TONGMIAO XU

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RESEARCH INTERESTS

My research interests include enhancing robotic manipulation and interaction with the physical world through efficient control, estimation, and learning algorithms. My long-term goal is to utilize robotics to automate various tasks in daily life scenarios given human instructions, thereby seamlessly integrating into homes and factories to support humanity.

EDUCATION

Xi'an Jiaotong University, Hsue-shen Tsien Honors College Xi'an China
B.S. in Mechanical Engineering Sep 2021 – Jun 2025 (Expected)
GPA: 3.90; Rank: 2/27 in Honors Engineering Program
CS related courses: Program Design Method and Practice: 96; Computer Network Theory & Its Applications: 97; Introduction to Artificial Intelligence: 93; Fundamentals of Big Data Technology: 90

University of California – Berkeley Berkeley, CA
Visiting Student Aug 2023 – Dec 2023
Courses: Mechatronics Design; Introduction to Embedded Systems; Advanced Control Systems I

PUBLICATIONS

Tongmiao Xu, Dehao Cai, Shaojie Yang, Shuai Gu, Xiang Li, "Dynamic Vision-Enabled Machine Condition Monitoring: A Point Cloud-Based Diagnostic Methodology" - 2024 IEEE Global Reliability & Prognostics and Health Management Conference [PDF]

RESEARCH EXPERIENCE

National University of Singapore Singapore
Undergraduate Intern with Dr. David Hsu Jul 2024 – Present
Project: Object-Centric Representations for Enhanced Manipulation

- Developing imitation learning models enabling Fetch robot to open and close refrigerator, microwave, and cabinet doors.
- Performing ablation studies and quantitative benchmarking to evaluate design choices, identifying optimal configuration.
- Advancing a 3D-based object-centric algorithm for imitation learning on RLbench to enhance robotic manipulation skill.

Xi'an Jiaotong University Xi'an, China
Undergraduate Research Assistant with Dr. Xiang Li Nov 2022 – May 2024
Project: Dynamic Vision-Enabled Machine Condition Monitoring: A Point Cloud-Based Diagnostic Methodology

- Investigated the application of event cameras as Dynamic Vision Sensors for machine fault diagnosis, classifying bearing states as healthy, inner race fault, ball fault, or outer race fault.
- Developed an innovative geometric data structure to represent event information and implemented a deep learning-based classification method (PointNet ++).
- Achieved accurate fault diagnosis across varying experimental setups, including camera position and rotational speed.

INDUSTRY EXPERIENCE

Theia IoT Technology Co. Ltd. Xi'an, China
Software Development Department: Dec 2023 – Jan 2024
Project: Embedded Real-Time Mobile Object Detection

- Developed applications in a Qt C++ environment with OpenCV, deployed on Nvidia Jetson units under a Linux system.
- Deployed traditional detection algorithms, like Gaussian Mixture Mode, Optical Flow, and KCF, for real-time detection.

RELEVANT COURSEWORK&SCI-TECH COMPETITION PROJECT

"Minato Cup" 2024 China Undergraduate Mechanical Engineering Innovation Competition Fall 2024
Awarded the First Prize in the 2024 China College Students Mechanical Engineering Innovation and Creativity Competition

- Designed the PCB circuit board optimized for high-accuracy resistance measurement.
- Deployed an embedded application on a Raspberry Pi 3 Model B board, ensuring efficient functionality.

Mechanical Art Installation "Tears of the Ocean" with ESP32-based PID Control Fall 2023
ME102B course (Mechatronics Design) Project at UC Berkeley
Awarded the Second Prize in Mechatronics Design Social Impact at UC Berkeley

- Designed and machined the mechanical parts of the entire system, ensuring functionality and structural integrity.
- Implemented precise rotation angle control of the moving mechanisms, including a motor carrying 13 heavy wooden plates with a shaft, using PID control based on force-sensitive resistor data.

Raspberry Pi Based Bluetooth Rescue Rover Fall 2023
EECS149 course (Introduction to Embedded & Cyber-Physical Systems) Project at UC Berkeley

- Enabled motion control for a 3pi+ 2040 robot equipped with an HC05 module, operating through Bluetooth commands.
- Implemented a finite state machine and utilized gyroscopes to perform localization.

All-Terrain Adaptive Path Following and Obstacle Avoidance Robot Spring 2023
Awarded the Excellence Prize in the 25th Shaanxi Province China Robot Competition

- Designed a small robot vehicle tailored to the competition arena specifications, optimizing performance and adaptability.
- Integrated motor and servo actuation with state machine software, leveraging ultrasonic and color sensors to enable all-terrain adaptive path following, line tracking, obstacle avoidance, and projectile launch command execution.

SKILLS

Programming: Python, C/C++, MATLAB
Softwares & Tools: ROS, PyTorch, TensorFlow, OpenCV, Solidworks, Gazebo, Git, LaTeX
Hardware: Arduino, Raspberry Pi
OS: Linux

AWARDS & HONORS

- The International Journal of Structural Integrity Prize at the 2024 Global Reliability & Prognostics and Health Management Conference Oct 2024
- National University Mechanical Engineering Innovation and Creativity Competition 1st Prize Aug 2024
- 34th XJTU "Tengfei Cup" Sci-Tech Competition 2nd Prize Apr 2023
- National College Students Mathematics Competition 3rd Prize, Shaanxi Region Mar 2023
- Hsue-shen Tsien Scholarship, XJTU (top 5%) Dec 2022
- Outstanding Student Awarded by Hsue-shen Tsien Honors College (top 5%) Dec 2022
- Outstanding Individual by Hsue-shen Tsien Alumni Award Nov 2022
- National College Student Mathematical Modeling Competition 1st Prize, Shaanxi Region (top 10%) Nov 2022
- National University Intelligent Robot Contest 1st Prize, Shaanxi Region (top 10%) Aug 2022
- National 3D Digital Innovation Design Contest 1st Prize, Shaanxi Region (top 5%) Jul 2022

ACTIVITIES & LEADERSHIP

- Chair of the Class Cultural and Sports Committee Sep 2021 – Present
- Leader of the Hsue-shen Tsien Academic Study Assistance Group Aug 2022 – Aug 2023
- Excellent Volunteer of the "Caring for Shangluo" Project (selection rate: 10%) Jun 2022 – Jul 2022