

Yang-Lun (Alan) Lai

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EDUCATION

University of Michigan, Ann Arbor, MI, United States

Aug. 2021 — May 2023

Master of Science in Engineering in Electrical and Computer Engineering (Robotics track)

(Expected)

- Overall GPA: 4.0/4.0
- Coursework: Math for Robotics, Algorithmic Robotics, Mobile Robotics, Machine Learning, Deep Learning for Computer Vision

National Taiwan University (NTU), Taipei, Taiwan

Sept. 2016 — June 2020

Bachelor of Science in Biomechatronics Engineering

- Overall GPA: 3.78/4.30 (with Dean's Awards)
- Coursework: Dynamics and Control of Robots, Practical Data Structures and Algorithms, Introduction to AI and ML, Robot Vision

SKILLS

Software & Tool: Robot Operating System (ROS), PyTorch, PyBullet, MATLAB, Simulink, OpenCV, SolidWorks

Programming: C++, Python

Operating System: Windows, Linux (Ubuntu)

WORK & RESEARCH EXPERIENCES

Isuzu Technical Center of America, Inc., Ann Arbor, MI, United States

Incoming PVRD Intern – Autonomous Driving Software Intern

May 2022 — Aug. 2023

Robots and Medical Mechatronics Lab (National Taiwan University), Taipei, Taiwan

Researcher

Sept. 2019 — Feb. 2021

Collaborative Motion System of the Collaborative Tea Harvesting Vehicle | C++, Python, ROS

- Implemented the visual servoing framework based on RGBD camera for the robot to move side-by-side with human. [\[Video\]](#)
- Processed LiDAR data to detect the tea trees by RANSAC model-fitting algorithm and make the robot avoid collisions.
- Reduced the farmer's average physical loads by 85% and maintain the harvesting quality during tea harvesting.

SELECTED COURSE PROJECTS

Novel View Synthesis with Neural Radiance Fields (NeRF)-based Models | Python, Pytorch

April 2022

- Built a NeRF model from scratch to synthesize images showing the scene from new viewpoints unseen in the training set.
- Improved performance of peak signal-to-noise ratio (PSNR) by 15 % by adapting the architecture based on the FastNeRF.

Robot Localization using ORB-SLAM3 and Graph-Based Sensor Fusion | C++, MATLAB, GTSAM

April 2022

- Pre-processed a long-term vision dataset (NCLT dataset) and applied the ORB-SLAM3 to get the trajectory of the robot.
- Solved the lost tracking problem by coupling wheel encoder data using the incremental smoothing technique (iSAM2).

Nonlinear Filters for Robot Localization | Python, ROS

Feb. 2022

- Implemented nonlinear Kalman Filters and Particle Filter to localize a robot in the environment composed of six landmarks.
- Utilizing the Low variance resampling algorithm to solve the degeneracy problem and the sample impoverishment problem.

Kinodynamic RRT Motion Planning for a Planar Hover-craft Robot | Python, PyBullet

Dec. 2021

- Developed a kinodynamic motion planning algorithm based on the Rapidly-exploring Random Tree (RRT) with the best-input extension algorithm to search for collision-free path in a 2D environment. [\[Video\]](#)
- Improved performance of computation time and path quality by 50% by increasing motion primitives for the algorithm.

A-Star (A*) Path Planning for the PR2 Robot | Python, PyBullet

Oct. 2021

- Implement the A* search-based algorithm to find the shortest collision-free path for the PR2 robot to reach the goal.
- Reduced the path cost by 20 % by expanding the successor function from 4-connected to 8-connected.

PUBLICATIONS

Journal Article

- **Y.-L. Lai**, P.-L. Chen, T.-C. Su, W.-Y. Hwang, S.-F. Chen, and P.-L. Yen, "A collaborative robot for tea harvesting with adjustable autonomy," *Cybernetics and Systems*, pp. 1–19, 2021.

Conference Proceeding

- **Y.-L. Lai**, P.-L. Chen, and P.-L. Yen, "A human-robot cooperative vehicle for tea plucking," in *2020 IEEE 7th International Conference on Control, Decision and Information Technologies (CoDIT)*, 2020.