Junwoon Lee

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REASEARCH INTEREST

SLAM, Perception, Navigation, Exploration, Point Cloud, Field Robotics

EDUCATION

The University of Tokyo *April, 2023 - March, 2025* (expected)
M.E.S. Student in Human & Engineered Environmental Studies (expected)
- Thesis: Switching-based Multi-modal SLAM for Extreme and Degraded Environments
- 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
- Focus: 3D mapping for unpaved road surface using lidar-visual sensor fusion.

PUBLICATIONS

Journal Papers

[1] **Switch-SLAM: Switching-Based LiDAR-Inertial-Visual SLAM for Degenerate Environments**
Junwoon Lee, Ren Komatsu, Mitsuru Shinozaki, Toshihiro Kitajima, Hajime Asama, Qi An, Atsushi Yamashita
IEEE Robotics and Automation Letters (RA-L), 2024. (Presented at ICRA@40) [Link]

[2] **Three-dimensionalized Feature-Based LiDAR-visual Odometry for Online Mapping of Unpaved Road Surface**
Junwoon Lee, Masamitsu Kurisu, Kazuya Kuriyama
Journal of Field Robotics, 2024. [Link]

Conference Papers

[1] **TC-LTIO: Tightly-coupled LiDAR Thermal Inertial Odometry for LiDAR and Visual Odometry Degraded Environments** - ***Best Paper Award Finalists***
Junwoon Lee, Taisei Ando, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita
International Conference on Control, Automation and Systems (ICCAS), 2024.

[2] **Highly Accurate and Fast Two-view Pose Estimation by Fast Reduction of Spherical Image Distortion Effects**
Taisei Ando, Junwoon Lee, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita
International Conference on Control, Automation and Systems (ICCAS), 2024.

Under Review

[1] **Self-TIO: Thermal-Inertial Odometry via Self-supervised 16-bit Feature Extractor and Tracker**
Junwoon Lee, Taisei Ando, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita
IEEE Robotics and Automation Letters (RA-L), (in revision)

[2] **Accurate and Rapid Reduction of Spherical Image Distortion for Feature-Based Pose Estimation**
Taisei Ando, Junwoon Lee, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita
International Journal of Automation Technology

REASEARCH EXPERIENCE

Reasearch Assistant, University of Tokyo *April, 2023* - Present
Real World Robot Informatics Lab.
- Focus: Localization and mapping using multi-modal sensor fusion (LiDAR, visual camera, thermal camera, IMU)
- Developing multi-modal based SLAM systems robust to sensor degeneration.
- Collaborating with Kubota Corporation to develop autonomous farm tractors.
- Advisor: Prof. Atsushi Yamashita, Prof. Hajime Asama, Prof. Qi An, Prof. Ren Komatsu

Reasearch Assistant, Osaka University *April, 2022 - March, 2023*
Komatsu MIRAI Construction Equipment Cooperative Research Center
- Focus: 3D mapping system for automated maintenance of unpaved roads in mining sites
- Developed an unpaved road surface mapping system using a novel tightly-coupled LiDAR-visual odometry.
- Collaborated with Komatsu Ltd. to develop an autonomous road maintenance system in mining sites.
- Advisor: Prof. Masamitsu Kurisu[†], Prof. Kazuya Kuriyama

HONORS AND AWARDS

Best Paper Award Finalists *October, 2024*
- Top 5 papers out of 400 submitted to ICCAS 2024 (1.25%).

IEEE RAS Travel Grant *September, 2024*
- Travel support awarded for participation in ICRA@40.

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*
- Government-sponsored full scholarship with living stipend and full tuition waiver.

SKILLS

Reasearch Skills
- Program Languages : C/C++, Python, MATLAB
- Computer Vision : OpenCV, Open3D, PCL
- SLAM/Optimization : GTSAM, Ceres Solver, g2o
- Deep Learning : PyTorch, TensorRT, LibTorch, Keras, TensorFlow
- Other : ROS, Git, LaTeX, Arduino, Rasberry Pi, 3D CAD, Blender

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

PATENT

1. Kaoru Adachi, Masamitsu Kurisu, Junwoon Lee, "Terrain Detection System and Method.", *Japanese Patent 2023-105215*, Filed on June 27, 2023.

TEACHING

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

SERVICES

Academic Reviewer: RA-L, ICRA, ICCAS *2024*

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

Sergeant, Republic of Korea Army *April, 2020 - October, 2021*
- Served as a frontline guardian at a coastline observation post in the 23rd Security Brigade

REFERENCES

Ph.D. Atsushi Yamashita
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Ph.D. Qi An
Associate Professor, The University of Tokyo
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Ph.D. Ren Komatsu
Computer Vision Engineer, Mujin, Inc.
komatsu@robot.t.u-tokyo.ac.jp

Ph.D. Kazuya Kuriyama
Professor, Osaka University
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