Puen Xu

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Objective

I am a highly motivated Senior Robotics Engineering student at WPI with a research interest in Control of Under-actuated Systems and Cyber-Physical Systems to make our world smart and connected. I am looking for a Master of Science degree in Robotics/Electrical Engineering with a future goal to earn a PhD degree in the field.

Education

Worcester Polytechnic Institute (WPI) Worcester, MA
Bachelor of Science in Robotics Engineering, GPA 3.94/4.00 May 2024
Honors: Presidential Scholarship, Dean's List, Tau Beta Pi, National Name Exchange
Coursework: Unified Robotics I-IV, Foundations of Robotics, Robot Dynamics, Robot Control, Stochastic Processes, Multi-Sensor Configuration, Estimation, and Fusion, Software Engineering, Artificial Intelligence for Robotics

Skills

Robotics: ROS, Linux, Robot Programming (C++, Python, MATLAB), Optimal Control, Reinforcement Learning
Mechatronics: CAD (SolidWorks), CAM, CNC Machining, Embedded Systems, PCB Design, Sensor Intergration
Software: Front-end (HTML, CSS, JavaScript, React), Back-end (AWS, Flask, SQL)
Languages: Bilingual in English and Mandarin, Competent in Japanese, French, and Spanish

Work Experience

WPI, Robotics Engineering Department Worcester, MA
Research Assistant Aug 2023 – Present
- Actively engaged in and contribute to hands-on research projects that aimed at addressing real-world challenges under the guidance of professors in the robotics engineering department.

WPI, Robotics Engineering Department Worcester, MA
Student Assistant Aug 2023 – Present
- Guided and managed student-led laboratories in core senior-level robotics courses, facilitating the application of classroom knowledge to accomplish complex projects.

WPI, Academic Resources Center Worcester, MA
Peer Tutor Aug 2023 – Oct 2023
- Provided individual peer tutoring to help students to understand materials in lecture and reading in textbooks, master new concepts, and put ideas into perspective.

WPI, Mathematical Sciences Department Worcester, MA
Peer Learning Assistant Aug 2022 – May 2023
- Facilitated weekly discussions for students to reinforce key concepts from the lectures and guided them through selected practice problems.

Research Projects

Bimodal Quadruped Robot Aug 2023 – Present
Advisor: Prof. Agheli
- To design, manufacture, and test a robot arm attached to a quadruped robot that serves as a fifth limb; the robot will exploit the arm to climb on top of a surface that is too high to reach by any gaits with only four legs.
- To develop a control framework with Model Predictive Control and Whole Body Impedance Control to command the robot to reach a desire position with a specified gait.
- To integrate computer vision and sensor fusion to allow the robot to navigate uneven terrains such as stairs and flat floors with scatterd obstacles.

Bird Deterrent Robot Aug 2023 – Present

Advisor: Prof. Lewin

- To design and build a robot that autonomously patrols on high-voltage transmission lines and deters ravens from pecking at wires and causing power outages and potential deaths of themselves.
- To develop a state machine in ROS to enable high-level decision-making and establish communications between ROS and an Arduino microcontroller that handles low-level functionality of peripherals.
- To employ artificial intelligence algorithms to detect ravens of a specific species in real-time from the live camera feed and communicate with ROS to act accordingly.

Course Projects

Seats4U Website Design Oct 2023 – Present

Software Engineering

- To design a website for customers to purchase movie tickets, and venue managers to create movie events and develop layout for the show with ReactJS and AWS.
- To develop a API for the AWS back-end that supports the Crowdsourcing Funding Platform and a secure database using Amazon RDS and SQL.

Unknown Maze SLAM and Navigation Mar 2023 – May 2023

Unified Robotics IV - Navigation

- Programmed a Turtlebot 3 robot to navigate through an unknown maze and generate a map for the maze using laser-based SLAM.
- Employed the AMCL algorithm to allow the robot localize itself in the maze upon the self-generated map and navigate to a desired destination by A* search algorithm.

Vision-Based Robotic Pick and Place Jun 2023 – Mar 2023

Unified Robotics III - Manipulation

- Developed an autonomous vision-based robotic pick and place system to sort balls of different colors using a 3 DoF spherical robot manipular.
- Employed robot kinematics, computer vision, motion planning techniques for the robot manipulator to continuously locate the balls from live feed of the camera and generate quintic trajectories to grab the balls.

Robot Escape Room Oct 2022 – Dec 2022

Unified Robotics II - Sensing

- Customized and programmed a set of robots to communicate with each other via MQTT to escape from a maze that uses a variety of beacons and tags to lead the robot to find the escape door.
- Implemented PI speed control, PD wall-following algorithm, sensor fusion of accelerometer and gyroscope, wireless communication, forward kinematics, and inverse kinematics to navigate the arena.

Robotic Replacement of Solar Collector Panels Aug 2022 – Oct 2022

Unified Robotics I - Actuation

- Built and programmed a set of mobile robots to work together to pick up solar panels and place them onto roofs of different angles on a competition field.
- Designed and manufactured a gear box to allow a 9N-cm motor to lift a CAD designed and 3D-printed four-bar robotic arm to place the solar panel within a specified tolerance of 5mm.

Honors

National Name Exchange (NNE), *WPI* May 2023
Dean's List, *WPI (Every Semester)* Fall & Spring 2020 - 2023
Presidential Scholarship, *WPI* Aug 2020

Activities

Member, *Tau Beta Pi (Engineering Honor Society)* Apr 2023 – Present
Mentor, *WPI Peer Learning Mentoring* Jan 2022 – Dec 2022