PENGDA MAO

XueYuan Road No.37, HianDian District, Beijing, 100191, P.R.China
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Education

Ph.D. Candidate in Guidance, Navigation and Control **Sep. 2022 – Present**
Department of Automation, Beihang University, Beijing, China *Advisor: Prof. Quan Quan*

Master in Guidance, Navigation and Control **Sep. 2020 – July 2022**
Department of Automation, Beihang University, Beijing, China *Advisor: Prof. Quan Quan*

B.S. in Automation **Sep. 2016 – July 2020**
Shen Yuan Honors College, Beihang University, Beijing, China

Research Interest

Robotics, Trajectory Planning, Optimization Control, Swarm Robotics

Publications

1 **Pengda Mao**, Shuli Lv, and Quan Quan, " Tube-RRT*: Efficient Homotopic Path Planning for Swarm Robotics Passing-Through Large-Scale Obstacle Environments," *IEEE Robotics and Automation Letters* (**RA-L**), Vol 10, No 3, 2025, 10.1109/LRA.2025.3531151.

2 **Pengda Mao**, Rao Fu, and Quan Quan, "Optimal Virtual Tube Planning and Control for Swarm Robotics," *International Journal of Robotics Research* (**IJRR**), Vol 43, No 5, 2024, https://doi.org/10.1177/02783649231210012 (Cover Paper).

3 **Pengda Mao**, and Quan Quan, "Making Robotics Swarm Flow More Smoothly: A Regular Virtual Tube Model," *IEEE/RSJ International Conference on Intelligent Robots and Systems* (**IROS**), pp. 4498-4504, 2022, 10.1109/IROS47612.2022.9981842.

4 **Pengda Mao**, Yan Gao, Bo Wang, An Yan, Xiaoyu Chi, and Quan Quan, "Fast Light Show Design Platform for K-12 Children," *IEEE International Conference on Robotics and Automation* (**ICRA**), pp. 9396-9402, 2021, 10.1109/ICRA48506.2021.9561445.

5 Shuli Lv, **Pengda Mao**, and Quan Quan, " Mean-Field Based Time-Optimal Spatial Iterative Learning Within a Virtual Tube," *IEEE Control Systems Letters* (**L-CSS**), pp. 2021-2026, 2024, 10.1109/LCSYS.2024.3425331.

Research Experience

Trajectory Planning and Control for Swarm Robotics **Apr. 2022**

- Introduced the concept of the "optimal virtual tube" for swarm robotics passing through obstacles-dense environment.
- Proposed a method for generating a set including infinite homotopic optimal trajectories.
- Combined with model predictive control (MPC), simulations and experimental validations were conducted to confirm the effectiveness of the proposed method.

Unmanned Aerial Vehicle (UAV) Intelligent Racing Competition **Oct. 2021**

- Implemented YOLO for circular object detection in Airsim simulated environments, and employing estimation algorithms to predict the motion state of dynamic circular objects.
- Implemented visual servo control for autonomous landing and crossing diagonal gaps during actual flight of unmanned aerial vehicles.
- In the simulation competition, achieved first place; in the actual flight competition, secured second place.

Fast Light Show Platform Design **Aug. 2020**

- Responsible for the research and development of algorithms for drone swarms, employing a model-based approach and utilizing the artificial potential field method to achieve collision avoidance and trajectory generation.
- Completed the design, construction, and testing of the platform prototype, and conducted actual flight experiments.

Selected Awards

Specially Invited Guest in Robot Motion Planning Lecture Series
Awarded by Shenlan College *Aug. 2024*

Beihang Outstanding Graduates
Top 10%, awarded by Beihang University *Mar. 2024*

The First Prize Scholarship
Top 15%, awarded by Beihang University *Sep. 2022*

Beihang Outstanding Graduates
Top 10%, awarded by Beihang University *July 2020*

Beihang Outstanding Student
Top 10%, awarded by Beihang University *Mar. 2017*

Technical Skills

Languages: English at academic and daily communication level (CET-6)
Solver: OSQP, MOSEK
Programming: C++, Matlab, Python, LaTeX
Experiment: Possesses multirotor control skills and experience in drone swarm testing and real flight.