Hayden M. Webb

hayden.m.webb@rice.edu
LinkedIn | Portfolio
832.480.2225
Rice University

Education

William Marsh Rice University **Houston, TX**
Bachelor of Science in Mechanical Engineering ***Aug. 2021 - Present***
Minor in Engineering Design Specialization in Mechanics/Dynamics

Research Interests

- Robotics
- Biomechanics
- Mechatronics
- Engineering Design
- Manipulation
- Prosthetics

Publications

Undergraduate Research Project ***Apr. 2024 - Present***
Paper Title: *Between-Finger Roller Rings for Direct Drive In-Hand Manipulation through Active Surfaces*
Supervisor: Dr. Kaiyu Hang, Assistant Professor, Computer Science

- Designing between-finger in-hand manipulator for robotic systems for non-differential, non-holonomic full spatial manipulation through active surfaces
- Developing biomimetic compliant surface to imitate skin layers in device to improve manipulability

Undergraduate Research Project ***Oct. 2023 - Mar. 2024***
Paper Title: *Wearable Roller Rings to Enable Robot Dexterous In-Hand Manipulation through Active Surfaces*
Supervisor: Dr. Kaiyu Hang, Assistant Professor, Computer Science
Publication Venue: *arXiV preprint 2403.13132*
[Under consideration for International Conference on Robotics and Automation (ICRA) 2025]

- Designed in-hand manipulator for both human & robotic grasping systems for differential, non-holonomic full spatial manipulation
- Developed a generalized active surface-based motion model for manipulation of arbitrary geometry objects
- Investigated differential manipulation solutions of worn robotic mechanisms

Presentations

2024

H. Webb, P. Changrunmaneekul., S, Yuan, and K. Hang; Wearable Roller Rings to Enable Robot Dexterous In-Hand Manipulation through Active Surfaces. ASME Mechanism and Robotics Committee [Talk/Poster]

H. Webb, P. Changrunmaneekul., S, Yuan, and K. Hang; Wearable Roller Rings to Enable Robot Dexterous In-Hand Manipulation through Active Surfaces. Texas Regional Robotics Symposium (TEROS) [Poster]

2022

J. Chang, R. Lee, **H. Webb**; Body Cooling Device for the Cooling of Humans in Heat Waves. Rice University Engineering Design Showcase [Poster]

Selected Projects

Electronic Prony Brake Torquemeter ***Jun. 2024 - Aug. 2024***
Rice Mechanical Engineering Department

- Designed and developed multiple functional 3D-Printed Prony Brakes to mechanically test the concepts of dynamic torque, speed, and power through inset motors and load cells
- Built an electronic subsystem consisting of a photo interrupter, Arduino microcontroller, signal amplifier, and LCD to display the torque and RPM of a motor

Body Cooling Device for the Cooling of Humans in Heat Waves ***Jan. 2022 - May 2022***
Engineering Design Coursework

- Developed a convective body cooling suit for individuals to wear during 95+% humidity to cool down
- Designed a water-driven cooling subsystem with water-blocks located at high-temperature regions in the body to dissipate heat more effectively from the body
- Optimized design using calculations of heat dissipation for intended use case in nominal human subjects

Grasping Aid Device for Arthrogryposis Multiplex Congenita (AMC) ***Aug. 2021 - Dec. 2021***
Engineering Design Coursework

- Manufactured an underactuated robotic glove for performing power & precision grasps in daily activities
- Built and assembled cable-driven mechanism for furling and unfurling of fingers

Technical Skills

CAD Software: SolidWorks, Fusion360, AutoCAD
Programming Languages: Python, Matlab
Hardware Skills: 3D Printing, Product Design and Manufacturing, Microcontroller (Arduino), Metalworking
Tools: Microsoft Office (Word, Excel, Powerpoint), Latex

Technical Experience

Co-President ***May. 2023 - May 2024***
Rice Robotics Club

- Managed and aided 10+ subteams and 50+ students on the development of their projects
- Developed new safety & testing procedures for R&D and Combat Robotics subteams
- Organized and instructed several workshops, talks, and presentations on robotics

Team Lead, Mirrored Robot Arm Subteam ***May 2022 - May 2023***
Rice Robotics Club

- Led and built the mechanism manufacturing for a 6-DoF underactuated robot hand and arm
- Integrated designed components with electronics package to allow for mirroring of human movement

Team Lead, Highschool Aerospace Scholar ***Oct. 2019 - July 2020***
National Aeronautics and Space Administration (NASA)

- Led 20+ students on the design of a theoretical human landing system between Gateway Space Station and the lunar surface utilizing CAD
- Collaborated with other teams to integrate Lunar Lander into theoretically designed Gateway Space Station for mock Artemis Mission

Teaching Experience

Head Teaching Assistant (ENGI 210 - Prototyping & Fabrication) ***Jan. 2023 - Present***
Rice Makerspace, Oshman Engineering Design Kitchen (OEDK)

- Taught material, hosted tutorials, and led workshops on engineering tools and fabrication methods
- Assisted 30+ undergraduate & graduate students with team projects and individual competencies

Teaching Assistant (MECH 343 - Modeling of Dynamic Systems) ***Aug. 2024 - Dec. 2024***
Rice Mechanical Engineering Department

- Assisted with teaching and grading of material for 60+ undergraduate students

Teaching Assistant (MECH 310 - Rigid Body Dynamics) ***Jan. 2024 - May 2024***
Rice Mechanical Engineering Department

- Assisted with teaching and grading of material for 70+ undergraduate students

IBB Summer Academy Assistant ***Jun. 2022***
Rice Department of Innovation

- Led week-long course for high school students on learning engineering design tools, devices, and processes

Awards and Certifications

Finalist, Student Mechanism and Robot Design Competition (SMRDC) ***Jun. 2024***
American Society of Mechanical Engineers (ASME)

Relevant Coursework

Algorithmic Robotics, Engineering Design Studio, Engineering Design Tools, Fundamentals of Robotic Manipulation, Fundamentals of Control Systems, Introduction to Operations Research and Optimization, Heat TransferMachines and Mechanisms, Modeling Dynamic Systems, Prototyping & Fabrication, Rigid Body Dynamics, Thermodynamics