Han WANG

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EDUCATIONAL BACKGROUND

ETH Zurich Master: Robotics, Systems and Control **Sep 2021 -**

University of Wisconsin, Madison Research Assistant **Apr 2020 - Oct 2020**

Topic: Design Safe Trajectories for Quadcopters

RESEARCH EXPERIENCE

Research Assistant in the Department of Mechanical Engineering, University of Wisconsin, Madison **Apr 2020 -Oct 2020**

Advisor: Prof. Xiangru Xu, Assistant Professor at University of Wisconsin, Madison

Project I: Design Safe Trajectories for Quadcopters

- Implement different algorithms including Dijkstra, PRM, A*, RRT, RRT*, informed RRT* to obtain an initial path, and analyzed their advantages and disadvantages in different situations.
- Generated a "minimum snap" trajectory based on clamped B-splines, and reformulated it into an unconstrained QP problem, which decreased the running time from 60×10^{-4} s to 8×10^{-4} s.
- Determined the optimal time allocation, modified the total time to meet actuator constraints, achieved collision-checking and reselected waypoints, which further ensured the safety and feasibility of trajectories.

Semester Project, ETH Zurich **Feb 2022 -Jun 2022**

Advisor: Prof. Margarita Chli, Vision for Robotics Lab

Project II: Temporal Sampling-Based Algorithm for Motion Planning in Dynamic Environments

(Report: https://drive.google.com/file/d/1nWI-TFd0OvxST6b4Oz1cm-8SW6Fwh9Tj/view?usp=sharing)

- Implemented Temporal RRT* planner in Python and C++, which is able to generate a path without colliding into moving obstacles.
- Implemented Temporal Dubins RRT* for dubins cars, and Temporal Kinodynamic RRT* for quadrotors.
- Performed a benchmark to compare the performance of T-RRT*, T-PRM, OMPL PRM and OMPL RRT* algorithms, and the experiment shows that T-RRT* always generates the shortest safe path in the dynamic environments.
- Simulate the new path planner on UAVs and ground robots.

Other topics learned and projects performed in the classes:

- Robot Dynamic, Autonomous Mobile Robots, Theory of Robotics and Mechatronics, Planning and Decision Making for Autonomous Robots, Model Predictive Control
- Vision Algorithms for Mobile Robotics: implement a simple visual odometry.
- Deep Learning for Autonomous Driving: implement semantic segmentation and depth estimation with deep neural networks.
- Dynamic Programming and Optimal Control: Policy Iteration, Value Iteration to find the optimal policy.

SKILLS

MATLAB / Python / C++ / ROS