Xuyi Lian

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Education

Zhejiang University Sep 2022 - Jul 2026
Major in Aircraft Design and Engineering (Specialization: Aircraft Information and Electronics)
GPA: 3.62/4.0
Relevant Courses: Aerodynamics, Flight Dynamics, Embedded Computing Technology, Finite Element Method, Automatic Control, Signals and Systems, Digital Circuit, Robot Modeling and Control, Fundamentals of Pattern Recognition and Machine Learning.

Research Projects

Learning-based Attitude Estimation and CPG Control for a Robotic Butterfly Featuring Significant Oscillation Motion
Advisor: ***Prof. Tiefeng Li****, Institute of Applied Mechanics, Zhejiang University* Mar 2025 - Present

- Built a **3D-printed robotic platform** with **two independently driven servos**, incorporating onboard sensors and implementing a **sensor fusion** strategy for robust attitude estimation and control.
- Trained a **neural network** using servo outputs, angular velocities, and accelerations as inputs, with motion-capture attitude as reference outputs to learn accurate flight attitudes under oscillations.
- Integrated angular velocity measurements and neural network outputs applying an **Extended Kalman Filter (EKF)**, achieving accurate and robust attitude estimation for stable flight performance.
- Used **Central Pattern Generators (CPG)** to generate coordinated flapping signals for independent servos, optimizing flight stability with real-time attitude feedback.
- Validated the robustness and adaptability of the attitude estimation and control algorithms using **motion capture**, ensuring stable flight across different conditions.

Abdominal Undulation with Compliant Mechanism Improves Flight Performance of Biomimetic Robotic Butterfly
Advisor: ***Prof. Tiefeng Li****, Institute of Applied Mechanics, Zhejiang University* Apr 2024 - Mar 2025

- Aimed to develop a biomimetic robotic butterfly with a compliant mechanism that couples abdominal undulation and wing motion, enhancing overall **flight performance, stability, and efficiency**.
- Designed a flapping wing mechanism using a **3D-printed rigid PLA skeleton and flexible TPU hinges** to mimic the muscle contractiondriven wing flapping of a real butterfly.
- Integrated an abdominal undulation mechanism with a TPU pivot, carbon fiber rod, and PLA rings that undulates in **counter-phase** to the wing motion, simulating natural butterfly abdominal movement.
- Performed theoretical dynamic modeling which revealed that the flexible hinges **increase flapping frequency by 16.85%**, while abdominal undulation **enhances average lift by approximately 3.4%** and **amplifies pitch oscillation amplitude**.
- Validated the design through motion capture experiments, demonstrating a **10-meter flight distance and a 4-second flight duration**, along with significant improvements in stability and efficiency.

Characterization of Soft Materials under High Hydrostatic Pressure
Advisor: ***Prof. Tiefeng Li****, Institute of Applied Mechanics, Zhejiang University* Jul 2023 - Aug 2023

- Aimed to develop a spider-inspired quadruped robot with optical fiber sensors for sensitive vibration detection and adaptive tracking.
- Designed a robot with **vibration-sensitive leg structures** inspired by spiders, integrating optical fiber sensors to detect both environmental vibrations and the robots own motion.
- Developed a robust algorithm that processes vibration signals to **localize vibration sources** and **adapt the robots gait** accordingly.
- Performed experimental validation that demonstrated the robots ability to detect and react to vibrations, enhancing its responsiveness and adaptability in **dynamic environments**.

Awards

Second Prize in Zhejiang Province, Undergraduate Physics Competition Dec 2023
Student Innovation and Entrepreneurship Award 2023-2024
National Student Research Training Program (1/28) 2024

Skills

Core skills: Aircraft structure design, embedded system development, control system analysis, electronic circuit experiments, and fluid dynamics simulations.
Programming Skills: C/C++, MATLAB, Python, LaTex, Verilog
Software Tools: AutoCAD, Solidworks, Webots, Abaqus, MATLAB, Qgis, Vivado, Modelsim, Photoshop