CHUIZHENG KONG

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EDUCATION

M.S. Electrical Engineering, RPI (thesis advisor: Prof. John T. Wen) GPA: 3.79/4.00 2023
Thesis: *Design and Control of a Nonprehensile Impulse Manipulator* [Proquest Link]

B.S. Mechanical Engineering, RPI (research advisor: Prof. Sergio Pequito) GPA: 3.92/4.00 2021

RESEARCH EXPERIENCES

Towards NIST Robotics Assembly Challenge

Mitsubishi Electric Research Lab, Cambridge MA July 2023 – August 2023

- Tackled the initial object segmentation task by incorporating SAM into a real-time (∼30 Hz) ROS implementation with dual RGB-D cameras
- Designed a Blender/Python based scene generation pipeline for fine-tuning object pose estimation model
- Hands-on manufacturing of copper threaded peg-and-holes assembly with fine tolerance control using CNC mill and lathe
- Work titled *3D Bin Picking* presented in PACK EXPO at the Las Vegas Convention Center on Sep. 12 2023

Under-actuated Impulse Manipulator Control

Mitsubishi Electric Research Lab, Cambridge MA Jan 2022 – Jun 2022

- Designing and programming a nonprehensile manipulator for robot assembly pick-and-place tasks
- Enabling camera vision guided assistance with contour extraction, shape recognition, and frame transformations
- Conducting machine learning based model-predictive control with a robot arm in the loop to perform industrial assembly tasks (k-Nearest Neighbor, Random Forest, or RBF kernel SVM)
- Resulted work has a provisional patent filed and two papers in ACC'23 and ICMLA'23 published

RELEVANT PROJECTS

[Manufacturing Robot] Program a tormach ZA6 robot to perform subtractive manufacturing with compliance control in python [Link]

- program a parth planning pipeline that converts a 5-axle cutting tool-path into waypoints for 6 robot joint-angles
- develop supplementary tools such as workspace calibration and path executability analysis based on singularities and joint limits
- Utilize a torque force sensor to perform refined surface calibration and compliance controlled cutting

[Robotics I] Enable ROS communication of a 4-DoF Robot Arm with no available API [Link]

- Calculate and implement forward / inverse kinematics of the robot arm in python code
- Decrypt factory pyserial command to read / write joint angle, angular speed, angular acceleration
- Creat a basic ROS library that host services to control end effector location and speed, which enabled vision-based feedback control

PUBLICATION

- C. Kong, W. Yerazunis, and D. Nikovski, "Learning Object Manipulation With Under-Actuated Impulse Generator Arrays," 2023 IEEE Am. Control Conf. (ACC), San Diego, CA, USA [IEEE Link]
- (Accepted) C. Kong, W. Yerazunis, and D. Nikovski, "Stochastic Learning Manipulation of Object Pose With Under-Actuated Impulse Generator Arrays," 2023 IEEE Int. Conf. Mach. Learn. Appli. (ICMLA), Jacksonville, Florida, USA
- D. Liu, A. Varatharajan, A. Goldsmith, C. Kong, L. k. Sigatapu, Y. Wang, "Broken-bar Fault Detection by Injecting a Frequency Modulated Continuous Wave Signal," 2023 IEEE International Electric Machines and Drives Conference (IEMDC), San Francisco, CA, USA [IEEE Link]