

YI WANG

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EDUCATION

Columbia University

Aug 2022 - May 2024

Master of Mechanical Engineering | GPA: 4.0/4.0

Sichuan University

Sep 2018 - June 2022

Bachelor of Mechanical Engineering | GPA: 3.73/4.0

PUBLICATION

J. Kang*, **Y. Wang***, and X. Xiong, "Fast Decentralized State Estimation for Legged Robot Locomotion via EKF and MHE," To appear in RAL. <https://arxiv.org/pdf/2405.20567>.

Y. Wang*, J. Kang*, Z. Chen, and X. Xiong, "Terrestrial Locomotion of PogoX: From Hardware Design to Energy Shaping and Step-to-step Dynamics Based Control," ICRA 2024. <https://arxiv.org/pdf/2309.13737.pdf>.

Wang Y, Cheong K-P, Wang J, Liu S, Hu Y, Chyu M, Mi J. Operational condition and furnace geometry for premixed C3H8/Air MILD combustion of high thermal-intensity and low emissions. *Energy* 2024;288:129905. <https://doi.org/10.1016/j.energy.2023.129905>.

RESEARCH EXPERIENCE

Decentralized State Estimation via EKF and MHE

Jan 2024 - May 2024

University of Wisconsin - Madison | Advisor: Prof. Xiaobin Xiong

Madison, WI

- Propose a fast decentralized state estimation framework based on Extended Kalman Filter (EKF) and Moving Horizon Estimation (MHE) for the control of legged robot locomotion. The EKF fuses inertial sensors and vision information to estimate the orientation of the floating base, while the MHE estimates linear velocity based on time-varying linear dynamics using data from all sensors within a past time window.
- Evaluate the proposed method on various legged robots, including the highly dynamic hopping robot PogoX, the bipedal robot Cassie, and the quadrupedal robot Unitree Go1. The method demonstrates the capability to provide accurate state estimation at a frequency of 200 Hz with a window interval of 0.1 seconds.

Design and Control of Novel Robot PogoX

June 2023 - Oct 2023

University of Wisconsin - Madison | Advisor: Prof. Xiaobin Xiong

Madison, WI

- Designed and manufactured a novel robotic system, PogoX, that seamlessly integrates a quadrotor with a spring-loaded leg, enabling aerial vehicles to perform terrestrial locomotion under heavy payloads and varying conditions.
- Applied a decoupled control strategy that employs vertical height control through a quadratic program-based energy shaping and horizontal velocity control based on step-to-step dynamics.

EMG Pattern Classification of Head-neck Movements

Feb 2023 - June 2023

Columbia University | Advisor: Prof. Sunil K Agrawal

New York, NY

- Developed and evaluated different EMG pattern classification algorithms such as LDA, SVM, and DNN to classify the EMG signals into different head-neck movements and achieved 86.5% accuracy using ConvRNN Classification method.
- Detected a motor impaired user's intention to execute specific head movements based on neck muscles EMG and implemented selected machine learning algorithm into neck brace's control system.

Operational Condition and Furnace Geometry of MILD Combustion

Sichuan University | Advisor: Prof. Kin-Pang Cheong

May 2021 - Dec 2022

Chengdu, CH

- Conducted a comprehensive numerical analysis of premixed C₃H₈/air MILD combustion under various operational conditions and furnace geometries, revealing critical correlations between these factors and pollutant emissions.
- Identified and optimized furnace geometry and operating conditions for premixed MILD combustion, achieving a significant reduction in pollutant emissions by 90%.

Design and Simulation of Manipulator

Shandong University | Advisor: Prof. Jun Zhou

June 2021 - Sep 2022

Jinan, CH

- Designed and fabricated various mechanical end-effectors for manipulator based on diverse project requirements.
- Conducted simulations on the ROS1 Gazebo platform, controlling manipulator through forward and inverse kinematics. Implemented A* and RRT algorithms for path planning and obstacle avoidance.

COURSE PROJECT

Design and Control a Small Legged Robot. Designed and manufactured a small 8-DOF bipedal robot from scratch using 3D printing. A Raspberry Pi is used to control the robot, and walking is achieved through gait design and kinematics.

Object Recognition and Path Planning of Manipulator. Implemented a simplified U-Net for image segmentation, achieving a 90% mIoU score, and applied the ICP algorithm to align point clouds for object recognition. I utilized the RRT algorithm for path planning and trained a Visual Affordance model with manually labeled data for robotic pack-and-place tasks in the PyBullet simulation.

Robot Learning. With the provided ‘teacher dynamics’ model of 3-linked robotic arms and controller, both deep learning and reinforcement learning were utilized to train a ‘student dynamics’ model to mimic the ground-truth behavior of the arm and learn the forward dynamics.

EXTRA-CURRICULAR ACTIVITIES

The Yangtze River Clear Flow Protection. Organized the program to promote the knowledge of river environment protection. Led the team to test the composition and contaminant of the rivers and reported to the Sichuan River Protection Association.

Cultural Exchange and Integration. Showed volunteers from different countries the places of interest and introduced Chinese culture to them. Assisted these volunteers in sharing their native cultures with middle school students in Chengdu.

TEACHING ASSISTANT

- Intro to Fluid Dynamics — Undergrad Level.
- Physics for Science and Engineering — Undergrad Level.
- Vibrations and Control — Undergrad Level.

SKILLS

Software	Solidworks, Ansys, Pybullet, Mujoco, Isaac Gym and Gazebo
Program Language	Python, Matlab, C, C++, ROS and ROS2