Qinghang Liu

Beijing, China | qinghangliu@stu.pku.edu.cn |
https://qinghangliu.github.io |

Education

Peking University **Beijing, China**
B.S. in Engineering and Scientific Computing Sep, 2022 – Jul, 2026
B.S. in Economics Sep, 2023 – Jul, 2026

- GPA: 3.76/4.0 (Top 20%)

Research Experience

SwarmPRM: Probabilistic Roadmap Motion Planning for Large-Scale Swarm Robotic Systems Dec 2023 – Feb 2024

- Reproduce sampling-based algorithm dRRT* for comparison experiments.

Decentralized MPC for non-linear dynamics Swarm System March 2024 – July 2024

- We propose an algorithm that can control thousands of robots to follow a time-varying formation in the shape of a Gaussian Mixture Model.
- The MPC-based algorithm can generate energy-saving and collision-free trajectories for robots in cluttered environments.
- We adopt the idea of differential flatness to transform the motion planning problem of non-linear systems to the optimization of its linear flat outputs.
- We have deployed the algorithm on real-world robot cars to show its robustness.

Reinforcement Learning-Driven Path Planning for Large-Scale Swarm Robots August 2024 – Present

- We propose an RL algorithm that can generate collision-minimized PDF trajectories, which can be used to represent the macroscopic state of the swarm.

Publications

SwarmPRM: Probabilistic Roadmap Motion Planning for Large-Scale Swarm Robotic Systems IROS 2024

Yunze Hu, Xuru Yang,Kangjie Zhou,***Qinghang Liu***, Kang Ding,Han Gao,Pingping Zhu,Chang Liu

Projects

A self-designed deep learning framework

- Developed a deep learning framework in reference to PyTorch.
- Reproduced basic operators (convolution layer, fully connected layer) and the Autograd mechanism by CUDA and Python respectively.
- The framework can recognize hand-written digits in MNIST with an accuracy rate of over 70%.
- Tools Used: CUDA, Python

Technologies

Languages: C++, Python, Matlab, CUDA