Zhongtao(Tony) Guan

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Education and Research Experience

- **ShanghaiTech University** *Sep. 2021 - Present*
  Bachelor of Engineering, Electronic Information Engineering Shanghai, China
  - GPA: 3.80/4.00; Ranking 3/56
  - Core courses: Introduction to Control, Signals and Systems, Electromagnetic, Power Electronics
  - Scholarship: Undergrad. National Exchange Scholarship; International Conference Scholarship
- **Massachusetts Institute of Technology** *Feb. 2024 - May.2024*
  Special Student Program in EECS Cambridge, Massachusetts, U.S.
  - GPA: 5.00/5.00
  - Core courses: Underactuated Robotics, Nonlinear Control
- **Massachusetts Institute of Technology** *July. 2024 - Present*
  Undergraduate Visiting Student in EECS Cambridge, Massachusetts, U.S.
  - Advisor: Kevin Chen

Publications

C=Conference, J=Journal, S=In Submission, +=equal contribution

[S.1] Yi-Hsuan Hsiao^{+}, Songnan Bai^{+}, **Zhongtao Guan**$^{+}$, et al. **Hybrid locomotion at the insect scale combined flying and jumping for enhanced efficiency and efficacy**. Manuscript submitted for publication in *Nature Machine Intelligence*.

[C.1] **Zhongtao Guan**, et al. **Preliminary Result of Cury: A Backdrivable Leg Design using Linear Actuators**. In *IEEE/RSJ International Conference on Intelligent Robots and Systems(IROS), 2024*.

[C.2] **Zhongtao Guan**, et al. **Accurate Single-Ended Fault Location for Cable-OHL Hybrid Transmission Lines**. In *Power and Energy Society General Meeting (PESGM), 2023*.

[C.3] Jiayu Yang, Yu Liu, Kang Yue, **Zhongtao Guan**, et al. **Closed-Form Solutions of Mutual Inductance and Load for LCC-S Wireless Power Transfer Systems**. In *3rd IEEE International Conference on Industrial Electronics for Sustainable Energy Systems, 2023*.

[C.4] Mengzhao Duan, Yu Liu, Ze Liu, Xinchen Zou and **Zhongtao Guan**. **A Group of Single-Ended Time-Domain Line Fault Location Methods Using Breaker Operation Information**. In *IEEE Power and Energy Society General Meeting (PESGM), 2023*.

Projects

- **Implicit Regularization and Dynamic Gain Control** *Sep. 2023- Jan. 2024*
  Advisor: Prof. Jiahao Chen [ ]
  - Presented a Bezier Curve-based nonlinear controller for improved tracking, efficiency, and disturbance rejection.
  - Proposed an open-source package for simulation and hardware deployment.
  - Proposed feasibility criteria using Sturms theorem, and Multi-Objective Optimization for fine tunning.
  - Proposed online numerical realization on embedded system using Brent's Method.
  - Proposed online control-point adapting using implicit regularization, sum-of-square.
  - This work is prepared for IEEE Transactions on Power Electronics Letter.
- **Sensor Autonomy for Insect-Scale Robots (Ongoing)** *July. 2024- Present*
  Advisor: Prof. Kevin Chen
  - Presented sensing-autonomy on insect scale robots.
  - Presented PCB fabrication and components selection under 200-mg weight.
- **Hybrid Locomotion at Insect Scale** *Jan. 2024- Sep. 2024*
  Advisor: Prof. Kevin Chen
  - Presented a sub-gram flapping-wing passive hopper at insect scale using soft actuator.
  - Demonstrated capabilities in overcoming obstacles, navigating challenging terrains, and exhibiting high agility.
  - Trajectory optimization and online NLMPC are used for complex task such as fast dynamic between slopes.
  - Contributed to controller design, experiments and data analysis.
  - This work is submitted to a journal: [S.1].

- **A Backdrivable Leg Design Using Linear Actuators** *Aug. 2023 - Jan. 2024*
  Advisor: Prof. Jiahao Chen [GitHub]
  * Developed a backdrivable 2-DoF leg prototype for walking and jumping.
  * Contributed to the design of electronic components, including a highly integrated AC motor drive.
  * Reduced the number of joint encoders through optimized mechanical design and electrical integration.
  * Built a simulation environment using the Webots simulator for closed-loop chain dynamics.
  * Acted as the project leader; responsible for mechatronics design and simulation.
  * This work has been accepted as a conference paper: [C.1].
- **Fault Location of Power Systems** *Jun. 2022 - Jan. 2023*
  Advisor: Prof. Yu Liu
  * Proposed methods for fault location on hybrid or purely overhead line power system.
  * Utilized fully distributed line model for accurate locating, while modified Eriksson method for analytical method .
  * Introduced breaker operation information for fault location of pure overhead-line power system.
  * Contributed to idea, methodology, experiments for [C.2]; proof reading and discussion for [C.4].
  * These works are accepted as conference papers [C.2], [C.4].
- **Design and Control of Inverter** *Jan. 2023 - Aug. 2023*
  Advisor: Prof. Yu Liu
  * Proposed analytical solutions of mutual inductance and load resistance for the LCC-S WPT system, without communication from the secondary side.
  * Designed and controlled a three-phase inverter for grid-connected photovoltaic systems.
  * This work is accepted as a conference paper: [C.3]

AWARDS

- **Outstanding Teaching Assistant** *2023*
  ShanghaiTech University, school of information and technology
  - Acted as head TA Electric Circuit.
  - Coordinated the workload of TAs, Recorded the class, lectured discussion/review session, graded homework.
- **RoboMaster University Championship** *2022*
  RoboMaster
  - Won 2nd Prize in Shanghai division, 3rd in national division
  - Acted as group leader; contributed to mechanical design.
- **National Undergraduate Electronic Design Contest** *2023*
  Shanghai Municipal Education Commission
  - Won 2nd Prize in Shanghai division
  - Acted as group leader; contributed to inverter design and control.
  - Included knowledge of device selection, embedded system, SVPWM and PLL.

SKILLS AND OTHERS

- **Programming Languages:** Python, C/C++, Julia, Matlab
- **Toolkit:** Simulink, Altuim Designer, KiCAD, Solidworks, LaTeX
- **Teaching:** Electric Circuit, Introduction to Control Project
- **Research:** Control Theory and its Application, Sensing and , and Mechatronic Design

REFERENCES

- **Research Supervisor:** Kevin Chen, Associate Professor Without Tenure, MIT, Contact: Email
- **Research Supervisor:** Jiahao Chen, Assistant Professor, ShanghaiTech, Contact:Email
- **Research Supervisor:** Yu Liu, Associate Professor, ShanghaiTech, Contact: Email