Pin-Yun Hung

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Skills

- **Technical Knowledge:** Motion Planning, Classic Control (PID Control), Optimal Control (MPC, LQR), Behavior Tree, Kinematics, State Estimation (EKF), Path Planning (A*, D*), Fuzzy Control, Trajectory Optimization, Deep Learning
- **Software:** C/C++, Python, MATLAB & Simulink, Git, OpenCV, ROS, Linux, AutoCAD, LabVIEW

Education

University of California Berkeley, Berkeley, CA   *Aug 2022 – May 2023*
MEng in Mechanical Engineering. Specialized in Control of Robotic and Autonomous Systems. (GPA: 3.78)

National Tsing Hua University, **Hsinchu, Taiwan**   *Feb 2019 – Jun 2021*
B.S. in Mechanical Engineering (GPA: 3.87)

National Taiwan Ocean University, **Keelung City, Taiwan**   *Sep 2017 – Jan 2019*
Mechanical Engineering (GPA: 4.0)

Work Experience

System Engineer (Control & Robotics) - Point Robotics MedTech Inc., NTPC, Taiwan   *Jul 2021 – Jun 2022*

- Developed milling functions in C++ that save doctors 50% of operating time on spinal decompression.
- Redesigned a PID-based motor controller using MATLAB, resulting in 5 times more bandwidth.
- Implemented a control algorithm utilizing stiffness on Universal Robot, reducing drilling risk by 10%.
- Designed an impedance controller with C++ that stabilizes in 0.3s while milling.
- Formulated an algorithm that identifies possible penetration and halts milling with 0.2mm of bone left.

Teaching Assistant in Control system and Engineering Mathematic – NTHU   *Sep 2020 – Jun 2021*

- Prepared academic material on Classical Control and Numerical Analysis.
- Held TA sessions after class.

Project Experience

Distributed Multi-agent Interaction Modeling without Communication using Games and iLQR

Paper in submission

- Developed distributed trajectory optimization with obstacle avoidance in Python, using imagined potential games and iLQR to address infeasible problems in no-communication interactive scenarios.
- Established an interaction generation framework to generate diverse behaviors in closed-loop planning.
- Validated through simulated experiments, resolving 70% of deadlocks in narrow-way navigation problems.

Vehicle Motion Planning with Obstacles Avoidance using MPC

- Designed a dynamic obstacles avoidance algorithm using A*, MPC and LIDAR that response in 5 time steps.
- Led a team of three to do research and implement with IPOPT and Python in simulation within 3 weeks.

State Estimation for Autonomous Vehicle Tracking with EKF

- Implemented an Extended Kalman Filter in C++, using Encoders and IMU to estimate vehicle state.
- Reduced the mean square error of state estimation from 0.1 to 0.01 in simulation.

Autonomous Car Racing using Steering Control

- Utilized the Frenet frame, dynamic vehicle model, IPOPT and Python to generate a time-optimal race line.
- Applied pure pursuit control for race line tracking, reducing race time from 16s to 6.7s in simulation.

Automated Cell Analyzer using OpenCV and Deep Learning

- Designed a 2D cell image recognition algorithm with Python, OpenCV and YOLOv3, reaching 95% accuracy.
- Built a human-machine interface in Python to analyze and offer health information in 5 minutes.