Zicen Xiong

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Interests: Robotics, Dynamics and Control, Reinforcement Learning

Education

- **Beihang University**
  M.S. Candidate in Dynamics and Control, GPA:3.89/4 (5%) Sept. 2022 - Now

- **Beihang University**
  B.Eng. in Flight Vehicle Design, GPA:3.8/4 (5%), **National Scholarship** (1%) Sept. 2018 - Jun. 2022

Publications

Journals

- Zicen Xiong, Yue Wang, "Constant-Thrust Orbital Transfer about Binary Asteroids Using BLT Guidance", *IEEE TRANS on AERO ELEC SYS.*[paper]

Conferences

- Zicen Xiong, Yue Wang, Zheng Chen, "Satellite formation control using multi-agent deep reinforcement learning", *International Astronautical Congress, IAC*, 2024.OpenSource:[code]

- 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

- **In-cabin Robot *LINGSUO*** Apr. 2024 - Present
  World Robot Contest 2024
  - **Problem:** Human-machine synergy can strongly affect the efficiency in the space. Teleoperation robots provide a feasible solution.
  - Jetson Nano, ROS, OPENCV

- **In-cabin Teleoperation Assistant Robotic Arm** Jan. 2024 - Present
  Research Project
  - **Problem:** Human-machine synergy can strongly affect the efficiency in the space. Teleoperation robots provide a feasible solution.
  - **Hardware:** 7 DoF ARM: OMEGA Haptic-FRANKA Panda; Agile Hand: SENSEGlove-Libertec

- **Satellite Formation Reconfiguration using Reinforcement Learning** Nov. 2023 - Present
  Master's Thesis
  - **Aim:** Multi-agent Learning algorithms are needed in cooperation, reconfiguration and collision avoidance control to acquire autonomy on handling nonlinear constraints in satellite formation flying.
  - **Method:** Multi-agent Soft Actor-critic is developed for satellite formation flying tracking problems and over-performed some state of art methods, e.g. MAPPO and MADDPG.
  - Accepted by *International Astronautical Congress, IAC*, 2024.[code]

- **Free-Flying Cubic Robot for Space Station**
  Conceptual Design for IAF-Space Universities CubeSat Challenge, SUCC Jun. 2023 - Present
  - **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 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**
  Solution to China Trajectory Optimization Competition, CTOC Aug. 2022 - Oct. 2022
  - **Method:**The low-energy E-M orbital control is solved through gravity-assist optimization method and weak stability boundary (WSB) and then searched via particle swarm optimization(PSO) and dynamic programing(DP).

- Ranked 3rd Team in CTOC12 and orally reported at 35th NSSE.[report][pdf]

- **Constant-Thrust Orbital Transfer about Binary Asteroids Using BLT Control**
  Bachelor Thesis Dec. 2021 - May 2023
  - **Aim:** Current control algorithms near asteroids are computationally expensive for autonomous orbital tracking. This research tries to achieve efficient guidance for autonomous constant low-thrust guidance about binary asteroid systems.
  - **Method:** A bilinear tangent control is derived by Pontryagin's maximum principle and manifold theory. Acquire near-optimal 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**
  Course Project of Electrical and Electronic Experiment 2 Sept. 2020 - Dec. 2020
  - Proteus design, prototype made with 74 series and NE555. Support functions: tare module, unit price-total price display. Score:95/100.[slide]

- **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

- **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

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

- **Language**: English(IELTS 8.0, TOEFL 104), Chinese(Native)
- **Coding**: Python, MATLAB, C/C++, C#, Git, bash, LaTeX
- **Hardware**: Arduino, STM32, Jetson Nano
- **Software**: ROS, CAD (SolidWorks), ADAMS, ANSYS, Multisim, Proteus,
- **Photograph**: Aircrafts[homepage]/Railway/Astronomical/Underwater/Wildlife[video]
- **Misc.**: Miniature Model Manufacturing, HAM(Amateur Radio)[**BI1RKD's QRZ**], Illustration[report]