **E. M. Lee**, D. Choi, and H. Myung, "Run Your Visual-Inertial Odometry on NVIDIA Jetson: Benchmark tests on a micro aerial vehicle," *IEEE Robotics and Automation Letters (**RA-L**)*, 2021

International Conference Papers

1. H. Kim, **E. M. Lee**, C. Park, and H. Myung, "TDPF: Temporal dynamic prior filter for radar ego velocity estimation in highly dynamic environments," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2026
2. J. Jeon, D.-U. Seo, **E. M. Lee**, and H. Myung, "AIM-SLAM: Dense monocular SLAM via adaptive and informative multi-view keyframe prioritization with foundation model," in *Proc. IEEE International Conference on Robotics and Automation (**ICRA**)*, 2026
3. J. Choi, K. Ryoo, J. Kim, T. Kim, **E. M. Lee**, M. Jeong, K. C. Marsim, H. Lim, and H. Myung, "SaWa-ML: Structure-aware pose correction and weight adaptation-based robust multi-robot localization," in *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, 2025
4. S. Shin, Y. Kim, B. Yu, **E. M. Lee**, D.-U. Seo, and H. Myung, "PanoNetVLAD: Visual loop closure detection in continuous space represented with panoramic view using multiple cameras," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2023
5. D.-U. Seo, H. Lim, **E. M. Lee**, H. Lim, and H. Myung, "Enhancing robustness of line tracking through semi-dense epipolar search in line-based SLAM," in *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, 2023
6. J. Choi, M. Jeong, **E. M. Lee**, D. Choi, and H. Myung, "NLOS-avoiding and obstacle-adaptive formation control by sharing obstacle information of a leader UAV in multi-UAV system," in *Proc. IEEE International Conference on Ubiquitous Robots (UR)*, 2023
7. J. Choi, **E. M. Lee**, M. Jeong, D. Choi, and H. Myung, "Range-only relative position estimation for multi-UAV," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, 2022
8. D. Lee, **E. M. Lee**, H. Lim, S. Song, and H. Myung, "FARO-Tracker: Fast and robust target tracking system for UAVs in urban environment," in *Proc. International Conference on Robot Intelligence Technology and Applications (RiTA)*, 2022
9. D. Lee, **E. M. Lee**, D. Choi, J. Choi, C. Tirtawardhana, and H. Myung, "M-BRIC: Design of mass-driven bi-rotor with RL-based intelligent controller," in *Proc. IEEE International Conference on Ubiquitous Robots (UR)*, 2022
10. S. Shin, **E. M. Lee**, J. Choi, and H. Myung, "MIR-VIO: Mutual information residual-based visual inertial odometry with UWB fusion for robust localization," in *Proc. IEEE International Conference on Control, Automation and Systems (ICCAS)*, **Best Paper Award**, 2021
11. S. Lee, S. Chang, **E. M. Lee**, J. Choi, J. Jeon, S. Kim, and H. Myung, "TPL: Trajectory planner for target tracking in low-light environments," in *Proc. International Conference on Robot Intelligence Technology and Applications (RiTA)*, 2021
12. J. Choi, **E. M. Lee**, S. Shin, and H. Myung, "Solving geometric constraints for relative position estimation using UWB sensors in multi-robot system," in *Proc. World Congress on Advances in Nano, Bio, Robotics and Energy (ANBRE21)*, 2021
13. D. Choi, **E. M. Lee**, and H. Myung, "Online 3D coverage path planning using surface vector," in *Proc. IEEE International Conference on Ubiquitous Robots (UR)*, 2021
14. Y. Jin, S. Han, **E. M. Lee**, S. M. Lee, C. Shin, and J. Yun, "Development of autonomous driving systems using state estimator with multi-rate sampled-data," in *Proc. IEEE International Conference on Consumer Electronics (ICCE)*, 2019

Domestic Papers

1. S. Jung, J. Choi, **E. M. Lee**, D. Choi, and H. Myung, "Multi-sensor based 3D mapping for autonomous bridge inspection using unmanned

aerial vehicle," in *Proc. Korea Institute of Structural Maintenance and Inspection 2020 Fall Conference (KSMI)*, 2020

2. I. Wee, **E. M. Lee**, T. Kim, and D. H. Shim, "Dynamic model analysis of FlightGoggles simulator and autonomous flight using moving virtual target," in *Proc. The Korean Society for Aeronautical and Space Sciences 2019 Spring Conference (KSAS)*, 2019
3. T. Kim, I. Wee, **E. M. Lee**, and D. H. Shim, "Vision based gate detection algorithm for autonomous drone racing," in *Proc. The Korean Society for Aeronautical and Space Sciences 2019 Spring Conference (KSAS)*, 2019
4. W. Kim, **E. M. Lee**, W. Eom, S. Han, Y. Jin, and S. M. Lee, "Sampled-data control for visual servoing of 6 DOF system using TP model transformation," in *Proc. IEMEK Symposium on Embedded Technology (ISET)*, 2018

Projects & Competitions

Adversarial Testing, Verification, and Validation of Autonomous Drone Systems

United States

Supported by DSTA, Conducted at AirLab in CMU — *Aug. 2026 - **Current***

- This project develops a reusable framework for adversarial testing, verification, and validation of autonomous drone systems, focusing on learning-based obstacle avoidance and methods to improve robustness.
- I manage the project and develop an automated test bench that uses LLM-based agents to identify vulnerabilities in neural networks used in drone autonomy across different algorithms and scenarios.

Autonomous UAV Mapping and BIM-Integrated Construction Monitoring

United States

Supported by the Shimizu Corporation, Conducted at AirLab in CMU — *Jul. 2026 - **Current***

- This project aims to develop an autonomous UAV system for mapping, inspection, and progress monitoring in complex underground construction environments, integrating multi-modal perception, semantic mapping, BIM-guided planning, and 3D reconstruction.
- I am primarily responsible for developing LiDAR odometry/SLAM and LiDAR–radar odometry/SLAM for robust localization and mapping in GPS-denied environments.
- Building on these capabilities, I plan to develop semantic exploration and inspection methods for autonomous construction monitoring.

2026 Nothing Stands Still Challenge (Team CuRaytor)

United States

Hosted by the Nothing Stands Still Challenge, Presented at CVPR 2026, Conducted at Urban Robotics Lab in KAIST — *Apr. 2026 - Jun. 2026*

- Team CuRaytor won 1st place in the 2026 Nothing Stands Still Challenge on spatiotemporal 3D point cloud registration.
- Our team developed the full multi-stage pipeline, including robust global registration, intra-cluster optimization with bundle adjustment and pose graph optimization, inter-cluster optimization and registration, change detection and refinement for optimization, and a novel registration scoring method.
- I was mainly responsible for the intra-cluster optimization module, designing and implementing the bundle adjustment and pose graph optimization pipeline for reliable local registration refinement.

KAIST InnoCORE: 5D AI Robotics Initiative

Rep. of Korea

[Team Leader] · Supported by KAIST InnoCORE and MSIT, Conducted at Urban Robotics Lab in KAIST — *Feb. 2026 - Jun. 2026*

- InnoCORE is a highly competitive, large-scale research initiative; only 8 out of 25 proposals within KAIST were selected. This project aims to develop next-generation autonomous robots through 5D world models, involving 23 principal investigators across 9 partner universities.
- As the team leader in Prof. Myung's lab, I played a central role in aggregating research content from all participating labs and leading the writing of the proposal and presentation materials, directly contributing to the successful project award.
- Related materials - website

Development of Drone System for Diagnosis of Porcelain Insulators in Overhead Transmission Lines

Rep. of Korea

[Team Leader] · Supported by KEPCO and KEPRI, Conducted at Urban Robotics Lab in KAIST — *Feb. 2023 - Jul. 2024*

- In this project, we developed an autonomous drone manipulation framework for diagnosis of porcelain insulators in transmission lines. We developed a robust multi-LiDAR SLAM, real-time obstacle avoidance path planner, and adaptive attitude / trajectory tracking controllers.
- I mainly developed the multi-LiDAR SLAM and the overall framework.
- Related materials - video1, video2, video3

Research of Coverage Path Planner for 3D Reconstruction with UAVs

Rep. of Korea

[Team Leader] · Supported by CONFIDENTIAL, Conducted at Urban Robotics Lab in KAIST — *in 2022*

- In this project, we developed an energy-efficient and obstacle-aware coverage path planner for UAVs to accurately reconstruct the target structures at high resolution. The detailed information is confidential.
- I developed the main coverage path planner.
- Related materials - video, paper

Autonomous Flight Competition in Battlefield Situations

Rep. of Korea

[Team Leader] · Hosted by ADD, Conducted at Urban Robotics Lab in KAIST — *May. 2022 - Oct. 2022*

- The competition aims to develop an autonomous drone to pass through complex and dangerous outdoor obstacles, infiltrate an unknown two-story building, detect hidden targets, create precise 3D maps including target types and coordinates, and return to the starting point safely.
- I developed main framework including exploration, local/global path planners, 3D map logger with the detected target positions, and a decision-making system.
- Related materials - video

IEEE UAV Competition

United States

[Team Leader] · Hosted by LPCV, Conducted at Urban Robotics Lab in KAIST — *Jan. 2022 - Feb. 2022*

- The goal of the competition was to track a non-uniformly moving vehicle at a constant distance with a quadrotor UAV, while avoiding obstacles.
- We estimated the trajectory of the moving vehicle in the form of 5th order polynomial using the detected center point with YOLO network. Then, Adaptive weight Model Predictive Controller (AMPC) is designed to track the target effectively.
- I mainly developed state estimator and MPC controller.
- Related materials - video

Unmanned Swarm CPS Research Lab

Rep. of Korea

[Team Leader] · Supported by ADD, Conducted at Urban Robotics Lab in KAIST — *Jan. 2021 - Dec. 2021*

- In this project, we developed adaptive multi-robot localization method. With the high fidelity networking, artificial intelligent cooperative control, and mobile ground control station, unmanned swarm system has been researched to operate cyber-physical systems.
- As my lab was in charge of managing all 10 labs and developing multi-robot localization, as a person in charge, I mainly managed all members in the project, validated whole system for the demonstration, and developed localization algorithm.
- Related materials - video, paper

Autonomous Drone Navigation for Power Line Inspection in Underground

Rep. of Korea

[Team Leader] · Supported by KEPCO and KEPRI, Conducted at Urban Robotics Lab in KAIST — *Aug. 2020 - Dec. 2022*

- In this project, we developed indoor SLAM, navigation, and exploration method to operate a UAV exploring the underground power line tunnel safely. In addition, the robust and autonomous landing framework of the UAV on moving mobile robot was developed to charge battery during operation.
- I mainly developed path planner, exploration, landing framework, and navigation system. Considering the limited payload and computational resource of the UAV, the precomputed and lightweight local exploration planner was developed.
- Related materials - video1, video2, video3, video4, paper1, paper2, paper3

A Study on the Visual-Inertial Navigation System of Artificial Intelligent Unmanned Aerial Vehicle for Reconnaissance and Exploration

Rep. of Korea

[Team Manager] · Supported by ROND, Conducted at Urban Robotics Lab in KAIST — *May. 2020 - Nov. 2020*

- The main goal of this project is to develop a UAV system with Visual-Inertial Navigation System for 3D mapping of unknown environments adopting single RGB-D camera.
- I mainly implemented whole system including VIO, YOLO object detection, mapping system, and controller.
- Related materials - video

AIRR AlphaPilot (Artificial Intelligence Robotic Racing)

United States

Hosted by Lockheed Martin and The Drone Racing League, Conducted at Unmanned Systems Research Group in KAIST — *Mar. 2019 - Dec. 2019*

- AlphaPilot is the first large-scale open innovation challenge of its kind focused on advancing artificial intelligence (AI) and autonomy. The main goal of this competition is to finish the drone racing track as soon as possible autonomously.
- I mainly implemented a VIO (Visual-Inertial Odometry) and Kalman filter-based state estimator and basic controller.
- My team won the 3rd prize among 424 teams over 81 countries.
- Related videos - YouTube playlist

2019 AI R&D Grand Challenge – Control Intelligence Track

Rep. of Korea

Hosted by MSIT, Conducted at Unmanned Systems Research Group in KAIST — *May 2019 - Jul. 2019*

- The competition challenged teams to develop autonomous UAVs capable of navigating complex obstacle courses using onboard perception and control without internet connectivity.
- I conducted research on vision-based UAV localization for autonomous flight.
- Our team won first place in the Control Intelligence track and received the Minister's Award from the Ministry of Science and ICT (MSIT).

R-BIZ Challenge Turtlebot3 Autorace

Rep. of Korea

[Team Leader] · Hosted by ROBOTIS, MathWorks Korea, KIRIA, and MOTIE, Conducted at Physical Intelligence Lab in Kyungpook Natl. Univ. — *Jun. 2018 - Nov. 2018*

- ROS-based autonomous driving system for a mobile robot (Turtlebot3) is developed for completing the racing track with diverse missions.
- I mainly developed Lyapunov functional to control the robot, HOG-based object detector, and decision-making mission planner.
- My team won the MathWorks Korea Special Prize.

Research on Multi-Rate Sensor Fusion based Mobile Robot Model Predictive Control System

Rep. of Korea

Supported by ETRI, Conducted at Physical Intelligence Lab in Kyungpook Natl. Univ. — *Apr. 2018 - Dec. 2018*

- The final goal of this research project is to design multi-rate state estimator that can assume exact state using asynchronous data from a vehicle's multi sensor system.
- I mainly developed ROS-based data processing system, LiDAR-based path planning for the mobile robot.
- Related materials - paper

Freelancing

Unity-ROS2 Multi-Robot Simulator Development

Rep. of Korea

[Main Developer] · Contracted with KETI *Oct. 2024 - Aug. 2025*

- The goal of this project was to develop Unity-based ROS2 multi-robot simulator for various types of mobile robots including wheeled, quadruped, quadrotor aerial robots equipped with IMUs, cameras, and LiDARs.
- I made the overall system architecture and implemented the simulation environment in Unity.
- Related materials - video

KHNP Virtual Robot Challenge 2022

Rep. of Korea

[Main Developer] · Contracted with KHNP *Sep. 2022 - Dec. 2022*

- The goal of the competition was to develop an autonomous navigation algorithm and a robust controller for a quadrotor UAV to complete diverse and challenging tasks including obstacle avoidance, exploration, and enduring the wind disturbances.
- I made Gazebo maps for the competition and coded scoring GUI. Additionally, I coded sample controllers for the quadrotor UAV.
- Related materials - video

Palm Tree Field Exploration and Tree Identification with UAV / UGV

Rep. of Korea

[Main Developer] · Conducted at AKA-AI Robotics *Nov. 2021 - May. 2022*

- The final goal of this project was to develop an exploration system for monitoring unknown palm tree orchard environments while avoiding collisions and figuring out appearances of trees (phenotyping).
- I developed the whole system including point cloud data processing, path planning, and controller. I integrated an open-source SLAM algorithm.
- Related materials - video1, video2

KHNP Virtual Robot Challenge 2021

Rep. of Korea

[Main Developer] · Contracted with KHNP *Sep. 2021 - Dec. 2021*

- The goal of the competition was to develop an autonomous navigation algorithm and a robust controller for a quadruped robot to complete diverse and challenging tasks including obstacle avoidance, manipulation for grasping a cube, climbing stairs, and enduring the disturbances.
- I made Gazebo maps for the competition and coded scoring GUI. Additionally, I coded sample controllers for the manipulator and the quadruped robot.
- Related materials - video

Technology Transfer

1. **Eungchang Lee**, Junho Choi, Duckyu Choi, Nahrendra I Made Aswin, Hyungtae Lim, Seunghyun Lee, Seungwon Song, and Hyun Myung, "SLAM-Based Autonomous Flying Patrol Drone System and Remote Control Interface", 2023.11.14, *Rep. of Korea*
2. **Eungchang Lee**, Hyungtae Lim, and Hyun Myung, "Adaptive and Robust 3D SLAM Method that Adjusts Parameters Depending on The Environments, and Application of SLAM Method for Unmanned Aerial Vehicle Flight in GNSS-Denied Environments", 2023.05.01, *Rep. of Korea*

Patents & SW

Registered Patents

1. Sungjae Shin, Kwangyik Jung, **Eungchang Lee**, Junho Choi, and Hyun Myung, "Tightly Coupled UWB-Visual-Inertial Odometry for Robust Localization," Patent Reg. No.10-2654852 (2024.04.01), Application Number: 10-2021-0154973, 2021.11.11, *Rep. of Korea*

Patents Applications

1. **Eungchang Lee**, Kevin Christiansen Marsim, and Hyun Myung, "Method and apparatus for degeneracy-aware LiDAR-inertial odometry," Application Number: 10-2026-0105899, 2026.06.10, *Rep. of Korea*
2. **Eungchang Lee**, Seungwon Song, Nahrendra I Made Aswin, Junho Choi, Duckyu Choi, Seunghyun Lee, and Hyun Myung, "Drone Unit for Unmanned Exploration and Reconnaissance, Autonomous Flight System and The Method Thereof," Application Number: 18/783,703, 2024.07.25, *United States*
3. **Eungchang Lee**, Seungwon Song, Nahrendra I Made Aswin, Junho Choi, Duckyu Choi, Seunghyun Lee, and Hyun Myung, "Drone Unit for Unmanned Exploration and Reconnaissance, Autonomous Flight System and The Method Thereof," Application Number: 10-2023-0099161, 2023.07.28, *Rep. of Korea*
4. Minho Oh, Wonho Song, Hyungtae Lim, **Eungchang Lee**, Euigon Jung, Sumin Hu, Jung-Hee Park, Chae Hyun Lee, Jae Kyung Kim, and Hyun Myung, "Method and Apparatus for Recognizing a Moving Environment Based on Sensor Data," Application Number: 10-2023-0075575, 2023.06.13, *Rep. of Korea*
5. Nahrendra I Made Aswin, Byeongho Yu, Tirtawardhana Christian, **Eungchang Lee**, and Hyun Myung, "METHOD AND APPARATUS FOR CONTROL OF DRONE PERFORMING NOMINAL CONTROL REINFORCEMENT BASED ON DEEP REINFORCEMENT LEARNING," Application Number: 10-2023-0054096, 2023.04.25, *Rep. of Korea*

Registered Software

1. **Eungchang Lee** and Hyun Myung, “RGB-Colorized 3D Mapping Program with LiDAR and Camera,” Registration Number: C-2023-054561, 2023.10.07, *Rep. of Korea*
2. Sungjae Shin, Sungwon Hwang, **Eungchang Lee**, Junho Choi, Kwangyik Jung, and Hyun Myung, “Multi-Robot Relative Pose Estimation Algorithm Using Polar Histogram Matching,” Registration Number: C-2021-043064, 2021.05.19, *Rep. of Korea*