Jingyi Huang

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Education

- **Beihang University** — Sept. 2020 - now
  Master student in Control Science and Engineering, GPA:85/100 — *Advisor: Prof. Liang HAN*

- **INSA Toulouse** — Sept. 2019 - Jan. 2020
  Exchange student, Ingénierie des Matériaux, Composants et Systèmes

- **Beihang University** — Sept. 2016 – June 2020
  Bachelor of Information and Computer Science, École centrale de Pékin

Research Interests

My research includes formation control of Unmanned Aerial Vehicles (UAVs), path planning problems, and artificial intelligence applications in UAVs' decision-making and planning.

Publications

Paper

1. [**CAC'23**] Jingyi Huang, Qingke Tan, Jiming Ma, Liang Han, "Path Planning Method Using Dyna-Q Algorithm under Complex Urban Environment", *Chinese Automation Congress (CAC)*, 2022. [pdf]

Research Experiences

Stars Lab, Beihang University — *Beijing & Hangzhou, China*

- **Consensus Based Multi UAV Control and planning** — Nov. 2022 - Present
  Master's Thesis — *Advisor: Prof. Liang HAN*
  - **Problem**: 1.In collaborative issue tracking, I want to use a consensus approach for group formation control. To save communication resources, I need to employ event-triggered control methods, combining consistency control and event-triggered methods to design the formation control strategy; 2.I need to design the paths for multiple agents to facilitate target tracking; 3.It is necessary to devise a multi-source information fusion method to obtain accurate positions of the formation agents.
  - **Method**: Consensus based algo; Event Trigger algo; Multi-agent Path Planning; Kalman filtering
  - **Experiment**: OptiTrack, UWB, Tello, Robomaster EP

- **Multi-Agent Decision Control Model for Information Gathering Task** — Apr. 2023 - Sept. 2023
  Developper, Collision Avoidance part — *Advisor: Prof. Liang HAN*
  - **Aim**: Develop a collision avoidance algorithm for multi-agent, avoid restricted zones and prevent collisions between agents in a given region.
  - **Method**: Employ the method of artificial potential fields(APF) for collision avoidance among agents. Employ OpenCV to discretize the map into grids in the avoidance zone. Utilize the A* algorithm to compute the collision-free path. In scenarios requiring simultaneous obstacle avoidance and collision evasion, determine the repulsive forces of the agents and the avoidance zone and apply APF.
  - **Achievement**: This research is part of our team's participation in the 18th "Challenge Cup Jie Bang Gua Shuai" National College Student Curricular Academic Science and Technology Works Competition. And we got the Grand Prize!

- **Path Planning Method Using Dyna-Q Algorithm** — Aug. 2022 - Sept. 2022
  Researcher — *Advisor: Prof. Liang HAN*
  - **Aim**: Do simulation on a new simulation platform and test Dyna-Q based path planning algorithme.
  - **Method**: Use Dyna-Q to plan paths in a priori map. Employ potential field method and PID control for the autonomous vehicle to follow the designated line. Use PID control for the UAV to track the autonomous vehicle.
  - **Achievement**: The paper has been accepted by CAC 2022, see the 1.

- **Development of a 3D Simulator for Swarm Robots** — May. 2022 - Aug. 2022
  Developper, UGV part — *Advisor: Prof. Liang HAN*
  - **Aim**: Develop the UGV(Unmanned Ground Vehicle) model so that the self-developed simulator can conduct heterogeneous swarms simulation. This part encompasses the dynamic modeling of the UGV, the application of vector field-based control methods for the autonomous vehicle, and the presentation of test examples within the simulation platform, along with corresponding graphs to validate the results.
  - **Method**: Implement the modular simulation for UGVs, including *path follower*, *autopilot*, and *dynamics*. Dynamics include a dynamic bicycle model with nonlinear tire force laws. Some relevant parameters for the magic formula was found in MathWorks. Autopilot includes a PID controller to let the UGV achieve desired speed and heading angle. Path follower includes a designed vector field(As the vehicle moves farther from the planned path, the vector becomes more perpendicular to the intended route) to guide the UGV to the desired path. The vector at a specific location represents the direction and speed that the vehicle needs to control itself at that point.

Academic Projects, Beihang University　　　　　　　　　　　　　　　　　　　　　　　*Beijing, China*

- **LEGO Mecanum Wheel Car Path Following Control**　　　　　　　Dec. 2021 - Jan. 2022
  PID Coding, Course Project of Automatic Control　　　　　　　　　*Advisor: Prof. Jiming MA*
  - Given many waypoints, design a PID controller to enable a LEGO car to navigate through the waypoints and reach the destination as quickly as possible. The final assessment will evaluate the completion time and accuracy.
  - Total time is 3min 1sec and got 86/100 in this course.

Teaching Assistant, Beihang University　　　　　　　　　　　　　　　　　　　　　　*Beijing, China*

- **Research Class – Planning Control Simulation and Experiments**　　　　　Feb. 2023 - Nov. 2023
  Simulation and Experimental Teaching
  - **Teaching Content**: Do control and planning simulation using simulation platform developed by our lab. Use A star as the front-end of path planning while no back-end optimization. Use PID control. Use UWB device for localization.
  - **Results**: Students completed a complex navigation task while avoiding all the given static obstacles in a given area, both in the simulation platform and in the real set (UWB, Tello, RM EP).

Skills Summary

- **Languages:**　Chinese (Mother Tongue), English (IELTS Academic 7.0), French (TCF B1)
- **Coding:**　　AI Prompt, Python(OpenCV, Pandas, etc), MATLAB, Git, LaTeX, UML, Java (a little)
- **Hobbies:**　　Photography [homepage], Badminton, Eight ball, Genshin Impart, Animation, Travelling, Singing

Honors and Awards

- Grand Prize of Challenge Cup "Jie Bang Gua Shuai"　　　　　　　　　　　　　　　　2023
- Beihang Academic Scholarship　　　　　　　　　　　　　　　　　　　　　　　$2021 \sim 2022$
- Beihang Freshman Scholarship　　　　　　　　　　　　　　　　　　　　　　　　　2020
- China Scholarship Council (CSC) scholarship　　　　　　　　　　　　　　　　　　　2019