Shiming Liang

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Personal Profile

I am a first-year master student in robotics at the University of Pennsylvania, well grounded in robotics, linear systems, state estimation, optimal control and machine learning. Interested in multi-agent exploration and distributed sensing, I am looking for related projects to participate in.

Education

University of Pennsylvania *Philadelphia, USA*

MSE in Robotics *August 2022 - Estimated May 2024*

- **Current GPA:** 4.00/4.00

Huazhong University of Science and Technology *Wuhan, China*

BEng in Mechanical Design, Manufacturing and Automation *September 2018 - June 2022*

- **GPA:** 3.94/4.00 (Top 6%)

University Projects

Learning in Robotics *Philadelphia, USA*

University of Pennsylvania *February 2023*

- Multi-agent relative pose estimation and cooperative mapping based on Unscented Kalman Filter.
- Implement a quaternion-based unscented Kalman filter to estimate rotation from IMU measurements.
- Implement Simultaneous Localization and Mapping(SLAM) with a particle filter.
- Use LQR controller and energy shaping controller to control a double inverted pendulum.
- **Skills:** Kalman Filter, LQR Control, Non-linear Control.

Advanced Robotics *Philadelphia, USA*

University of Pennsylvania *February 2023*

- Implement a linear backstepping controller and a geometric nonlinear controller for quadrotor.
- Implement Dijkstra and A* algorithm for path planning and generate dynamically feasible trajectories with minimum jerk spline
- Implement a complementary filter to estimate rotation from IMU measurements.
- Use the RANSAC algorithm to estimate pose from stereo rigs measurements.
- **Skills:** Quadrotor Dynamics, Linear System, Graph Search, Trajectory Generation, 2 View Geometry.

Machine Learning *Philadelphia, USA*

University of Pennsylvania *August 2022*

- Implement a range of unsupervised image segmentation methods: clustering, normalized cut, CNN based methods(DFC, W-Net).
- Develop a new method(DFC++, W-Net++) by assembling normalized cut and CNN-based methods.
- Achieve better performance compared to the CNN based methods in the context of small dataset.
- **Skills:** K-means, Gaussian Mixture Models, Normalized Cut, CNN.

Robotic Arm Pose Feedback System *Wuhan, China*

Huazhong University of Science and Technology *February 2022*

- Develop and test a pose feedback system with a laser tracker(API Radian) and an industrial robotic arm(KUKA KR 16).
- Implement 4 pose feedback control schemes based on PID controller and robot kinematics.
- Improve the absolute precision in position compared to open loop system(average error drop from 3.2799mm to 0.0641mm).
- **Skills:** Robotics Kinematics, PID Control, Signal Processing, Software Modular Design.

Dual Robotic Arms Collaborative Maneuvering *Wuhan, China*

Huazhong University of Science and Technology *September 2020*

- Derive the forward and inverse kinematics of UR5.
- Calibrate relative pose between the 2 robots using Kabsch algorithm.
- Generate constrained trajectories given a specific task: welding intersecting pipes.
- **Skills:** Robotics Kinematics, Rigid Body Transformation, ROS.

Skills

Programming Python, MATLAB, C++ on Linux and Windows

Mechanical SolidWorks, NX Unigraphics, 3D Printing, CNC Mill

Mathmatics linear algebra, probabilistic theory, boundary value problems(ODE, PDE), convex optimization and graph theories

Test Scores GRE 333 (V164+Q169, AW 3.5)

References available upon request.