

Lei WU

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PROFESSIONAL SUMMARY

Strong interest in robotic manipulator kinematics, dynamics, control, and motion planning.
Specialization in Motion Control and Mechanical Design, experience in various robotics projects.
Strength: Enthusiastic, high accountability, creativity, and strong team player.

EDUCATION

Wuhan University, Wuhan, China

09/2017-06/2021

- Bachelor of Engineering in Mechanical Design Manufacturing and Automation
- Courses: (1) Industrial Robot (2) Principle of Automatic Control (3) Electrical and Electronic Technology (4) Machine Design (5) Machinery Principle

National University of Singapore, Singapore

08/2022-12/2023

- Master of Science (Mechanical Engineering)
- Courses: (1) Advanced Robotics (2) Linear System (3) Autonomous Mobile Robotics (4) Neural Network (5) Machine Vision

PUBLICATION AND PATENT

- *Design of a 6 DOF Cable-Driven Upper Limb Exoskeleton.* (14th International Conference on Intelligent Robotics and Applications. ICIRA 2021. Lecture Notes in Computer Science, vol 13013. Springer, Cham.)
Author: Letian Ai, Tianlin Zhou, **Lei Wu**, Wei Qian, Xiaohui Xiao, Zhao Guo.
- *Design of Quadruped Robot with Parallel Elastic Actuator (patent pending)*
Author: **Lei Wu**, Aidi Xiao, Zhao Guo
- *A novel Quadruped Robot with Dual Rack Unit (patent pending)*
Author: **Lei Wu**, Wei Wang

RESEARCH EXPERIENCE

Instruct the Robot's Motion Based on Simple Language Instructions

08/2022-Now

- Utilized simple language instructions to effectively guide the robot in performing various tasks, including but not limited to pick and place operations and opening doors.
- Developed a robust system that incorporates object localization techniques, enabling the robot to accurately identify the position of objects in its surroundings.
- Implemented advanced algorithms to recognize the rotation and moving axis of objects, enhancing the robot's ability to interact and manipulate objects with precision.

Design of Quadruped Robot with Parallel Elastic Actuator

06/2019-06/2020

- Conducted extensive research on the subject matter of parallel elastic actuators, analyzing existing literature and exploring their potential applications in legged robotics.
- Formulated and proposed a novel design concept for a legged robot incorporating parallel elastic actuators, leveraging their advantages to optimize performance and energy efficiency.
- Executed the design and modeling process, utilizing various tools and software to create detailed plans and specifications for the robot's construction.
- Successfully led the team in building and testing the quadruped robot, ensuring adherence to design specifications and achieving desired outcomes.

Design of a 6 DOF Cable-Driven Upper Limb Exoskeleton

06/2019-06/2020

- Achieved a lightweight design for the exoskeleton by utilizing carbon fiber and aluminum materials, resulting in a rebuilt mechanical structure that enhanced mechanical stability and improved control accuracy, while maintaining a lightweight profile.
- Developed a highly integrated and compact series elastic actuator, contributing to the overall functionality and performance of the exoskeleton.
- Oversaw the production process of the entire machine, demonstrating effective organizational skills in coordinating team members to complete the assembly phase.
- Conducted control simulations using Simulink and implemented a comprehensive control program, contributing to the precise and efficient operation of the exoskeleton.
- Published a paper at a prestigious international conference (Intelligent Robotics and Applications. ICIRA 2021)

WORKING EXPERIENCE

Unitree Robotics

07/2021-07/2022

Mechanical Engineer

- Assumed a key role in the structural design of a novel heavy-load quadruped robot, shouldering the responsibility for ensuring its robustness and reliability.
- Conducted comprehensive force analysis and vibration analysis using the finite element method, focusing on critical

- components such as robot legs and motors, in order to optimize performance and mitigate potential structural issues.
- Implemented significant improvements to the mechanical structure, employing plastic injection molding techniques to manufacture key components, thereby enhancing overall durability and functionality.
- Facilitated the deployment of the robot into small-scale production, meticulously overseeing the manufacturing process and ensuring adherence to quality standards.

Xiao Jie Technology Co., Ltd.

09/2019-09/2020

Product management Intern

- Played a pivotal role in co-founding the company and spearheaded the initiation of a project centered around the development of an automatic meal vending machine.
- Assumed responsibility for the system design of the automatic meal vending machine, leveraging technical expertise to create an efficient and user-friendly solution.
- Organized team members, leading them in the construction of the mechanical structure and successfully producing a prototype of the machine.
- Gained valuable experience in business solution development, acquiring insights into the intricacies of product management and the dynamics of entrepreneurship.

EXTRACURRICULAR ACTIVITIES

Model and Control the UR5e Robot

02/2023-05/2023

- Derived the forward and inverse kinematics of the robot and determine the dynamics of the robot arm.
- Designed and implemented PID and computed torque method controllers to achieve precise and controlled motions.
- Utilized MATLAB for simulation, successfully producing desired trajectories and validating control algorithms.

Mapping and Navigation of Mobile Robots

02/2023-05/2023

- Employed algorithms such as Cartographer, A-LOAM, and FAST-LIO to generate accurate maps of the robot's surroundings.
 - Using AMCL and odometry localize the mobile robot and use A* and DWA algorithms to navigate the mobile robot.
- Simulated the entire process in Gazebo, successfully achieving automatic navigation and obstacle avoidance.

The 18th National Robot Contest for College Students(ROBOCON)

09/2017-06/2019

- Demonstrated exceptional leadership skills as the team leader, undertaking the design responsibilities for docking, lifting, and grabbing mechanisms.
- Contributed actively to the design and debugging phases of the jumping quadruped robot, exhibiting a profound understanding of writing and debugging motor programs.
- Displayed effective management abilities by overseeing team materials, including the maintenance of 3D printers and equipment, and actively engaging in various processes such as debugging.
- Orchestrated the coordination of team members, facilitating their preparation for examinations while maintaining a focus on competition preparations. Engaged in numerous inter-university exchanges to foster collaborative learning.
- Led the team to win third place finish and awards of Best Design and Best Technology in the final round.

Design of a Quadruped Walking Robot with Dual Rack Unit

06/2019-06/2020

- Assumed leadership of a College Student' Innovative Entrepreneurial Training Project, effectively coordinating efforts among team members, professors, and other relevant departments.
- Conceptualized and designed a quadruped robot featuring a dual rack unit, enabling advanced functionalities such as rapid forward movement, precise steering, obstacle traversal, and slope climbing.
- Applied for a patent for a quadruped walking robot which is under review

Class Leader

06/2019-09/2020

- Organized class activities and ensured the orderly study life of the class, such as organizing classmates to study online and creating online self-study rooms during the pandemic period
- Led the class to win the honors of Advanced Class of Wuhan University and Advanced Youth League Branch of Wuhan University

Public Welfare Association of Wuhan University

09/2017-09/2018

- Organized a book donation activity for children in Chunhui primary school, and collected more than 1000 books and 200 school supplies

Awards

- Third place in the final of the 18th National Robot Contest for College Students(ROBOCON) 2019
- Second prize in the Mechanical Innovative Design Competition for College Students 2020
- Wuhan University Dean's List 2019,2020

SKILLS& INTERESTS

- Programming: Python, C, MATLAB, Visual Studio, Keil
- Mechanical Design: Solidworks 2017, Auto CAD, ANSYS
- Laboratory Techniques: ROS, Gazebo, Isaac Sim, Metal Processing, Part Assembly, 3D Printing(Soft Material), Welding