Junwoon Lee

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RESEARCH INTEREST

- **Mapping**
  Learning-based Perception and SLAM, Robust Point Cloud Registration, Sensor Fusion
- **Navigation**
  Active SLAM, Risk-Aware Navigation in Complex Environments, Field Robotics

EDUCATION

The University of Tokyo *April, 2023 - March, 2025*
M.E.S. Student in Human & Engineered Environmental Studies
- 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 (Military Service included)
- Thesis: LiDAR-visual SLAM for Online Mapping of Unpaved Road Surface
- Focus: 3D mapping for unpaved road surface using lidar-visual sensor fusion.

PUBLICATIONS

[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 (under review)

[3] **TC-LTIO: Tightly-coupled LiDAR Thermal Inertial Odometry for LiDAR and Visual Odometry Degraded Environments** - ***Best Paper Award Finalists (1.25%)***
Junwoon Lee, Taisei Ando, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita
International Conference on Control, Automation and Systems (ICCAS), 2024.

[4] **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.

[5] **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 ICRA40. [Link]

[6] **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]

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.

RESEARCH EXPERIENCE

Research Assistant, The University of Tokyo *April, 2023* - Present
Real World Robot Informatics Lab.

- Focusing on Localization and mapping using multi-modal sensor fusion (LiDAR, visual camera, thermal camera, IMU)
- Developing multi-modal based SLAM systems robust to sensor degeneration [1,3,5].
- Collaborating with Kubota Corporation to develop autonomous farm tractors.
- Advisor: Prof. Atsushi Yamashita, Prof. Hajime Asama, Prof. Qi An, Prof. Ren Komatsu

Research Assistant, Osaka University *April, 2022 - March, 2023*
Komatsu MIRAI Construction Equipment Cooperative Research Center

- Focused on 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 [6].
- Collaborated with Komatsu Ltd. to develop an autonomous road maintenance system in mining sites.
- Advisor: Prof. Masamitsu Kurisu[†], Prof. Kazuya Kuriyama

ACADEMIC REVIEWER

- IEEE Robotics and Automation Letters (RA-L) *2024*
- IEEE International Conference on Robotics Automation (ICRA) *2024*
- International Conference on Control, Automation and Systems (ICCAS) *2024*

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

Special Lecturer, Rotary International *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

SKILLS

Research Skills

- Program Languages : C/C++, Python
- Professional : ROS1, ROS2, GTSAM, Ceres Solver, OpenCV, PyTorch, TensorRT
- Etc. : Git, Docker, Open3D, OpenMP, SolidWorks, Blender, LaTeX

Languages

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

REFERENCES

Dr. Atsushi Yamashita
Professor, The University of Tokyo
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Dr. Qi An
Associate Professor, The University of Tokyo
anqi@robot.t.u-toyko.ac.jp

Dr. Ren Komatsu
Engineer, Mujin, Inc. (Former Professor in UTokyo)
komatsu@robot.t.u-tokyo.ac.jp

Dr. Kazuya Kuriyama
Project Professor, Osaka University
kazuya_kuriyama@global.komatsu