JUNWOON LEE

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REASEARCH INTEREST

Mobile robotics, SLAM, Path planning, Exploration, Computer Vision, Field robotics

EDUCATION

University of Tokyo *April, 2023 - March, 2025* (expected)
M.E.S. Student in Human & Engineered Environmental Studies
- Thesis: Switching-based Multi-modal SLAM for Extreme and Degraded Environments (expected)
- Advisor: Prof. Atsushi Yamashita
- Focus: Localization and mapping robust in sensor degeneration

Osaka University *April, 2017 - March, 2023*
B.E. in Mechanical Engineering
- Thesis: LiDAR-visual SLAM for Online Mapping of Unpaved Road Surface
- Advisor: Project Prof. Masamitsu Kurisu[†]
- Focus: 3D mapping for unpaved road surface, LiDAR-visual SLAM, Field robotics

PUBLICATIONS

Journal Papers

[1] J.Lee, R.Komatsu, M.Shinozaki, T.Kitajima, H.Asama, Q.An, A.Yamashita. "Switch-SLAM: Switching-Based LiDAR-Inertial-Visual SLAM for Degenerate Environments," *IEEE Robotics and Automation Letters (RA-L).* (presented in ICRA@40) [link]

[2] J.Lee, M.Kurisu, K.Kuriyama. "Three-dimensionalized feature based LiDAR-visual SLAM for online mapping of unpaved road surface," *Journal of Field Robotics*, 2024. [link]

Conference Papers

[1] J.Lee, T.Ando, M.Shinozaki, T.Kitajima, Q.An, A.Yamashita. "TC-LTIO: Tightly-coupled LiDAR Thermal Inertial Odometry for LiDAR and Visual Odometry Degraded Environments," in *24th International Conference on Control, Automation and Systems (ICCAS2024)*, Jeju, Korea, 2024. (under review)

[2] T.Ando, J.Lee, M.Shinozaki, T.Kitajima, Q.An, A.Yamashita. "Highly Accurate and Fast Two-view Pose Estimation by Fast Reduction of Spherical Image Distortion Effects," in *24th International Conference on Control, Automation and Systems (ICCAS2024)*, Jeju, Korea, 2024. (under review)

Patent

[1] K.Adachi, M.Kurisu, J.Lee. "Terrain detection system and method", Japanese Patent 2023-105215, Filed on June 27, 2023.

REASEARCH EXPERIENCE

Reasearch Assistant, University of Tokyo *April, 2023* - Present
Real World Robot Informatics Lab.
- Focus: LiDAR-visual / Thermal / Learning-based localization and mapping
- Developed LiDAR-visual-Inertial SLAM robust to sensor degeneration.
- Developing Thermal-Inertial SLAM robust to dark, dusty, and foggy environments.
- Published a paper in RA-L on LiDAR-visual SLAM for each sensor degenerate environments.
- Working with Kubota Corporation to develop autonomous farm tractors.
- Advisor: Prof. Atsushi Yamashita, Associate Prof. Qi An, Assistant Prof. Ren Komatsu, and Prof. Hajime Asama

Reasearch Assistant, Osaka University *April, 2022 - March, 2023*
Komatsu MIRAI Construction Equipment Cooperative Research Center
- Focus: 3D Mapping system for automated maintenance of unpaved road in mining sites
- Developed a unpaved road surface mapping system using a novel tightly-coupled LiDAR-visual odometry.
- Published a paper in JFR and a Japanese patent on road surface mapping system.

- Worked with Komatsu Ltd. to develop an autonomous road maintenance system in mining sites.
- Advisor: Project Prof. Masamitsu Kurisu[†]

HONORS AND AWARDS

Rotary Yoneyama Memorial Foundation Scholarship *April, 2023 - March, 2025*
- Full scholarship for academic achievement and excellent records.

Korea-Japan Joint Government Scholarship *April, 2017 - March, 2023*
- National scholarship, living stipend and full tuition fee waiver.

SKILLS

Reasearch Skills
- Program Languages : C/C++, Python, MATLAB
- Libraries : GTSAM, Ceres Solver, OpenCV, Open3D, PCL
- Frameworks : ROS, Git, PyTorch, Keras, TensorFlow, LibTorch, TensorRT, LaTeX
- Sensors : Pinhole/Fisheye/Omnidirectional/Thermal Camera, LiDAR, IMU, RTK-GNSS
- Others : Mobile Robots (Clearpath Jackal, Unitree Go1), Arduino, Rasberry Pi, 3D CAD

Languages
- English (Professional Proficiency)
- Japanese (Professional Proficiency)
- Korean (Native Language)

TEACHING

Teaching Assistant, UTokyo FEN-SC3102S1 Exercises for Mathematics 2C *April, 2024 - July, 2024*

SERVICES

Special Lecturer, Rotary Club of Funabashi-West/East *April, 2023 - March, 2025*
- Lectured about introduction to mobile robotics and artificial intelligence

Military Service at Republic of Korea Army *April, 2020 - October, 2021*
- Frontline guardian on coastline observation post in the 23rd Security Brigade
- Discharged from full military service as a ROK Army Sergeant

Special Lecturer at Sungkyunkwan University Trading Club *April, 2020*
- Lectured about introduction to Python for automated trading system

REFERENCES

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Ph.D. Ren Komatsu
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