

# FU ZE

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## EDUCATION

### Shanghai Jiao Tong University (SJTU)

Shanghai, China

Robotics (GPA: 3.84/4.00; Rank: top 3%)

2021.09-2024.06

- Scholarships: National Scholarship for Graduate Students
- Core Modules: Matrix Theory, Computational Methods, Data Mining, Modern Control Theory, Intelligent Control, Advanced Mechanical Dynamics, Advanced Kinematics

### Xi'an Jiao Tong University (XJTU)

Xi'an, China

Mechanical Engineering (GPA: 4.06/4.3; Rank: 1/212)

2017.09-2021.07

- Selected in the International Elite Programme
- Scholarships: Baogang Scholarship, HIWIN Outstanding Student Scholarship (top 0.1%)
- Core Modules: Advanced Mathematics, Linear Algebra, Advanced Programming, Electronic and Electrical Technology, Microcomputer Principles and Interface Technology

## SELECTED PUBLICATIONS

- [1] **Fu, Z.**, Wen, L., Cai, P., Fu, D., et al. (2024). TrafficMCTS: A Closed-Loop Traffic Flow Generation Framework with Group-Based Monte Carlo Tree Search. *Journal: Transection on Intelligent Vehicles*.
- [2] Li, Y., **Fu, Z.** (2024). Experience-Oriented Imitation Locomotion Learning for Legged Mobile Lander with Awareness of Leg Distortions and Extraterrestrial Environment. *Engineering Applications of Artificial Intelligence*.
- [3] **Fu, Z.**, Li, Y. (2023). Swing Leg Motion Strategy for Heavy-load Legged Robot Based on Force Sensing. *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*.
- [4] **Fu, Z.**, Xu, H., Li, Y., & Guo, W. (2022). Design of a Novel Wheel-Legged Robot with Rim Shape Changeable Wheels. *Advances in Mechanism, Machine Science and Engineering in China: Proceedings of IFToMM CCMMS 2022*, 315.

## RESEARCH EXPERIENCE

### Multi-agent Cooperative Decision Planning in Large-scale Complex Traffic Flow

2022.12-2023.03

Advisors: Dr. Pinlong Cai.

- Proposed a grouping algorithm based on interaction possibilities between vehicles.
- Proposed a multi-agent joint decision-making algorithm based on Monte Carlo Tree Search (MCTS), enabling vehicles to complete driving intentions such as lane changing, overtaking, and merging.
- Enhanced the efficiency of multi-vehicle joint decision-making by four times while maintaining a decision success rate of over 95% compared to other methods.
- Proposed a dual closed-loop framework, which is capable of handling up to 80 vehicles simultaneously planning on a road network while maintaining an overall simulation acceleration ratio of over 110%.
- Introduced the driver's social value orientation (SVO), allowing for diversity in traffic flow.
- Paper Link: <https://arxiv.org/abs/2308.12797>
- Video Link: <https://youtu.be/Tr0QWCasO54>

### Force Sensing Inspection of a Novel Legged Quadruped Lander

2021.11-2022.11

Advisors: Prof. Weizhong Guo | Chinese National Natural Science Foundation Project

- Developed a dynamic simulation environment for the landing and inspection processes.
- Developed control modules including kinematic inverse solutions and trajectory interpolation, implemented the communication system using ROS.
- Established an external force sensing method based on joint currents and Kalman filter.
- Proposed dynamic foot trajectory planning algorithms based on D\* and finite state machine, which enabled heavy-load legged robots to pass through complex terrains autonomously and smoothly.
- Proposed a localization algorithm based on ground contact point and point cloud registration.
- Paper Link: <https://arxiv.org/abs/2309.01112>

## Experience-Oriented Imitation Locomotion Learning for Legged Robot

2023.04-2024.05

Advisors: Prof. Weizhong Guo.

- An adaptive locomotion learning framework for the ReLML, a legged mobile lander with varying dimensions pre-landing and post-landing, is proposed for extraterrestrial exploration.
- A simulation has been constructed to facilitate large-scale training for spatial-parallel-leg robots.
- A pre-landing experience-oriented imitation learning method induces effective locomotion of postlanding ReLML with distorted legs in unstructured environments.

## WORK EXPERIENCE

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### Baidu Apollo

2024.03-2024.06

*Decision-making & Planning Algorithm Intern*

- 1) Proposed an interactive game algorithm for left and right turns of autonomous vehicle [JIYUE-01](#).
- 2) Deployed the algorithm on JIYUE-01 and tested it in the real road environment.

### Ant Group

2023.06-2023.09

*Embedded Software and Hardware Development Intern (Digital Technology - AIOT Department)*

- 1) Implemented a lightweight Zero-Knowledge Proof (ZKP) algorithm based on zkSNARK protocol, deployed the ZKP algorithm on embedded devices with ARM architecture.
- 2) Developed Solidity smart contracts and deployed them on both Ethereum for on-chain verification, developed a blockchain interaction tool using Web3.js.
- 3) Applied for an CHN patent as the **first** author.

### Shanghai Artificial Intelligence Laboratory

2022.12-2023.03

*Decision-making & Planning Algorithm Intern (Intelligent Transport Platform)*

- 3) Investigated joint decision-making of multiple intelligent agents under large-scale complex traffic flow.
- 4) Completed an SCI journal paper as the **first** author.

## SCIENCE COMPETITIONS

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### "Huawei Cup" National Mathematical Modeling Competition, National 2<sup>nd</sup> Prize

2022.10

- Team leader, responsible for modeling and analyzing, coding, and paper writing.

### National College Student Mechanical Design Innovation Competition, National 1<sup>st</sup> Prize

2021.02

- Team leader, take charge of innovative structural design and control system development.

### RoboCup China Robot Competition, National 1<sup>st</sup> Prize

2020.08

- Algorithm group leader, responsible for designing and debugging robot path planning algorithms.

## SKILLS & INTERESTS

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- **Language Skills:** English (fluent, IELTS Overall Band 7.5), Chinese(native)
- **Programming Languages:** C/C++, Matlab, Python, JavaScript, C#
- **Operating System:** Robot Operating System (ROS), Linux, and experienced in embedded system development with devices such as Raspberry Pi, STM32, etc.
- **Behavioral decision-making:** Monte Carlo Tree Search, imitation learning, reinforcement learning.
- **Path Planning:** Search-based algorithms (A\*, D\*), sampling-based algorithms (PRM/RRT), optimization-based algorithms for path planning, and convex optimization principle.
- **Robotics:** Kinematic and dynamic modeling methods for serial and parallel mechanisms.
- **Simulation Software:** Toolkit for RL such as OpenAI-Gym and NVIDIA Isaac, dynamic analysis software such as Adams and its co-simulation with Simulink, 3D modeling software such as SolidWorks and UG, FEA software such as ANSYS.
- **Control Theory:** Modern control theory, fuzzy control, and model predictive control (MPC), with experience in applying industrial controllers.
- **Interests:** Fitness, football, table tennis, running, photography.
- **Teaching Activity:** TA for *Design and Manufacturing* (Outstanding Teaching Assistant Award).
- **Leadership:** Team Leader of RoboCup team in XJTU, and Director of Media Studio at Runners' Club.