

Interests: Dynamics and Control, Reinforcement Learning, Formation Flying

## Education

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- **Beihang University**

M.S. Candidate in Spacecraft Dynamics and Control, GPA:3.89/4 (5%)

Sept. 2022 - Now

- **Beihang University**

B.Eng. in Aerospace Engineering, GPA:3.8/4 (5%), **National Scholarship** (1%) Sept. 2018 - Jun. 2022

## Publications

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### Under Review

- Zicen Xiong, Yue Wang, “Constant-Thrust Orbital Transfer about Binary Asteroids Using Bilinear Tangent Guidance”, *IEEE Transactions on Aerospace and Electronic Systems, TAES* :**minor revision**[\[pdf\]](#)

### Conferences

- Pengfei Lu, Shuhao Cui, Zicen Xiong, Yongjie Cheng, Yue Wang, “Trajectory Design of Reusable Transport Stations Between the Earth and Mars”, *35th National Symposium on Space Exploration (in Chinese), NSSE*, 2023[\[slide\]](#)
- Zicen Xiong, Ruikang Zhang, Yue Wang, “Near-optimal Finite-thrust Orbital Control Near A Binary Asteroid System”, *28th International Symposium on Space Flight Dynamics, ISSFD*, 2022 [\[pdf\]](#)

## Researches

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- **Satellite Formation Reconfiguration using Reinforcement Learning** Nov. 2023 - Present  
*Master's Thesis*
  - **Problem:** The deterministic control methods have limited autonomy and difficulties in handling non-linear constraints in satellite formation flying. How to achieve near-optimal/optimal multi-agent cooperation, reconfiguration and collision avoidance control in the absence/insufficient knowledge of prior dynamics?
  - **Method:** Multi-agent learning based MPC is being developed for satellite formation flying tracking problems.
- **Free-Flying Cubic Robot for Space Station** Jun. 2023 - Present  
*Conceptual Design for IAF-Space Universities CubeSat Challenge, SUCC*
  - **Aim:** Self-propelled in-cabin assistant robot for astronauts in space stations with 6-DoF arm
  - **Method:** Double-gimbal fans enables the robot to have 6 DoF. SLAM mapping is used for in-cabin navigation. The PyTorch deep neural network is applied to monitoring astronauts's emotion.
  - The prototype is still under development and the conceptual design won 2nd Prize in China Grand Finale.[\[pdf\]](#)[\[report\]](#)
- **Trajectory Design of Reusable Transport Stations Between the Earth and Mars** Aug. 2022 - Oct. 2022  
*Solution to China Trajectory Optimization Competition, CTOC*
  - **Problem:** Martian migration mission requires the design of interplanetary transfers, escapes and captures of the Earth-Moon system, the optimization of massive missions and station sequences.
  - **Method:** The interplanetary transfer are obtained by developing a definitely matching gravity-assist optimization method and weak stability boundary (WSB). The low-energy escapes and captures in the Earth-Moon system is achieved via solving of a time-phase decoupling nonlinear programming (NLP) using particle swarm optimization (PSO) and dynamic programming (DP).[\[pdf\]](#)
  - Efficiently transporting over 4,000 passengers to Mars in 20 yrs with only 24 ships. Ranked 3rd Team in CTOC12 and orally reported at 35th NSSE.[\[report\]](#)
- **Constant-Thrust Orbital Transfer about Binary Asteroids Using Bilinear Tangent Guidance** Dec. 2021 - May 2023  
*Bachelor Thesis*

- **Problem:** Current guidance algorithms in circular restricted 3-body problem(R3BP) are computationally expensive for autonomous orbital tracking near asteroids. This research tries to achieve efficient guidance for autonomous constant low-thrust guidance about binary asteroid systems.
- **Method:** Spherical harmonic model is used for gravitational field modelling. A bilinear tangent constant-thrust guidance is derived by Pontryagin's maximum principle and manifold theory.
- Acquire near-optimal and fuel-efficient control profiles and 200 times faster than IPOPT results. Talks on 2nd International Stardust Conference [[abstract](#)] and ISSFD28[[pdf](#)][[slide](#)]
- **Multi-functional Electronic Scale with Quotation**  
*Leader, Course Project of Electrical and Electronic Experiment 2* Sept. 2020 - Dec. 2020
  - Proteus design, prototype made with 74 series and NE555. Support functions: reading strain gauge weight, overweight alarm, delayed shutdown, unit conversion, tare module, unit price-total price display. Score:95/100.
- **Heavy Load P3E Class Piston-Powered Aeromodelling**  
*Member, Beihang Aeromodelling Team* Sept. 2018 - Dec. 2019
  - The aircraft for time-limited airdrop competition. Participated in manufacturing the composite parts for all race aircraft and fixed-point automatic airdrop mechanism based on Arduino PIX and GPS.
  - **Achievement:** Championship in 2019 China Aeromodelling Design Challenge.[[video](#)]

## Competitions

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- **2nd Prize, 2nd Space Universities CubeSat Challenge, SUCC** Aug. 2023  
by International Astronautical Federation
- **1st Prize, 12th China's Trajectory Optimization Competition, CTOC** Oct. 2022  
by Center for Space Utilization, Chinese Academy of Sciences Ranked 3rd Team[[rankinglist](#)]
- **2nd Prize, 13th National Mechanics Competition for College Students** May. 2021  
by Chinese Society of Theoretical and Applied Mechanics Ranked 130th[[rankinglist](#)]
- **1st Prize in 12th National Mathematics Competition for College Students** Dec. 2020  
by Chinese Society of Theoretical and Applied Mechanics
- **2nd Prize in China Undergraduate Mathematical Contest in Modeling 2020** Oct. 2020  
by China Society for Industrial and Applied Mathematics
- **Champion in China Aeromodelling Design Challenge 2019** Oct. 2019  
by Aero Sports Federation of China Champion Team[[rankinglist](#)]

## Honors and Awards

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Items by Ministry of Education

- **National Scholarship, Top 1% Student in the Academic Year** [[announcement](#)][[report](#)] 2021

Items by Beihang University

- **Academic Excellence Scholarship for Graduates** 2022, 2023
- **Freshman Scholarship** 2022
- **Outstanding Graduate** 2022
- **Academic Excellence Scholarship for Undergraduates** 2019 - 2021

## Skills

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- **Language:** English(IELTS 8.0, R9L9W7.5S6), Chinese(Native)
- **Coding:** Python, MATLAB, C/C++,  $\text{\LaTeX}$
- **Hard&Software:** Arduino, ROS2, CAD (SolidWorks), STK, ANSYS, Multisim, Proteus, ADAMS
- **Photograph:** Aircrafts[[homepage](#)]/Railway/Astronomical/Underwater/Wildlife[[video](#)]
- **Misc.:** HAM(Amateur Radio)[[BI1RKD's QRZ](#)], Illustration[[report](#)], Rescue Diver, Weightlifting, Miniature Model Manufacturing