Jongann **Lee**

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Research Interest: Mobile Robotics, Reinforcement Learning, Control Systems Engineering, Safety in Control

Education

Seoul National University — *Seoul, Republic of Korea*

B.E. in Mechanical and Aerospace Engineering — *Mar. 2019 - Aug. 2025*

- Overall GPA: 4.17/4.30 | Major GPA: 4.19/4.30
- 2 year military service

Publications

Journal Papers

[1] **Jongann Lee**, Taekyun Kim, Dongjun Lee, "Geometric Control of a Multirotor UAV with Collective Pitch-Tilting", *International Journal of Control, Automation, and Systems (IJCAS)*, Submitted

Research Experience

Polytechnique Laboratory for Assistive and Rehabilitation Technologies — *Montréal, QC, Canada*

Advisor: Prof. Abolfazl Mohebbi — *Jun. 2024 - Oct. 2024*

- Designed a 2 degrees of freedom ankle joint mechanism using a compliant mechanism to enable inversion and eversion movements as well as dorsiflexion and plantarflexion
- Built a prototype using a 3D printer and integrated it with the existing PERL ankle exoskeleton to confirm the mechanism's performance

Interactive and Networked Robotics Laboratory — *Seoul, Republic of Korea*

Advisor: Prof. Dongjun Lee — *Mar. 2023 - Jun. 2024*

- **Geometric Control of a Multirotor UAV with Collective Pitch-Tilting**
- Created a trajectory tracking controller for a multirotor with collective pitch-tilting by modifying the geometric tracking controller
- Demonstrated that the 5-variable trajectory consisting of position, yaw, and pitch is the differentially flat output of the vehicle dynamics
- Proved the almost global exponential attractiveness of the controlled vehicle dynamics using Lyapunov analysis
- Demonstrated the superior performance of the controller using a Matlab numerical simulation
- **Adaptive Quadrotor Controller**
- Designed an adaptive quadrotor controller by augmenting the geometric tracking controller for the quadrotor with an adaptive control law based on the geodesic distance of the manifold of physically consistent inertial parameters

Lab for Autonomous Robotics Research — *Seoul, Republic of Korea*

Advisor: Prof. H.Jin Kim — *Sept. 2023 - Jun. 2024*

- **Bachelor's Thesis: Reinforcement Learning based Tuner for the Geometric Tracking Attitude Controller**
- Developed an automatic tuner for the parameters of the geometric tracking attitude controller for the quadrotor using the TD3 reinforcement learning algorithm
- Defined a custom state, action, and reward architecture to enable stable training and to ensure the tuner's performance is independent of the agent's physical parameters
- Trained the reinforcement learning based tuner using data from a Pybullet quadrotor simulation wrapped in a Gym environment

Projects

Disturbance Observer Controller for a Unicycle — *Advanced Control Techniques Class*

Class project — *Oct. 2023 - Dec. 2023*

- Augmented an existing PD controller for a unicycle by adding a disturbance observer inner loop
- Implemented and tested the controller in Matlab and Simulink, confirming the performance improvement in the form of reduced overshoot

Autonomous Quadrotor System for Payload Delivery

Drone Club Bulnabi

2023 Korea Robot Aircraft Competition

Jul. 2022 - Jul. 2023

- Created an autonomous quadrotor capable of detecting and avoiding obstacles, automatically landing on a designated landing area, detecting a pre-determined delivery point, and delivering a payload to it
- Implemented a communication system for sending flight data and commands between the PX4-Autopilot flight computer system and the ROS2 companion computer system using the fast-DDS protocol
- Designed and implemented a real-time Bezier curve trajectory generation algorithm capable of updating the destination in real-time.

Work Experience

J.Marple

Seoul, Republic of Korea

Research Intern

Sept. 2023 - Dec. 2023

- Implemented various LiDAR inertial odometry(LIO) algorithms for quadrotor navigation without GPS
- Tested the algorithm's computational and navigational performance using pre-recorded LiDAR data

Data Design Engineering

Seoul, Republic of Korea

Research Assistant

Jun. 2022 - Aug. 2022

- Performed research on satellites and their payload, focusing on Earth observation satellites and synthetic aperture radar

Republic of Korea Air Force(military service)

Gyeonggi-do, Republic of Korea

English-Korean Interpreter/Translator

May. 2020 - Feb. 2022

- Worked as an interpreter/translator for the Air Force Operations Command A3, interpreting various operational dialogues between ROK and US Air Force officers, and translating English USAF documents, doctrines, and emails for the ROK officers and vice versa

Extracurricular Activity

SNU Drone Club Bulnabi

Seoul National University

President

Mar. 2019 - Jun. 2024

- Served as the vice president from Jan. 2022 to Jul. 2023, leading the communication team for the 2023 Korea Robot Aircraft Competition.
- Served as the president from Aug. 2023 to Jun. 2024, growing the club from 10 members to 40 members
- Organized weekly seminars and planned winter break projects to train the new members
- Assembled a 25 member team for the 2024 Korea robot aircraft competition, which they proceeded to win

SNUBuddy(Exchange Student Helper)

Seoul National University

Member

Jan. 2022 - Jun. 2022

- Helped international exchange students at Seoul National University settle into Korea and experience Korean culture by taking them around various venues and events

Honors

2023 **Kwanjeong Domestic Undergraduate Scholarship**, Kwanjeong Educational Foundation

2022 **Boeing Korea Scholarship**, Boeing Korea

2019 **College of Engineering Scholarship for Academic Excellence**, SNU College of Engineering

2018 **Hanseong Nobel Prodigy Scholarship**, Hanseong Sonjaehan Scholarship Foundation

Skills

Programming Python, C/C++, Matlab

Engineering ROS, PX4-Autopilot, Pytorch, Simulink, Solidworks

Languages Korean (native proficiency), English (bilingual proficiency, TOEFL iBT 117)