Michael Hagenow

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Research Interests

Shared Control/Autonomy and Human-Robot Physical Interaction

My research focuses on answering how humans can team with robots to complete complex and injury-prone tasks. My broad research interests include shared autonomy, Learning from Demonstration (LfD), haptics, and controls.

Education

University of Wisconsin - Madison | PhD in Mechanical Engineering
2023 | Madison, WI

- Minor: Computer Science • Advisor: Michael Zinn, Ph.D.

University of Wisconsin - Madison | MS in Mechanical Engineering
2019 | Madison, WI

Tufts University | BS in Mechanical Engineering
2014 | Medford, MA

Experience

Massachusetts Institute of Technology | Postdoctoral Fellow
2023 – Present | Cambridge, MA

- Principal Investigator: Julie Shah, Interactive Robotics Group
- School of Engineering Postdoctoral Fellowship Program for Engineering Excellence (AeroAstro)

UW-Madison | Graduate Research Assistant
2019 – 2023 | Madison, WI

- NSF grant exploring communication in human-robot interaction.
- NASA University Leadership Initiative (ULI) focused on aircraft manufacturing and development of shared robotic assistants for physically demanding and challenging tasks.
- Dissertation: Toward Effective Human-Robot Teaming Through Corrections
- Committee: Michael Zinn, Bilge Mutlu, Michael Gleicher, Robert Radwin, Dan Negrut, Terry Fong

NASA - Johnson Space Center | Intern - ER4
2021 | Houston, TX

- Supervisor: Dr. Kimberly Hambuchen, Mentor: Evan Laske
- Investigating human-in-the-loop corrective methods for semi-automated fitting of affordance templates/primitives for use in remote robot programming during intra-vehicular activities (IVAs).

Epic Systems | Manager - MyChart - Technical Services
2014 – 2017 | Verona, WI

- Managed 5-6 direct reports. Development and planning lead for Clinical Data for MyChart. Responsible for technical support for several large hospital contracts. VB development of internal tools for accounting.

Publications

Up-to-date publications on Google Scholar

Journal Articles

- J3. Senft, E., **Hagenow, M.**, Welsh, K., Radwin, R., Zinn, M., Gleicher, M., and Mutlu, B. (2021) "Task-Level Authoring for Remote Robot Teleoperation," Front. Robotics, AJ 8:707149.
- J2. **Hagenow, M.**, Senft, E., Radwin, R., Gleicher, M., Mutlu, B. and Zinn, M. "Informing Real-time Corrections in Corrective Shared Autonomy Through Expert Demonstrations," IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 6442-6449, Oct. 2021.
- J1. **Hagenow, M.**, Senft, E., Radwin, R., Gleicher, M., Mutlu, B. and Zinn, M. "Corrective Shared Autonomy for Addressing Task Variability," IEEE Robotics and Automation Letters, vol. 6, no. 2, pp. 3720-3727, April 2021.

Refereed Conference Papers

- C7. Doshi, M., **Hagenow, M.**, Radwin, R., Gleicher, M., Mutlu, B. and Zinn, M. "Handheld Haptic Device with Coupled Bidirectional Input," 2023 IEEE World Haptics Conference (WHC), 2023.
- C6. **Hagenow, M.**, Senft, E., Laske, E., Hambuchen, K., Fong, T., Radwin, R., Gleicher, M., Mutlu, B. and Zinn, M. "Registering Articulated Objects With Human-in-the-loop Corrections," 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.
- C5. Senft, E.†, **Hagenow, M.**†, Praveena, P., Radwin, R., Zinn M., Gleicher, M., and Mutlu, B. "A Method For Automated Drone Viewpoints to Support Remote Robot Manipulation," 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.
- C4. Zhang, B., **Hagenow, M.**, Mutlu, B., Gleicher, M, and Zinn, M. "Assessing the Perceived Realism of Kinesthetic Haptic Renderings Under Parameter Variations" 2022 IEEE Haptics Symposium (HAPTICS). IEEE, Accepted for Publication.
- C3. Senft, E., **Hagenow, M.**, Radwin, R., Zinn M., Gleicher, M., and Mutlu, B. "Situated Live Programming for Human-Robot Collaboration," The 34th Annual ACM Symposium on User Interface Software and Technology. 2021.
- C2. **Hagenow, M.**, Zhang, B., Mutlu, B., Zinn, M., and Gleicher, M. "Recognizing Orientation Slip in Human Demonstrations," 2021 International Conference on Robotics and Automation (ICRA), 2021.
- C1. W. Hu, Q. Fan, A. H. Nicholas, **M. C. Hagenow**, and A. T. Ohta. "Bubble micro-manipulator for co-operative micro-manipulation," 9th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (IEEE-NEMS), Honolulu, HI, Apr. 2014.

Refereed Workshop Papers

- W4. Doshi, M., Zhang, B., **Hagenow, M.**, Gleicher, M., Mutlu, B., Radwin, R., and Zinn, M. "Bidirectional 1-DOF Handheld Haptic Device for Precise Differential Process Control," Mentoring Forum at 2022 IEEE Haptics Symposium, 2022.
- W3. Zhang, B., **Hagenow, M.**, Mutlu, B., Gleicher, M., and Zinn, M. "Effect-Adjective Associations of Kinesthetic-Based Haptic Renderings," Mentoring Forum at 2022 IEEE Haptics Symposium, 2022.

- W2. **Hagenow, M.**, Zinn, M., Fong, T., Laske, E., and Hambuchen, K. "Affordance Template Registration via Human-in-the-loop Corrections," Advances in Space Robotics and Back to Earth Workshop at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021.
- W1. Zhang, B., **Hagenow, M.**, Mutlu, B., Zinn, M., and Gleicher, M. "Characterizing the Effects of Haptic Rendering Parameter Variations on Perceived Kinesthetic Rendering Accuracy," 2021 IEEE World Haptics Conference (WHC), 2021, pp. 868-868.

Honors & Awards

Postdoctoral Fellowship for Engineering Excellence
• 2023 • MIT

Grainger Wisconsin Distinguished Graduate Fellowship (WDGF)
• 2022 • UW-Madison

Phi Kappa Phi
• 2019 • UW-Madison

Mitchell Fellowship (Instructional Design)
• 2018 • The Mitchell Institute

O'Leary Design Award
• 2014 • Tufts University

Tau Beta Pi
• 2014 • Tufts University

Senator George J. Mitchell Scholarship
• 2010 • The Mitchell Institute

Rensselaer Medal
• 2009 • Rensselaer Polytechnic Institute

Mentoring and Advising

I meet with research mentees on a weekly basis to establish research goals, brainstorm, and grow skills for future careers. Students have consequently been admitted to top robotics graduate programs (e.g., UPenn, CMU, Georgia Tech, UW, UTA).

Graduate Students

Nitzan Orr
• 2021-2023 • Shared Autonomy and Human-in-the-loop Robotic Sanding

Megh Doshi
• 2020-2023 • Design of a Mobile Bidirectional Haptic Input

Undergraduate Students

Kevin Macauley
• 2021-2023 • Affordance Template Registration Using Corrections

Nicole Gathman
• 2021-2023 • Affordance Template Registration Using Corrections

Mohamed Safwat
• 2021-2022 • State Estimation and Methods for 6D Input

Ahmed Khalil
• 2021-2022 • State Estimation and Methods for 6D Input

Yash Hindka
• 2021 • Dynamic Camera During Robot Teleoperation via UAV

Michael Matuszewski
• 2020 • Real-time Force Display for Physical Interaction

Saheen Feroz
• 2019-2020 • Synopsis of Robot Trajectories and Interaction using Optimization

Eric Wang
• 2019-2020 • Force Sensing and Visualization using Low-cost Sensors

Invited Talks
• Boeing Cobot Summit (5/2023)
• Tufts Mechanical Engineering Colloquium (4/2023)
• Interactive Robotics Group (MIT) (8/2022)
• NASA University Leadership Initiative Tech Talk (9/2021) (virtual)
• NASA Intelligent Robotics Group (IRG) (7/2021) (virtual)
• NASA Transformative Aeronautics Concepts Program (TACP) Showcase (2/2021) (virtual)

Teaching

Formal Instruction

Guest Lecturer, ME739 - Advanced Robotics

• 2020 • UW-Madison

Instructor of Record, ME346 - Intro to Feedback Controls

• 2019 • UW-Madison

Teaching Assistant, ME739 - Advanced Robotics*

• 2019 • UW-Madison

Teaching Assistant, ME346 - Intro to Feedback Controls

• 2018 • UW-Madison

Teaching Assistant, ME446 - Automatic Controls*

• 2018-2019 • UW-Madison

Teaching Assistant, ME370 - Energy Systems Laboratory

• 2018 • UW-Madison

Teaching Assistant, COMP11 - Intro to Computer Science

• 2013-2014 • Tufts University

* Distance Learning

Extracurricular

Teaching-As-Research Project (Delta Program)

• 2019 • How does problem-based learning instruction of loop-shaping in the frequency domain affect student adaptive expertise and student perceived value of material?

Tutorial Contributor (CTMS)

• 2018-2021 • Developed tutorial for Lead motor position control. Tutorials will be hosted on the official website (http://ctms.engin.umich.edu).

Lab Development

• 2018 • Developed real time control platform using Simulink and three labs (system identification, PID, and Frequency Domain Lead Control). Fabricated 10 control platforms using industrial connectors and hardware (B&R Automation). Co-authored posters at the 2018 Midwest Robotics Workshop (TTIC) and 2018 ADEIL Conference.

Academic Service

Referree Services

• AAAI Conference on Artificial Intelligence
• Frontiers in Robotics and AI
• IEEE Robotics and Automation Letters (RAL)
• International Journal of Social Robotics (SORO)
• Human-Computer Interaction
• IEEE International Conference on Robotics and Automation (ICRA)
• IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
• Artificial Intelligence for Human-Robot Interaction (AI-HRI)

Organization

• Co-organizer - Wisconsin Robotics Seminar Series (https://robotics.wisc.edu/seminar-series/)
• Co-chair - PHRI & Shared Autonomy for PHRI sessions at IROS 2021

Recent Service

Workshop Volunteer, New Educator's Orientation
• 2019-2023 • UW-Madison

Lab Tours (People & Robots, REACH)
• 2018-2023 • UW-Madison

Volunteer Tutor - Algebra/Geometry
• 2018-2019 • West High School

Engineering Expo
• 2019, 2022, 2023 • UW-Madison

Alumni Interviewer
• 2017-2019 • Tufts University

Event Supervisor - Mechatronics & Aerial Scrambler
• 2019 • Science Olympiad

Technical Skills

Programming (github,gitlab):
• Python • C/C++ • CUDA • Java • HTML/CSS/JS

Robotic Platforms:
• Franka Emika • UR3/UR5 • Rethink Sawyer • Kinova Mico/Jaco • Tello
• da Vinci shadowing (prostatectomy, abdominal hernia repair)

Tools:
• ROS • V-REP • git • LaTeX • CMake

Engineering:
• Solidworks • Matlab • Simulink (control system design certified) • Labview • EES