WONKYUNG DO
216 Rosse Lane Bldg. 209, Stanford, CA 94305, United States
(+1) 650 353 6507 ⋄ wkdo@stanford.edu ⋄ Linkedin ⋄ Google Scholar

RESEARCH INTERESTS

Tactile sensing, dexterous manipulation, machine learning, reinforcement learning, control theory, hardware design, and human-robot interaction

EDUCATION

Ph.D. **Mechanical Engineering, Stanford University** *2025(exp)*
Academic advisor: Monroe Kennedy III

M.S. **Mechanical Engineering, Stanford University** *2021*

B.S. **Mechanical Engineering, Stanford University** *2019*
Academic advisors: Dongjun Lee, Insoon Yang, and Jin Young Choi
Overall GPA: **4.03** / 4.30 , Major GPA: **4.10** /4.30

RESEARCH EXPERIENCE

Improving Robotic Assistant Dexterity, Doctoral Student Researcher *Sep 2019 - Present*
Prof. Monroe Kennedy III, Dept. of Mechanical Engineering, Stanford University

· Developed a DenseTact, DenseTact 2.0, and DenseTact-mini, a vision-based tactile sensor that can estimate force and deformed surface in high resolution for dexterous manipulation. [Video]
· Developed a methodology that uses vision-based tactile sensor for efficient tactile exploration of embedded objects within soft materials. [website]
· Developed inter-finger manipulation system that can grasp, control, and classify a small object in cluttered environment using vision-based tactile sensor. [website]

Visual-inertial Hand Tracking with Occlusion Resilience, Research Intern *Mar 2018 - June 2019*
Prof. Dongjun Lee, Dept. of Mechanical Engineering, Seoul National University

· Developed AR-based UAV interaction interface using HMD and hand-tracker.
· Proposed and developed algorithm and AR interface for IMU-based hand tracker through HMD and stereo camera - Visual-inertial hand motion tracking with robustness against occlusion, interference, and contact: paper
· Based on C/C++, C# and Unity3D.

Management System for Electric Vehicle Charging Station, Research Intern *June 2018 - Aug 2018*
Prof. Insoon Yang, Dept. of Electrical and Computer Engineering, Seoul National University

· Proposed and developed an optimal management system for electric vehicle charging station using approximate dynamic programming (ADP) based on a realistic EV demand model in MATLAB.
· Awarded 2nd prize at BMW X SNU Research Competition and independently wrote a grant proposal for the BMW Korea Group and Seoul National University ($2,000).

WORKING EXPERIENCE

Naver Labs, Korea, Research Intern *July 2017 - Feb. 2018*
Main Advisor : Dr. Sangok Seok

· Proposed and developed Shelly, a robot designed to reduce childrens' aggressive behavior.
  - NBC News article about Shelly: *"Robot abuse is real, but maybe this little tortoise can help."*
  - More articles about Shelly: Guardian, IEEE Spectrum, Techcrunch, Video of Shelly.
  - Designed robot hardware and implemented social touch pattern recognition system using 3D-CNN, LSTM, and HMM.
· Developed controller for two-wheeled robot that is robust under strong perturbations.
  - Designed constrained explicit model predictive control (MPC) on two-wheeled inverted pendulum robot.
· Researched and proposed company directives on technology trends and key players for HD maps and advanced driver-assistance systems (ADAS). This led to a partnership with HERE technologies, a German mapping and location company.

PUBLICATIONS AND PATENTS

Publications

- J. Solano-Castellanos, **W. Do**, and M. Kennedy, "**Embedded Object Detection and Mapping in Soft Materials Using Optical Tactile Sensing**", SN Computer Science, 5, 1-11., Apr 2024 [doi]
- A. Swann, M. Strong, **W. Do**, G. S. Camps, M. Schwager, and M. Kennedy, "**Touch-GS: Visual-Tactile Supervised 3D Gaussian Splatting** ", *submitted to IROS2024*, Mar 2024 [arXiv]
- **W. Do**, B. Aumann, C. Chungyoun, and M. Kennedy, "**Inter-finger Small Object Manipulation with DenseTact Optical Tactile Sensor**", *IEEE Robotics and Automation Letters*, Nov 2023 [doi]
- **W. Do**, A. Dhawan, M. Kitzmann, and M. Kennedy, "**DenseTact-Mini: An Optical Tactile Sensor for Grasping Multi-Scale Objects From Flat Surfaces**", *2024 International Conference on Robotics and Automation (ICRA, **Best paper award finalist in Manipulation**)*, May 2024 [arXiv]
- **W. Do**, B. Jurewicz, and M. Kennedy, "**DenseTact 2.0: Optical Tactile Sensor for Shape and Force Reconstruction**", *2023 International Conference on Robotics and Automation (ICRA)*, May 2023 [doi]
- **W. Do** and M. Kennedy, "**DenseTact: Optical Tactile Sensor for Dense Shape Reconstruction**", *2022 International Conference on Robotics and Automation (ICRA)*, May 2022 [doi]
- Y. Lee, **W. Do**, H. Yoon, J. Heo, W. Lee, and D. Lee, "**Visual-inertial hand motion tracking with robustness against occlusion, interference, and contact**", *Science Robotics*, Sept 2021 [doi]
- H. Ku, J. J. Choi, S. Jang, **W. Do**, S. Lee, and S. Seok, "**Online Social Touch Pattern Recognition with Multi-modal-sensing Modular Tactile Interface**", *2019 16th International Conference on Ubiquitous Robots (UR)*, June 2019 (co-first author)[doi]
- H. Ku, J. J. Choi, S. Lee, S. Jang, and **W. Do**, "**Designing Shelly, a Robot Capable of Assessing and Restraining Children's Robot Abusing Behaviors**", *13th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Chicago, USA, Mar 2018 (co-first author, *Late-Breaking Report*) [doi]
- H. Ku, J. J. Choi, S. Lee, S. Jang, and **W. Do**, "**Shelly, a Tortoise-Like Robot for One-to-Many Interaction with Children**", *13th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Chicago, USA, Mar 2018 (co-first author, *Student Design Competition*) [video], [doi]
- **W. Do**, S. Jang, and J. Choi, "**Constrained Explicit Model Predictive Control of Two-wheeled Inverted Pendulum Robot under Strong Perturbation**", *13th Korea Robotics Society Annual Conference (KRoC)*, Gangwon, Korea, Jan 2018 (all co-authors)
- H. Ku, **W. Do,** S. Lee, S. Jang, and J. Choi, "**Shelly: An Educational Robot for Restraining Children's Abusive Behaviors towards Robots**", *13th Korea Robotics Society Annual Conference (KRoC)*, Gangwon, Korea, Jan 2018 (all co-authors, *Best Undergraduate Paper*)
- J. Park, J. Lim, D. Kang, **W. Do**, I. Jeung, et al., "**Bring-Back Cansat Mission for a simulated resupply mission on a remote planet**", *The Korean Society for Aeronautical & Space Sciences Conference (KSAS)*, Jeju, Korea, Nov 2014 (all co-authors) [**link**]

Patents

- KR10-2018-0026268, "METHOD AND DEVICE FOR PROCESSING SENSING DATA ASSOCIATED WITH A USER'S TOUCH INTERACTION", Korea.

HONORS AND AWARDS

2019 Graduate Study Fellowship ($25,000/yr), Kwanjung Educational Foundation *Sep 2019 -2024*
Supports Korean students pursuing a Ph.D. in the U.S. for 5 years

Presidential Science Scholarship ($10,000/yr), Korea Student Aid Foundation *2012 - 2018*
Full tuition and partial stipend awarded for academic excellence.

1st prize at the **Student Design Competition, 13th ACM/IEEE International Conference on Human-Robot Interaction (HRI)** *Mar 2018*
For "Shelly, a Tortoise-Like Robot for One-to-Many Interaction with Children."

TEACHING EXPERIENCE

Course Assistant, Stanford University *Fall 2020, Fall 2021*

- Dynamics (ENGR 15)

Tutor at College of Engineering, Seoul National University *Fall 2018 - Feb 2019*

· Engineering Mathematics 2 (033.015), Dynamics (M2794.001200), and Fluid Mechanics (M2794.001300)

Tutor at Department of Physics, Seoul National University *Fall 2018 - Feb 2019*

· Basic Physics 2 (034.006)

TECHNICAL STRENGTHS

Programming Languages

· C/C++, MATLAB, LabVIEW, C#, and Python

Software and Tools

· Pytorch, Solidworks, ROS, Abaqus, Unity3D, TensorFlow, and CATIA

REFERENCE

Prof. Monroe Kennedy III, Professor in Mechanical Engineering, Stanford University, US (monroek@stanford.edu)

Prof. Dongjun Lee, Professor in Mechanical Engineering, Seoul National University, Korea (djlee@snu.ac.kr)

Prof. Insoon Yang, Professor in Electrical Engineering, Seoul National University, Korea (insoonyang@snu.ac.kr)

Dr. Sangok Seok, Executive Vice President, Naver Labs, Korea (sangok.seok@navercorp.com)