CHUNCHU ZHU

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EDUCATION

Rutgers, The State University of New Jersey *Jan 2022 - Dec 2025(Expected)*
Ph.D. in Mechanical Engineering New Brunswick, NJ

Case Western Reserve University *Jan 2020 - Dec 2021*
MSc in Mechanical Engineering Cleveland, OH

Southern University of Science and Technology *Sept 2015 - June 2019*
B.E. in Mechanical Engineering Shenzhen, China

PUBLICATIONS

Journal Papers

· J2 **C.Zhu**, J. Grezmak, B. Schmidt, K. Daltorio(2022), "A Dactyl-Integrated Sensor Design for Measuring Lake Waves", *Soft Robotics, Brief Communication(Submitted)*

· J. Zhou, Q. Nguyen, S. Kamath, Y. Hacohen, **C.Zhu**, M. J. Fu, and K. A. Daltorio, "Hands to hexapods, wearable user interface design for specifying leg placement for Legged Robots," Frontiers in Robotics and AI, vol. 9, 2022.

Conference Papers

· C1 **C.Zhu**, F. Han, J. Yi, "Wearable Sensing and Knee Exoskeleton Control for Awkward Gaits Assistance", *2022 IEEE 18th International Conference on Automation Science and Engineering Mexico City, Mexico(Submitted)*

RESEARCH EXPERIENCE

Robotics, Automation, and Mechatronics (RAM) Lab June 2022 - Present
Advisor: Prof. Jingang Yi *Piscataway, NJ*

· **Learning Based Exoskeleton Control**
Developed an IMU-based real-time gait & pose estimation and knee exoskeleton control strategy for a set of awkward gaits for industrial workers using 2 IMUs;
Built two LSTM network models for different gait activities & motion states, and the Gaussian process dynamic model (GPDM) for the lower-limb joint angles estimation;
Developed a finite state machine based exoskelton controller;
Validate the results through real-time experiments and EMG signal analysis.

CRAB Lab at Case Western Reserve University Jan 2020 - Dec 2022
Advisor: Prof. Kathryn Daltorio *Cleveland, OH*

· **A Dactyl-Integrated Sensor Design for Measuring Lake Waves**
Designed a novel wave force sensor for amphibious crab-like robots using low-cost thin film pressure sensors and soft material;
Experimentally demonstrate the sensor's ability to respond to waves and compare it to camera-based wave speed estimation based on wavelet-based optical flow velocimetry (wOFV).

· **Stable Hexapod Locomotion through a Variable Flowing Stream**
Generated stable gaits for hexapod robot using Central Pattern Generator;
Working on impedance controller for to keep stable locomotion under stream and uneven terrain.

· **Geotechnical Modeling for CRAB-Like Robot Locomotion on Granular Medias**
Built hexapod robot model in Webots simulator and developed a tripod gait controller;
Designed experiments to derive the leg-terrain interaction model based on Resistive Force Theory;
Proposed a way to reduce the overlapping time of stance for different gaits and minimize the sinkage.

Control & Learning for Robotics and Autonomy (CLEAR) Lab Sept 2018 - Dec 2019
Advisor: Prof. Wei Zhang *Shenzhen, China*

· **Quadruped Design and Control Project**
Participated in the design of a quadruped robot in Solidworks, manufactured and assembled the robot
Optimized the motor design in Solidworks using static stress analysis;
Worked on the design and control of the Permanent-Magnet Synchronous Motor;
Thesis topic: System Identification for Dynamic Legged Robot

University of Notre Dame, College of Engineering June 2018 - Aug 2018
Advisor: Prof. Patrick Wensing *South Bend, IN*

· **International Summer Undergraduate Research Experience (iSURE)**
Simulated a single leg jumping robot in Webots and designed a speed and height controller;
Finished the embedded control of the hopping leg robot;
Read and analyzed data from robot via EtherCAT communication.

Notre Dame-SUSTech Summer Research Program 2016 - 2017
Advisor: Professor Kevin Yiming Rong and Professor Bill Goodwine

· **The Commercial Aircraft Corporation of Shanghai** *June 2017 - Aug 2017*
Designed the mechanical structure of a 5 DoF robot arm for aerospace wing panel riveting;
Simulated in SolidWorks and Adams for the static and dynamic analysis;
Developed an algorithm for the perpendicular calibration of the robot arm.

· **Timken: Large Wind Bearing Online Monitoring System** *June 2016 - Aug 2016*
Paper review to investigate different causes that lead to bearing failure;
Conducted ultrasonic tests on wearing bearings and use FFT to analyze the results;
Developed a large wind bearing online monitoring system in MATLAB to detect different failures and prevent them to further deteriorate

TEACHING EXPERIENCE

Dynamic System and Control June 2022 - August 2022
Instructor *Piscataway, NJ*

· The course addresses dynamic systems, i.e., systems that evolve with time. Typically these systems have inputs and outputs; it is of interest to understand how the input affects the output (or, vice-versa, what inputs should be given to generate a desired output). Lectures are intended to concentrate on systems that can be modeled by Ordinary Differential Equations (ODEs), and that satisfy certain linearity and time-invariance conditions. We will analyze the response of these systems to inputs and initial conditions. It is of particular interest to analyze systems obtained as interconnections (e.g., feedback) of two or more other systems. We will learn how to design (control) systems that ensure desirable properties (e.g., stability, performance) of the interconnection with a given dynamic system.

MAE Senior Lab II Jan 2022 - May 2022
Teaching Assistant *Piscataway, NJ*

· Comprehensive experiments in fluid dynamics, acoustics, heat transfer, power systems, and dynamic mechanical systems.

· Responsible for preparation of test procedure, data analysis, and presentation of results and conclusions of two labs: Inverted Pendulum and Airfoil.

SKILLS

Programming	Proficient: MATLAB, Python; Intermediate: C/C++, Java
Technical Tools	TensorFlow, Scikit, PyTorch, Git, Linux, LATEX, Solidworks, 3D-printing, etc
Language	Chinese, English

HONORS AND AWARDS

Outstanding Graduate of Zhicheng Residential College, SUSTech	2019
First-Class SUSTech Scholarship for Outstanding Students	2018
Third-Class SUSTech Scholarship for Outstanding Student	2015-2017
Outstanding Leadership of Zhicheng Residential College, SUSTech	2016-2018
Outstanding Student Representative of Student Congress, SUSTech	2017