Long Xu

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Education

Zhejiang University (ZJU), Hangzhou, Zhejiang, China　　　　　　　　　　**2022 – Present**

M.Phil. in Electronic Information, College of Control Science and Engineering.

- Advisor: Prof. Fei Gao

Zhejiang University (ZJU), Hangzhou, Zhejiang, China　　　　　　　　　　**2018 – 2022**

B.Eng. in Automation, College of Control Science and Engineering.

Honors and awards

- **1st** prize at RoboMaster 2022 University AI Challenge　　　　　　　　　　2022
- First Academic Scholarship of Zhejiang University (top 3%)　　　　　　　　2019
- Zhejiang Government Scholarship (top 3%)　　　　　　　　　　　　　　　2020

Experiences & Projects (need to be edited)

FAST (Field Autonomous System & compuTing) Lab　　　　　　**05/2021 – Present**

RoboMaster 2022 University AI Challenge (RMUA2022)

- Designed motion planning module. [Vedio]
- Realized **dynamic obstacle avoidance**, **dual-robot collaboration** and **rapid local re-planning**.
- Accelerate the process of trajectory optimization by using **CUDA** and GPU.

Research on motion planning of mobile robots on unstructured road (Graduation Project)

- Designed a geometry-based local **terrain assessment** algorithm.
- Using **B-spline** curve parameterized trajectories, implemented a local planner that considers **curvature constraint** and **terrain roughness**. [Vedio]

Design and manufacture of Ackermann chassis mobile robot (Research Assistant)

- Refitted the climbing remote control toy car into a **robot**. [Vedio]
- Implemented basis speed controller with STM32 and PID controller.
- Reproduced and implemented **Stanley trajectory tracking controller** with C++ and ROS.
- Reproduced and implemented the motion planning algorithm proposed in the work "Driving on Point Clouds"

Projects of Some Courses　　　　　　　　　　　　　　　　　**09/2018 – 06/2022**

Traffic control solution considering tidal lane Advised by Prof. Jun Liang　　*Team leader*

- Designed a novel implementation of reinforcement algorithms on traffic signal control.
- Implemented reinforcement learning algorithm **DDPG** and **3DQN** on time-distributing of traffic signal lights.
- **Took tidal lane into consideration**, compared it with **3DQN** and traditional methods.

Using Dogleg Method on Levenberg-Marquardt Method Advised by Prof. Heyu Wang

- Used Dogleg Method to solve the subproblem of Least Squares problem.
- Verified convergence and convergence rate of this method.
- Tested the algorithm on small-scale numerical examples.

Student Research Training Project　　　　　　　　　　　　　　**04/2019 – 04/2020**

Image-based Foreign body detection of High-speed Railway Catenary　　　　*Team leader*

Advised by Prof. Jiming Chen

- Used Yolo-v5s as the main detection framework, the result was **Excellent** [Vedio].
- Designed and implemented a **horizon segmentation** algorithm which was used as preprocessing.
- Accelerated the inference by **TensorRT**, the speed of detection is 34 FPS on Jetson Nano.

Publications

(*Equal Contribution)

[1] J. Wang*, **L. Xu***, H. Fu, Z. Meng, C. Xu, Y. Cao, X. Lyu, F. Gao, "Towards Efficient Trajectory Generation for Ground Robots beyond 2D Environment", *IEEE International Conference on Robotics and Automation (ICRA)*, 2023.
[Paper][Vedio][Code]

[2] **L. Xu**, K. Chai, Z. Han, H. Liu, C. Xu, Y. Cao, F. Gao, "An Efficient Trajectory Planner for Car-like Robots on Uneven Terrain", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.
[Paper][Vedio][Code]

[3] C. Ma, Z. Han, T. Zhang, J. Wang, **L. Xu**, C. Li, C. Xu, F. Gao, "Decentralized Planning for Car-Like Robotic Swarm in Cluttered Environments", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.
[Paper][Vedio][Code]

[4] Z. Han, Y. Wu*, T. Li, L. Zhang, L. Pei, **L. Xu**, C. Li, C. Ma, C. Xu, S. Shen, F. Gao, "An Efficient Spatial-Temporal Trajectory Planner for Autonomous Vehicles in Unstructured Environments", *IEEE Transactions on Intelligent Transportation Systems*, 2023.
[Paper][Vedio][Code]

Skills

- **Programming**: C++/C, Python, MATLAB, Java, CUDA
- **Software Development**: UE, ROS, Pytorch
- **Hardware Development**: IoT chips (STM32, Arduino)

Additional activities

- Minister of Youth Volunteer Department of Youth League Committee, ZJU   2019
- Chief sax of Marching Band of Zhejiang University   2019