Yunsoo Seo

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Research Interest

My research interests lie at the intersection of **robotics, control**, with a focus on **locomotion**, **model-based planning/control** (e.g., MPC, DDP, MPPI), and **reinforcement learning (RL)**. I am motivated by the challenge of enabling legged robots to operate effectively in dynamic, real-world environments by achieving **robust whole-body motion and balance**. I am particularly interested in **combining RL with model-based control** to leverage the efficiency and structure of model-based methods with the flexibility and generalization of RL. I believe that for robots to collaborate safely and effectively with humans, especially in home or disaster response settings, **expanding their mobility and physical interaction capabilities** will be essential.

Education

MS **Korea University**, Electrical Engineering — Mar. 2024 – Feb. 2026

- **Advisor**: Myo Taeg Lim
- **Coursework:** Computer Controlled System, Advanced Robotics, Reinforcement Learning and Mathematics

BS **Dongguk University**, Mechanical, Robotics and Energy Engineering — Mar. 2020 – Feb. 2024

- **Coursework:** Calculus 1,2, Engineering Applications of Linear Algebra, Soft Robotics, Control Theory
- **Exchange Student Program** — *2022 Spring*
  University of Wisconsin–River Falls

Publications

Whole Body MPPI for Real-time Control of a 3-DoFs Leg system — Jan 2025

Yunsoo Seo, Myo Taeg Lim, Yisoo Lee

INSTITUTE OF CONTROL, ROBOTICS AND SYSTEMS (ICROS)
Selected for recommendation for submission to the Journal of ICROS

Extremely Fast Computation of CoM Trajectory Generation for Walking Leveraging MPPI Algorithm — Dec 2023

Yunsoo Seo, Dongwhan Kim, Jaewan Bak, Yonghwan Oh, Yisoo Lee

IEEE-RAS 22nd INTERNATIONAL CONFERENCE ON HUMANOID ROBOTS(HUMANOIDS)

Research Experience

<Korea Institute of Science and Technology(KIST)> — Student Researcher, Jul 2022 - Present

- **Humanoid whole body controller (Ongoing):** Developing a robust controller for humanoid robots using Model Predictive Path Integral and Reinforcement Learning integrated with MJPC (MuJoCo MPC).
- **Humanoid footstep planner:** Implemented a ROS-based footstep planner to generate ZMP and CoM trajectories, which were integrated into a weighted whole-body controller for stable and coordinated humanoid walking
- **Humanoid CoM trajectory generator(MPPI & MPC):** Conducted research on Center of Mass(CoM) trajectory generation for humanoid robots using Model Predictive Path Integral and Model Predictive Control

<Mechanical Automatic Control(MAC) research society, Dongguk university> — Project leader

- **Capstone Design Track-Project:** 6-DOF Manipulator Design and Motion Control, Mobile Manipulator's Trajectory Generation for Path Planning — Sep 2022 – Dec 2023
- **Soft Robotics term project:** In charge of Origami Gripper Fabrication
- **Engineering Education FESTA 2022:** 6-DOF Manipulator Motion Control, Mobile Manipulator's Trajectory Generation for Path Planning

Awards and Honors

- Mentoring Program Scholarships, Korea University, BK21 Center (2024 Fall)
- Industry-Academia Internship Scholarship, Dongguk university, Scholarship Office for Educational Activity Assistance, Korea (Mar. 2023)
  Granted for outstanding academic performance and participation in a competitive internship program.
- **Engineering Education FESTA 2022**, Korea Institute for Advancement of Technology , Korea (Oct. 2022)
  Grand Prize winner for 6-DOF dual-arm manipulator project in a national engineering competition.
- University Innovation Program Scholarship, Dongguk university, National Off-Campus Scholarship, Korea (Sep. 2022)
- **Exchange Program Tuition Scholarship**, Dongguk university, Global Scholarship Office, Korea (Mar. 2022)
  Awarded to students selected for academic exchange based on academic merit.
- **Academic Excellence Award**, 2020 Fall, Dongguk university, Korea (Jan. 2021)
  Granted for achieving a GPA above 4.0/4.5 (top academic performance, equivalent to Dean's List).

Leadership and Teaching Experience

KROS Locomotion Manipulation Research Group Workshop — Seminar Presenter, Apr 2024
- Presented a seminar titled "Real-Time MPC via Improvement of MPPI Sampling Techniques"

Korea Institute of Science and Technology (KIST) — Intern Researcher, Jul 2022 – Jul 2023
- Worked as an intern researcher focusing on the development of the Center of Mass (CoM) trajectory generator for humanoid robots

Mechanical Automatic Control(MAC) Club — Member, Mar 2022- Jan 2024
- Participated in projects and activities related to mechanical automation and control systems(manipulator control, soft robot - origami gripper)

Korean Student Association — Treasurer, *2022 Spring*
- University of Wisconsin–River Falls
- Contributed to planning and executing cultural and community-building events

DoDream Collaborative Learning Study Group — Team Leader, Sep 2021 – Dec 2022
- Dongguk University
- Organized study sessions focused on robotics, kinematics, path planning algorithms

Eduplex Academy — Teacher, Aug 2020 – Jan 2022
- Instructed Mathematics, English, and Science to grades 7–11

Technologies

Programming Languages: Python, C++, MATLAB, CUDA

Developer Tools: Eigen, RBDL, ROS, Git, MuJoCo, qpOASES

Languages: Korean (Native), English (Fluent, TOEFL iBT 107 - R:26, L:29, S:28, W:24)

References

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