DO-GON KIM

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EDUCATION

Columbia University Sep 2023 – May 2025
Master of Science, Mechanical Engineering, **GPA: 4.072**
Relevant Coursework: Intro to Robotics, Applied Robotics, Computational Aspects of Robotics, Robot Learning

New York University Sep 2020 – Jan 2023
Bachelor of Science, Mechanical Engineering, **GPA: 3.823**
Relevant Coursework: Robotic Manipulation and Locomotion, Robotic Vision
Honors & Awards: Tau Beta Pi, Founder's Day Award, Dr. Morris Young Outstanding Project Design Award

SKILLS

Programming Language: Python, MATLAB, C++
Software/OS: ANSYS Workbench, SOLIDWORKS, Gazebo simulator, Pybullet, ROS, Linux, Rviz, Simulink
Machining/Tools: Laser cutting, 3D printing, Grizzly G7943, Baileigh WBS-22 Bandsaw, Jet JSG-96 Benchtop Sander

RESEARCH EXPERIENCE

Graduate Research Assistant, *Columbia University ROAM Lab*, New York, NY May 2024 – Present
- Designed and developed fingers to enable active acoustic sensing for manipulation, enabling material classification, Internal structure classification, object state classification, grasp point estimation, contact type estimation
- Developed and optimized tactile sensing systems using piezoelectric sensors and signal processing techniques, including FFT analysis for feature extraction, laying the groundwork for object classification using ML
- Conducted experiments that achieved 94% and 100% accuracy in FFT-based material and object state classification and 83% accuracy in grasp point and contact type estimation, enhancing robotic understanding of object and surrounding environment
- Engineered a vision-based control system for robotic grippers, integrating ArUco markers and MediaPipe for hands-free operation, enhancing the precision and ease of data collection

Graduate Research Assistant, *Columbia University DitecT Lab*, New York, NY Jan 2024 – Sep 2024
- Spearheaded the development of a simulation framework using ROS2 and PyBullet in AWS DeepRacer, enabling ML model testing without physical hardware and fostering a dynamic environment for autonomous vehicle research
- Designed a simulation pipeline that encompasses servo control systems and real-time sensor data processing
- Developed visualization tools for LIDAR to effectively detect obstacle around the autonomous vehicle
- Developed a real-time ArUco marker detection system with OpenCV, allowing for efficient processing and accurate determination of position, orientation, and speed of markers, which were integrated into dynamic vision-based applications

Undergraduate Researcher (UGSRP), *NYU Control/Robotics Research Lab*, Brooklyn, NY Jun 2022 – Dec 2022
- Researched and utilized ROS with Gmapping and AMCL algorithms to build and localize maps using sensors
- Enabled Turtlebot3 Burger to detect obstacles and navigate autonomously with LIDAR, encoder, and IMU
- Studied SLAM algorithms (RTAB-Map, ORB-SLAM) and analyzed mapping errors to minimize discrepancies

TEACHING EXPERIENCE

Graduate Teaching Assistant, *Columbia University*, New York, NY Sep 2024 – Present
- Assisted Professor Sunil Agrawal in teaching Intro to Robotics course during lecture, and weekly meetings
- Created homework and midterm problems on kinematics, Jacobian, and singularities to reinforce core course concepts
- Held weekly office hours for 2 hours, teaching class materials to help students better understand key robotics concepts

PROJECTS

Robot Learning Project – Navigation in 2D maze Sep 2023 – Dec 2023
- Designed and implemented DNN and CNN to navigate a complex 2D maze, achieving a 99.16% navigation accuracy by predicting optimal actions from positional and visual data
- Applied behavioral cloning to train models using expert demonstrations, enabling the robotic agent to determine the best actions from visual and positional data within the maze
- Enhanced maze navigation challenges by introducing variable obstacles and random placements, demonstrating marked improvements in the agent's adaptive navigation capabilities

Introduction to Robotics Project – Cable Driven Parallel Robot Sep 2023 – Dec 2023
- Developed an adaptive velocity controller for a 4-cable-driven parallel robot, enabling dynamic speed adjustments based on the different objects, which enhances efficiency and precision in handling diverse materials
- Validated performance through MATLAB 3D simulations, demonstrating successful integration of inverse kinematics and adaptive velocity control for smooth, responsive motion
- Optimized the cable-driven system design by reducing cables from 7 to 4, simplifying kinematic solutions and minimizing collision issues, demonstrating the system's applicability in industrial settings like distribution warehouses

Robotic Vision Project - Sheet Music Sight-Reader Feb 2022 – May 2022
- Created a Colab-based CV pipeline that takes in the image of a sheet of music and outputs a playable music file
- Trained a model to detect a rough position of each note in sheet music using the YOLO algorithm with 90% accuracy
- Utilized Canny Edge Detector to find five lines in sheet music and applied a vertical slice on across the five lines to calculate an accurate position of five lines