HANBYEOL YOON

Mechanical & Aerospace Engineering, Univeristy of California, Los Angeles
(+1)310-447-4103 ⋄ hanbyeol.yoon@ucla.edu

RESEARCH INTERESTS

Dental Robotics; Trajectory Planning; Model Predictive Control; Reinforcement Learning;

EDUCATION

University of California, Los Angeles CA, U.S.
Doctor of Philosophy in Mechanical & Aerospace Engineering *Sep 2021 - Present*

- Academic Advisor: Prof. Jacob Rosen
- GPA: **3.95**/4.0 (Major: Systems & Control / Minor: Optimization, Machine Learning)

Seoul National University Seoul, S.Korea
Bachelor of Science in Mechanical & Aerospace Engineering *Mar 2013 - Feb 2020*

- Academic Advisor: Prof. Dongjun Lee
- GPA: Major **4.03**/4.3, Overall **3.94**/4.3 (***Summa Cum Laude***)

RESEARCH EXPERIENCES

Bionics Laboratory CA, U.S.
Advisor: Prof. Jacob Rosen *Sep 2021 - Present*

- Dental Surgical Robotics for Cavity Removal and Tooth Preparation
  - Developed Reinforcement Learning (RL) path planning algorithm for cavity removal.
  - Implemented Model Predictive Path-Following Control (MPFC) to control robot to follow designed trajectory with presence of dynamic obstacles and disturbance.
  - Developed kinematics optimization framework using Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) for optimal design of dental robotic system.

Interactive & Networked Robotics Laboratory Seoul, S.Korea
Advisor: Prof. Dongjun Lee *Mar 2019 - Dec 2019*

- Robust Visual-Inertial Hand Tracking System
  - Contributed to developing Visual-Inertial Skeleton Tracking (VIST) framework based on Extended Kalman Filter (EKF) fusing visual and inertial sensor information.
  - Developed multi-drone control interface usigng rendered estimated hand model in Virtual Reality (VR) using Unity3D for a live demo scenario at IROS 2019 workshop.

WORK EXPERIENCES

Perceptive Technologies Inc. MA, U.S.
Robotics Internship *Mar 2023 - Sep 2023 / June 2024 - Sep 2024*

- Developed kinematics calibration and filtering algorithm based on local Product of Exponential (POE) to improve accuracy of robotic tooth preparation.
- Implemented path planning framework of dental robotic system using MoveIt2 in ROS2.
- Implemented admittance control of dental robot for safe Human-Robot Interaction (HRI) and simulated the controller using MuJoCo.

LG Electronics Inc. Seoul, S.Korea
Associate Researcher at Industrial Robot Development Team *Jan 2020 - Aug 2021*

- Contributed to designing and fabricating 6 DoF collaborative robot manipulator.
- Implemented Hand-Eye-Calibration of AI-vision based robot in Robot Production System.

PUBLICATIONS & PRESENTATIONS

1. **H. B. Yoon**, Ruoning Ren, Haoran Wang, Philip Getto, Chris Ciriello, and Jacob Rosen, "Kinematic and Functional Optimization of Dental Robotic System," *IEEE Transactions on Medical Robotics and Bionics.* [Under Review]
2. Y. S. Lee, W. K. Do, **H. B. Yoon**, J.W. Heo, W. H. Lee, and D. J. Lee, "Visual-Inertial Hand Motion Tracking with Robustness to Occlusion, Interference, and Contact," *Science Robotics, 2021.* [link]
3. Y. S. Lee, **H. B. Yoon**, J. W. Huh, W. H. Lee, and D. J. Lee, "Wearable Visual-Inertial Hand Tracking Interface Regardless of Environment and Occlusion," *IROS workshop on Visual-Inertial Navigation: Challenges and Application, 2019.* [link], [pdf]

HONORS & AWARDS

Korean Government Scholarship Program ($ 40,000/yr)	*Aug 2020*
KOFAC URP President's Award ($ 8,000)	*Mar 2018 - Mar 2019*
SNU Entrepreneurship Center Chief's Award ($ 500)	*Jan 2019*
National Scholarship ($ 6,000/yr), Korea Student Aid Foundation	*2013 - 2018*
Student of Honor ($ 2,500), SNU MECH Alumni Association	*Oct 2016*
Local Talent Scholarship ($ 2,000), Iksan Scholar Aid Foundation	*Aug 2014*

TECHNICAL SKILLS

Engineering Tools & Softwares: ROS2, MoveIt2, MuJoCo, Unity3D, Solidworks, MONAI
Programming Languages: C/C++, Python, MATLAB

TEACHING EXPERIENCES

TA, 171A Introduction to Feedback Control Systems, UCLA	*Sep 2024 - Dec 2024*
TA, 171A Introduction to Feedback Control Systems, UCLA	*Sep 2023 - Dec 2023*
TA, 270B Linear Optimal Control, UCLA	*Jan 2023 - Mar 2023*
TA, 271A Probability and Stochastic Processes, UCLA	*Sep 2022 - Dec 2022*
TA, 162D/E Mechanical Engineering Design I/II, UCLA	*Jan 2022 - June 2022*

REFERENCES

Prof. Jacob Rosen
Mechanical Engineering
University of California,
Los Angeles
310-206-0174
jacobrosen@ucla.edu

Prof. Dongjun Lee
Mechanical Engineering
Seoul National University
+82-2-880-1724
djlee@snu.ac.kr

Prof. Jaeheung Park
Convergence Science
and Technology
Seoul National University
+82-10-9077-2947
park73@snu.ac.kr