JINGWEN ZHANG

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Education Background

09/2017 - Present **MAE, University of California, Los Angeles,**
Ph.D. in Mechanical Engineering. Expected graduation: Dec 2022, GPA: 3.98/4.0
- Research Interests: Optimization-based methods on locomotion planning, Legged robots, Intelligent design, Robot Modelling, Optimal Control

09/2015 - 12/2016 **Columbia University,**
M.Sc. in Mechanical Engineering, GPA: 4.1/4.0

09/2011 - 07/2015 **Tsinghua University,**
B.Eng. in Mechanical Engineering and Automation, GPA: 3.8/4.0
- The Excellent Graduate of Tsinghua University (2015)

Research Experience

A Miniature Bipedal Robot with Proprioceptive Actuation 06/2020 – Present

Abstract: BRUCE (Bipedal Robot Unit with Compliance Enhanced) is a new-generation miniature bipedal robotic platform for studies on humanoid dynamic behaviors. The development in design and control is planned to be made open-source in the future. BRUCE is in favor of highly dynamic motions thanks to the proprioceptive actuation and unique joint design on the hip and ankle.

- Integrated IMU and foot contact sensors into the overall system
- Developed the software architecture based on a custom shared memory and the multi-threading
- Working on applying optimization-based methods to plan and control dynamic behaviors

Motion planning for Multi-Limbed Vertical Climbing Robots 01/2019 – Present

Abstract: To achieve autonomous vertical wall climbing for multi-limbed robots, motion planning requires a unique combination of constraints on joint torques, reaction forces, body postures, etc. This research focuses on one particular setup wherein a six-legged robot named SiLVIA braces itself between two vertical walls and climbs vertically with end-effectors that only use friction.

- Cooperated to design the optimization-based motion planner for on-wall climbing motions. Instead of planning with a single nonlinear programming (NLP) solver, the problem is decoupled into two parts: the first part is formulated as a mixed-integer convex programming (MICP) to solve contact positions and body postures while the second part solves a series of convex optimization to get feasible contact forces. With the proposed solution, the robot is capable of handling vertical walls with irregular profiles although some optimality is sacrificed.
- Developed a motion planner specifically for the transition phase from the ground to the wall during autonomous vertical wall climbing. Instead of using a pre-determined contact sequence for different transition setups, a nonlinear programming (NLP) via modeling contact constraints and limb switchability as complementarity conditions is used to generate various and feasible sequences of foot placements and contact forces to avoid failure cases.

INNOVA HAND, a Versatile and Simple Robotic Hand 01/2016-05/2016

Abstract: To balance cost and dexterity, current robotic hands for service robot are mainly focused on 2 or 3 finger underactuated hands. Inspired by **winter mitten**, even with four fingers tied together human hand are still functional to grasp a wide range of objects. INNOVA used one Thumb and one four-in-one

Finger to accomplish fingertip, enveloping and fist grasping pose. (Demo Video: INNOVA GRASP)

- Designed the overall system and the controller to complete fingertip, enveloping and fist grasp
- Utilized open-source simulation tool GraspIt! to simulate grasping and evaluate grasping quality

Selected Publications

Conference

- **Jingwen Zhang**, Xuan Lin, and Dennis W. Hong. "Transition Motion Planning for Multi-Limbed Vertical Climbing Robots Using Complementarity Constraints." 2021 IEEE/RSJ International Conference on Robotics and Automation (ICRA). IEEE, 2021.
- **Jingwen Zhang**, Junjie Shen, and Dennis W. Hong. "Kinematic Analysis and Design Optimization for a Reduced-DoF Quadruped Robot with Minimal Torque Requirements." 2020 17th International Conference on Ubiquitous Robots (UR). IEEE, 2020.
- Xuan, Lin, **Jingwen Zhang**, Junjie Shen, Gabriel Fernandez, and Dennis W. Hong. "Optimization based motion planning for multi-limbed vertical climbing robots." 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2019. (**IROS Best Paper Award on Safety, Security, and Rescue Robotics)**

Patent

- Shao Yang**, Jingwen Zhang**, and Kefu Yao. A Low-Temperature Measurement Apparatus of Resonant Ultrasound Spectroscopy. CN107422040A, 18 August 2017.

Professional Experience

09/2018 – Present **Teaching Fellow (promoted from Teaching Assistant)**

- MAE101 Statics and Strength of Materials
- LIFESCI 30A/B Mathematics for Life Scientists
- PHYSICS 1A Mechanics & 5C Electricity, Magnetism, and Modern Physics

06/2019 - Present **Paper Reviewer**

- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE/RSJ International Conference on Robotics and Automation (ICRA)
- IEEE Access
- ASME Journal of Mechanisms and Robotics

05/2016 - 08/2016 **Embedded Engineer Intern at Kovan Systems**

- Kovan Systems is a Chinese startup aiming to develop an automotive high-density storage system
- Optimized the algorithm of Laser Pointer in Human Work Station to improve the accuracy of pointing and the speed and position control of stepper-motors
- Compiled the C++ (based on Arduino) Library of Laser Pointer

Honors and Awards

2019 IROS Best Paper Award on Safety, Security, and Rescue Robotics
2014-2015 Academic Excellence Scholarship, Guanghua Educational Scholarship
2012-2014 Integrated Excellence Scholarship, Huangyicong Couple Scholarship for two consecutive years
2012 Outstanding Volunteer for Ecological Environmental Protection in Hoh Xil, Qinghai

Skills

Language: Chinese (native speaker), English (professional working proficiency)
Professional Skills: Solidworks (CAD and CAM), AutoCAD, C++, Python, MATLAB, Adobe Premiere Pro, Gazebo, Gurobi, CasADi, SNOPT, CVX, IPOPT
Hobbies: Basketball, Travelling and Bartending