Ran Jing

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Education

Boston University Boston, MA
Ph.D. in Mechanical Engineering (focus on robotics and control), GPA: 3.93/4 *Sept. 2021 - present*
Worcester Polytechnic Institute (WPI) Worcester, MA
M.S. in Robotics Engineering, GPA: 4.0/4.0 *Aug. 2019 - May 2021*
Shandong University Ji'nan, Shandong, China
B.E. in Control Science and Engineering, GPA: 4.15/5 *Sept. 2015 - Jun. 2019*

Work Experience

Boston University, *Soft Robotics Control Lab (SRC Lab) & BU Robotics Lab* Boston, MA
Graduate Research Assistant / Ph.D. Candidate. Advisor: Andrew Sabelhaus *Sept. 2021 – present*
Worcester Polytechnic Institue, *Robotics, Mobility, and Cyber-Physical Systems Lab* Worcester, MA
Graduate Research Assistant. Advisor: Xiangrui Zeng *May 2020 – Aug. 2021*
Boston University Boston, MA
Graduate Teaching Assistant for ME310 Instrumentation. *Sept. 2022 – Dec. 2022, Sept. 2023 – Dec. 2023*

Publications

6. A. Choi, **R. Jing**, A.P. Sabelhaus, M.K. Jawed, "DisMech: A Discrete Differential Geometry-based Physical Simulator for Soft Robots and Structures." *IEEE Robotics and Automation Letters (RAL)*, accepted in Jan. 2024 arXiv: 2311.18126
5. M.L. Anderson, **R. Jing**, J.C. Pacheco Garcia, I. Yang, S. Alizadeh-Shabdiz, C. DeLorey, A.P. Sabelhaus, "Maximizing Consistent Force Output for Shape Memory Alloy Artificial Muscles in Soft Robots." *IEEE 2024 International Conference on Soft Robotics (RoboSoft)*, accepted in Jan. 2024
4. **R. Jing**, M. Anderson, M. Ianus-Valdivia, A. Akber, C. Majidi, A.P. Sabelhaus, "Safe Balancing Control of a Soft Legged Robot." *Under Review*. arXiv: 2209.13715
3. J.C. Pacheco Garcia, **R. Jing**, M.L. Anderson, M. Ianus-Valdivia, A.P. Sabelhaus, "A Comparison of Mechanics Simplifications in Pose Estinmation for Thermally-Actuated Soft Robot Limbs." *ASME 2023 Conference on Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS)*, Sept. 2023 doi: 10.1115/SMASIS2023-110774
2. **R. Jing**, X. Zeng, "Predictive Optimal Control with Data-Based Disturbance Scenario Tree Approximation." *IEEE 2021 American Control Conference, (ACC))*, May 2021 doi: 10.23919/ACC50511.2021.9483341
1. **R. Jing**, "A self-attention based LSTM network for text classification." *APISE 2019 International Conference on Control Engineering and Artificial Intelligence (CCEAI)*, Jan. 2019 doi: 10.1088/1742-6596/1207/1/012008

Talks and Presentations

4. **R. Jing**, M.L. Anderson, M. Ianus-Valdivia, A. Akber Ali, C. Majidi, A.P. Sabelhaus, "Safe Balancing Control of a Soft Legged Robot." *Late Breaking Results, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023
3. **R. Jing**, M.L. Anderson, M. Ianus-Valdivia, A.P. Sabelhaus, "Safe Balancing Control of a Soft Legged Robot." *Northeast Regional Robotics Colloquium*, 2022
2. **R. Jing**, X. Zeng, "Predictive Optimal Control with Data-Based Disturbance Scenario Tree Approximation." *IEEE 2021 American Control Conference, (ACC))*, May 2021
1. **R. Jing**, "A self-attention based LSTM network for text classification." *APISE 2019 International Conference on Control Engineering and Artificial Intelligence (CCEAI)*, Jan. 2019

Relevant Projects

SRC Lab - Proprioceptive External Force Sensing for Soft Robot-Human Interaction Boston University
Graduate Research Assistant. Advisor: Prof. Andrew P. Sabelhaus *Mar. 2023 – present*
- Designed a thermal-actuated soft robot control system with programmable power supply, microcontroller, and computer vision using Python.
- Proposed a data-driven external force estimation method for shape memory alloy-based soft actuators.
- Achieved safe human interaction with soft robots and external force estimation under proprioceptive settings.

SRC Lab - Discrete Differential Geometry-based Physical Simulator for Soft Robots. Boston University

Graduate Research Assistant. Advisor: Prof. Andrew P. Sabelhaus *Dec. 2022 – present*

- Built a fast, high precision, fully implicit soft elastic rod simulator (in C++) that supports soft physics, frictional contact, and control inputs.
- Implemented a natural curvature controller to achieve soft robot motion control in simulation, which could be potentially used as a reinforcement learning training gym environment.
- Created a generalizable gradient-descent approach for "real2sim" mapping of actual soft manipulators in simulation.

SRC Lab - Safe Balancing Control of a Soft Legged Robot. Boston University

Graduate Research Assistant. Advisor: Prof. Andrew P. Sabelhaus *May 2022 – Nov. 2022*

- Designed a 5-limbs soft legged robot platform, Horton, with thermal shape memory alloy (SMA) wire muscles and sensors for its position and the actuator temperatures.
- Proposed a feedback control system with safety guarantees on some aspects of its operation and human interaction.
- Achieved repeatable soft legged robot balancing under human interference while maintaining robot state safety.

RMCPS Lab - Data-based Disturbance Approximation for Predictive Optimal Control WPI

Graduate Research Assistant. Advisor: Prof. Xiangrui Zeng *May 2020 – Aug. 2021*

- Built a scenario tree data structure for efficient disturbance sequences representation in optimal control and model-based reinforcement learning problems.
- Designed and built a clustering-based approximation for disturbance sequences to find optimal control policy via dynamic programming with significantly reduced computational load (10 times faster).
- Tested the proposed method on a hybrid electric vehicle battery management system in simulation.

MED Fusion Lab - 3-D Object Reconstruction with Franka Robot Arm WPI

Student Reseacrcher. Advisor: Prof. Haichong (Kai) Zhang *Sept. 2019 – Dec. 2019*

- Used an Oculus VR headset to control the motions of a Franka Emika Panda robot arm in Gazebo simulator.
- Implemented a robot tip position controller and tested robot motion planning with a physical Franka robot arm.
- Utilized an intel RealSense depth camera with the robot arm for object 3D reconstruction using both visual odometry and camera poses derived from Franka's forward kinematics.

Awards

Distinguished Mechanical Engineering Fellowship, Boston University	2021
Second Prize, (China) National Undergraduate Innovation and Entrepreneurship Training Program	2018
First prize, Shandong University Innovation and Entrepreneurship Competition	2018
Second prize, (China) National Undergraduate Smart Car Competition (Top 10% of 1000+ teams)	2017
Research and Innovation Scholarship, Shandong University	2017
Outstanding Individuals in Innovation and Entrepreneurship, Shandong University	2017
Outstanding Individuals in Social Practice, Shandong University	2017

Outreach and Services

NASA Downlink Day with The Calculus Project (Demo and Lab Tour), Boston University	2022 and 2023
Executive Committee, IEEE Robotics and Automation Society WPI Chapter, WPI	2020-2021
Captain, Department Soccer team, School of Control Science and Engineering, Shandong University	2017-2018
Vice President, Student Debate Association (Xinglongshan Campus), Shandong University	2016-2017

Technical and Soft Skills

Programming language: Python, C/C++, MATLAB, Julia, LaTeX

Software tools: Pytorch, TensorFlow, ROS, Gazebo, Linux, Git(Github), Docker, KiCad, LabVIEW, Keil for ARM.

Hardware/equipment: MCU(Arduino, MCS51, STM32, TI MSP430), oscilloscopes, soldering tools, 3D printer, Vicon.

Soft skills: Communication, problem-solving, active listening, collaboration, source control.