TESS HELLEBREKERS

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EDUCATION

Carnegie Mellon University

Ph.D. Candidate in Robotics

May 2020

Robotics Institute

School of Computer Science

Specialization: Soft Sensor Design, Fabrication, and Integration

University of Texas at Austin

B.S. Biomedical Engineering

May 2016

Specialization: Computational Biomedical Engineering

GPA: 3.79/4.00

Major GPA: 3.87/4.00

SKILLS

Software

Python, MATLAB, C/C++, ROS

Hardware

Raspberry Pi, Arduino

Soft

Collaboration, project management, adaptable

Rapid Prototyping

Laser cutting, 3D-printing, Instron material characteriztion

Modeling

Solidworks, COMSOL

RESEARCH EXPERIENCE

CARNEGIE MELLON UNIVERSITY | Pittsburgh, PA | August 2016-present

Graduate Researcher, Dr. Carmel Majidi

- Integrated liquid-metal circuit with shape-memory soft gripper
- Developing multimodal skins for underwater soft robots
- Contributed to review paper on liquid metal inclusions and properties
- Initiated project on soft magnetic elastomer for tactile sensing
- Collaborated with cross-university team to enable chemical sensing with embedded E.Coli cells on a soft robot gripper

CARNEGIE MELLON UNIVERSITY | Pittsburgh, PA | Summer 2015

Robotics Institute Summer Scholar, Dr. Yong-Lae Park

- Streamlined sensor fabrication to reduce cost and manufacturing time
- Collected, analyzed, and post-processed data for publication
- Improved sensor design to reduce size by including fiber optics
- Investigated soft multimodal sensor for future applications

THE UNIVERSITY OF TEXAS | Austin, TX | August 2014-May 2015

Undergraduate Research Assistant, Dr. Ashish Deshpande

- Designed and implemented safety system for hand exoskeleton
- Developed rubber to model passive impedance qualities of tendons
- Explored ASTM tensile testing protocols and motor control

GEORGIA INSTITUTE OF TECHNOLOGY | Atlanta, GA | Summer 2014

Robotics Summer Scholar, Dr. Andrea Thomaz

- Integrated Meka robot with website for remote HRI experiments
- Communicated between PHP/HTML5/JS and ROS to control robot
- Adapted current controllers with keyboard for intuitive controls

PROFESSIONAL EXPERIENCE

APPLIED RESEARCH LABS | Austin, TX | May 2012 – May 2014

Student Technician | Environmental Sciences Lab

- Programmed multi-touch programs for sonar displays
- Explored various graphical options for Sonar Tactical Decision Aid
- Adapted old programs to new touch screen monitors
- Researched new programs (Kivy, WorldWind) for future use
- Worked 20+ hrs/week to qualify for tuition reimbursement

RESEARCH AND PUBLICATIONS

Magnetic Soft Skins

Loading elastomers with magnetic micro-particles for deformation sensing

- **Hellebrekers, T.**, Chin, K., Ford, M.J., & Majidi, C. (2019, October). Soft Magnetic Tactile Skin for Continuous Force and Location Estimation using Neural Networks. *(submitted to Robosoft with RA-L option)*
- **Hellebrekers, T.**, Kroemer, O., & Majidi, C. (2019). Soft Magnetic Skin for Continuous Deformation Sensing. *Advanced Intelligent Systems*, *1*(4), 1900025.

Liquid-Metal Microelectronic Skins

Interfacing liquid-metal traces with conventional IC chips to bring additional sensing to soft skins

- Zimmer, J., **Hellebrekers, T.**, Majidi, C., & Kroemer, O. (2019, March). Grasp Detection with Soft Robotic Gripper and Soft Sensors. *(accepted to IROS 2019)*
- **Hellebrekers, T.**, Ozutemiz, K.B., Yin J., & Majidi C. (2018, October). Liquid Metal-Microelectronics Integration for a Sensorized Soft Robot Skin. In *Intelligent Robots and Systems (IROS), 2018 IEEE/RSJ International Conference*. IEEE.
- Kazem, N., **Hellebrekers, T.**, & Majidi, C. (2017). Soft multifunctional composites and emulsions with liquid metals. *Advanced Materials*, *29*(27), 1605985.

Biological Robot Sensing

Interfacing bacterial cells with robotic systems for chemical sensing in the environment

- Justus, K. B., **Hellebrekers, T.**, Lewis, D. D., Wood, A., Ingham, C., Majidi, C., & Tan, C. (2019). A biosensing soft robot: Autonomous parsing of chemical signals through integrated organic and inorganic interfaces. *Science Robotics*, *4*(31), eaax0765.

Soft Optical Waveguides

Making stretchable waveguides for long-term and robust pressure, strain, and bend sensing

- To, C., **Hellebrekers, T.**, Jung, J., Yoon, S. J., & Park, Y. L. (2018). A Soft Optical Waveguide Coupled With Fiber Optics for Dynamic Pressure and Strain Sensing. *IEEE Robotics and Automation Letters*, *3*(4), 3821-3827.
- To, C., **Hellebrekers, T. L.**, & Park, Y. L. (2015, September). Highly stretchable optical sensors for pressure, strain, and curvature measurement. In *Intelligent Robots and Systems (IROS), 2015 IEEE/RSJ International Conference on* (pp. 5898-5903). IEEE.

RECENT PRESENTATIONS AND POSTERS

- "Soft Robot Gripper with Integrated Sensing Skin for Predicting Grasp Success and Stability" (MLSE) (May 2019)
- "Liquid Metal-Microelectronics Integration for a Sensorized Soft Robot Skin" Intelligent Robots and Systems (IROS) (October 2018)
- "A Soft Optical Waveguide Coupled With Fiber Optics for Dynamic Pressure and Strain Sensing" Intelligent Robots and Systems (IROS) (October 2018)
- "Towards Autonomous Soft Robots" Society of Engineering Sciences (SES) (October 2018)
- "Liquid Metal-Microelectronics Integration for a Sensorized Soft Robot Skin" International Mechanical Engineering Congress & Exposition (IMECE) (November 2018)

AWARDS AND HONORS

NSF GRFP Fellowship Recipient   May 2017-present
3M Women's Scholarship Recipient   August 2012-May 2014