Hojune Kim

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Research Interests

Safe Autonomy: State Estimation, Safety-Critical Control, Multi-agent Systems
Optimization: Graph Optimization, Distributed Optimization, Recursive Estimation
Applications: System Design, Experimental Validation (Worked on Car / Quadcopter / Quadruped Robot / Humanoid)

Education

Seoul National University (SNU) Mar. 2019 – Present
B.S. in Aerospace Engineering, summa cum laude (expected) *Seoul, South Korea*
- GPA: **4.0/4.0(Major)**, 3.9/4.0(Overall) - Kwanjeong Scholar * 1.5-year absence from military service

ETH Zürich Feb. 2024 – Aug. 2024
Visiting Student in Mechanical Engineering *Zurich, Switzerland*

Publication

1. 2D Ego-Motion with Yaw Estimation using Only mmWave Radars via Two-Way weighted ICP
Hojune Kim, Hyesu Jang, Ayoung Kim.
IEEE ICRA 2024 *Workshop on Radar in Robotics, Yokohama, Japan, 2024. (Oral)*

Work Experience

German Aerospace Center (DLR) Sept. 2024 – Present
Humanoid TORO team, Guest Researcher, Advisor: Prof. Jinoh Lee *Munich, Germany*
- Developing Active Learning for Semantic Mapping in Humanoid Navigation via Kinematic-Aided Visual Odometry

Research Experience

Vision for Robotics Lab | ETH Zürich Feb. 2024 – Aug. 2024
Semester Project Intern, Advisor: Prof. Margarita Chli *Zurich, Switzerland*
- Improved the open-source package of continuous-time SLAM via distributed optimization

Robust Perception and Mobile Robotics Lab | SNU Jan. 2023 – Mar. 2024
Undergraduate Researcher, Advisor: Prof. Ayoung Kim *Seoul, South Korea*
- Devised robust mmWave radar 2D odometry and implemented direct SLAM by fusing infrared camera and LiDAR
- Designed handheld sensor system development and held camera-LiDAR-radar calibration via graph optimization

Satellite Geophysics Lab | SNU Aug. 2020 – May. 2021
Undergraduate Researcher, Advisor: Prof. Duk-jin Kim *Seoul, South Korea*
- Developed real-time flood monitoring system via semantic segmentation using satellite SAR image

Honors & Awards

Awards:

1st Place, IEEE-RAS Humanoids 2024 Competition Adult-sized Biped Free Walk Nov. 2024

Minister of National Defense Award, Minister of Defense Startup Competition, $5,000 funding Dec. 2022
Ministry of National Defense, Republic of Korea

Gold Prize, International Student Car Competition Autonomous Driving Sector Oct. 2021
Ministry of Land, Infrastructure and Transport, Republic of Korea

Final Selected, Star-Exploration Startup Support Project, $9,000 funding Feb. 2021
Korea Aerospace Research Institute(KARI)

Honors:

Korea-Germany Junior Research Fellowship Support, $9,000 | Max Planck POSTECH/KOREA Sept. 2024
- Full coverage of expenses during in DLR as a guest researcher

Global Leadership Program Scholarship | SNU Feb. 2024

Certificate of Appreciation (AI Tech Play) | Dean, College of Engineering in SNU Jun. 2021

Kwanjeong Undergraduate Scholarship, $17,000 | Kwanjeong Educational Foundation Mar. 2021

- Full coverage of junior and senior tuition and stipend

Undergraduate Research Internship Scholarship | SNU Mar. 2021

Merit-based Scholarship | SNU Fall 2019, Spring & Fall 2020

Selected Graduate Course Projects

Crowd Navigation for Quadruped robot, Perception and Learning for Robotics | ETH Zürich Spring 2024

- Developed teacher-student reinforcement learning policies with LiDAR data using Proximal Policy Optimization

Fault Tolerant Conrol of Quadrotor, Decision Making for Autonomous Aerospace Systems | SNU Spring 2023

- Designed Feedback Linearization, Sliding Mode and Backstepping Controllers on faulty condition

Analysis of LiDAR-Inertial SLAM, Sensor-Based Spatial Intelligence | SNU Fall 2023

- Analyzed and evaluated the LiDAR-inertial SLAM(Fast-LIO2, Faster-LIO) in urban long-term dataset

Memberships & Activities

SNU Tomorrow's Engineers Membership(STEM) | SNU Sept. 2023 – Present

- Served as Mentor : Organized a mentoring seminar for over 150 undergraduate engineering students
- Served as Speaker : Held academic talks for 'LiDAR vs Radar in perception' and 'Start-up business model building'

Bulnabi, Autonomous Flight Drone Club | SNU Feb. 2023 – Jan. 2024

- Developed auto-landing algorithm with path planning via bézier curve for continuous trajectory and control
- Verified in Gazebo simulation and on-board flight tests; finalizing technology transfer to the company

Army Aviation Operations Command | Republic of Korea Army Aug. 2021 – Feb. 2023

CH-47D Helicopter Flight Attendant & Maintenance Mechanics

- Produced CH-47D maintenance and put on tactical missions including forest fire extinguish for 60+ hours flight

SNU ZERO, Autonomous Driving Car Club | SNU Jan. 2021 – Oct. 2021

- Performed Extended-Kalman Filter with IMU, GPS and line detection for robust localization
- Developed dynamic obstacle avoidance by clustering LiDAR and combining vision detection

AI Tech Play(KAIT Foundation), Non-Profit Organization for AI education Feb. 2021 – Aug. 2021

Co-organizer & Hardware Team Leader

- Served as Organizer : Hosted nationwide AI camp and autonomous race car competition for over 200 students
- Served as Hardware Leader : Developed novel autonomous race car system for education and competition

Science Volunteer Corps | SNU Jul. 2019

- Held science experiment and mentoring camp for middle and high school students in Gochang

Teaching Experiences

Teaching Assistant

(M3228.001300) Basic of Robot Programming and Mechanical System Design | SNU Spring 2023

- Taught machine learning algorithms in Python and developed propeller competition kits for over 100 students

Teaching Tutor

(033.014) Engineering Mathematics 1 | SNU Fall 2023

(M2795.002100) Dynamics | SNU Fall 2023

Patent

1. Parking Location Tracking System, *KR102291377B1*, 2021
   Hojune Kim, Taekin Kim, Jinhwan Na, Jaeyoung Lee, Seunghwan Jeong

Skills

Programming: C/C++, Python, Matlab, Javascript

Frameworks: ROS, Isaac Sim, Gazebo, Ceres, Pytorch

Sensors: Radar, LiDAR, RGB-d/Thermal camera

Manufactures: SolidWorks, 3D printer, Laser cutter