

# 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  $60 \times 10^{-4}$  s to  $8 \times 10^{-4}$  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, Dynamic Programming and Optimal Control, 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,

## SKILLS

MATLAB / Python / C++ / ROS