Yongseok Kwon

kwonys@umich.edu · kwonyos.github.io

Education

University of Michigan — Ann Arbor, MI
M.S.E. in Mechanical Engineering — *Aug. 2020 – Aug. 2022*
- Focus: Robotics, Motion Planning, Control, Optimization, Deep Learning
- GPA: 4.0/4.0

Ulsan National Institute of Science and Technology (UNIST) — Ulsan, Republic of Korea
B.S. in Mechanical and Aerospace Engineering, Human Factors Engineering — *Mar. 2016 – Feb. 2020*
- Honors: *Summa Cum Laude*
- GPA:3.94/4.3

Publications

- Jonathan Michaux, Qingyi Chen, **Yongseok Kwon**, Ram Vasudevan."Reachability-based Trajectory Design with Neural Implicit Safety Constraints." *Robotics: Science and Systems*, Daegu, Republic of Korea, 2023. [webpage, arXiv, code]

Experience

Korea Army Research Center for Future and Innovation (KARCFI), Republic of Korea Army *Feb. 2023 – Aug. 2024*
Robotics Researcher (Mandatory Military Obligation)
- Conducted fieldwork near the Korean Demilitarized Zone to identify technological needs for national defense.
- Managed national defense research initiatives with a specific focus on unmanned reconnaissance systems.
- Formulated proposals for national defense projects, successfully securing grants totaling up to 20 billion Korean Won, approximately 15 million U.S. Dollars.

Robotics and Optimization for Analysis of Human Motion (ROAHM) Lab & *Jul. 2021 – Jan. 2023*
Ford Center for Autonomous Vehicles (FCAV), University of Michigan *Jun. 2022 – Jan. 2023*
Research Assistant & Research Engineer *Advisor: Prof. Ram Vasudevan*
- Developed a Python framework for parallel reachable set computation using polynomial zonotopes, resulting in a 2,000-fold speed enhancement. [code]
- Trained a neural signed distance function between reachable workspace and surrounding objects using Eikonal loss.
- Developed a novel trajectory planner with neural implicit constraints, achieving a speed of 40 Hz for 7 DoF robot arm.
- Created a provably safe reinforcement learning algorithm incorporating polynomial zonotope-based safety shield.

Locomotor Control Systems (LOCO) Lab, University of Michigan *Jan. 2021 – May 2021*
Research Assistant *Advisor: Prof. Robert D. Gregg IV*
- Trained a neural network for a gait model with positional encoded gait phase based on human walking data.
- Designed a gait state estimator using an Extended Kalman Filter (EKF) integrated with the neural gait model.
- Demonstrated real-time swing motion of an EKF-based controller using open-source robotic leg hardware.

Bio-Robotics and Control (BiRC) Lab, UNIST *Mar. 2019 – Jul. 2019*
Research Intern *Advisor: Prof. Joonbum Bae*
- Designed a novel decoupling mechanism for tendon-driven serial link robots.
- Managed various components of a hydraulic robot arm, including hydraulic actuators, encoders, and assembly.

COURSE PROJECTS

Transformers for Motion Planning, University of Michigan *Fall 2021*
Course: Introduction to Robotic Manipulation *Advisor: Prof. Nima Fazeli*
- Generated expert dataset via trained agent for offline reinforcement learning.
- Deployed the decision transformer for a multi-link arm reaching task.

Model Predictive Control for Autonomous Car, University of Michigan *Fall 2021*
Course: Self Driving Car *Advisor: Prof. Ram Vasudevan*
- Implemented a high-level planner to predict waypoints for lane-changing maneuvers in autonomous driving.
- Formulated convexified collision avoidance constraints for trajectory planning in dynamic racing scenarios.

UAV Navigation via Dubins Path Planning, UNIST *Spring 2019*
Course: UAV Flight Control and Simulation *Advisor: Prof. Hyondong Oh*
- Developed a comprehensive simulation dynamics model and a tracking controller for UAV navigation.
- Implemented a Dubins-curve-based RRT to generate paths under kinematic constraints for UAVs.

SKILLS

Programming	Python, MATLAB
Software	IPOPT, Gurobi, OSQP, MuJoCo
Frameworks and Others	Pytorch, Stable-Baseline3, Weights & Biases, Linux, Conda, Git

HONORS AND AWARDS

National Science and Engineering Scholarship, Korea Student Aid Foundation (KOSAF) *2018 – 2019*
- Full-tuition scholarship for the last two years of undergraduate studies.

Academic Performance Scholarship, UNIST *2016 – 2017*
- Full-tuition scholarship for the first two years of undergraduate studies.