Rahul Mitra

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EDUCATION

Boston University: Ph.D. in Computer Science, advised by Prof. Edward Chien — Sep 2021 - Present
Research Interests: Computer Graphics/Geometry Processing & Digital Fabrication

Trinity College: B.S. Computer Science (Hons.) & Physics (Hons.), Research Advisor: Kevin Huang — May 2021
Research Interests: Robotic Teleoperation, Evaulating Haptic Interfaces, Contact Sensing
GPA: 3.95/4.0, *Summa Cum Laude, Phi Beta Kappa inductee, Class of 2021's President's Fellow in Physics*

EXPERIENCE

Graduate Research Assistant, Boston University Department of Computer Science — Sep 2021 - Present
- Implementing geometry processing techniques to solve problems in meshing for computational knitting.
- Involves aspects from non-convex optimization, topology and computational fabrication.

Real-time Object Detection Aid for the Visually Impaired, (undergrad. CS senior thesis) — Sep 2020 - May 2021
- Built white cane, enhanced with a microcomputer, to identify objects and provide audio feedback in real-time.
- Configured Jetson Nano high-performance microcomputer for object identification using a trained model.
- Developed iOS application for audio feedback and seamless interfacing between user and enhanced white cane.
- Winner of best thesis award based on completeness, technical maturity and relevance.

Researcher, Vibration-based Contact Sensing, Trinity College Dept. of Engineering — Mar 2020 - Jul 2020
- Designed and implemented a Vibration-based Contact Sensor.
- Wrote code in C and Python to interface sensor with a Raspberry Pi.
- Co-authored research paper accepted at IEEE ICMRA, 2020. [Pub. 1]

Researcher, Vision-based force-feedback in RMIS, Trinity College Dept. of Engineering — Jan 2020 - Mar 2020
- Examined deviation of haptic feedback from ground truth for acceptable performance in Robot-Assisted Minimally Invasive Surgery (RMIS).
- Developed mathematical models for node-to-node interaction in simulated tissue surface.
- Co-authored research paper published at IEEE EMBC, 2020. [Pub. 2]

Researcher, Haptic Interface for Robot Locomotion, Trinity College Dept. of Engineering — Apr 2019 - Mar 2020
- Developed software and experimental protocol to compare a haptic feedback interface vs a keyboard interface and joystick interface for legged robot-locomotion.
- Conducted and interpreted results from user study with Matlab.
- Co-authored research paper published at IEEE IRC, 2020. Co-authored follow-up journal paper published at MDPI Applied Sciences Journal. [Pub. 3 & Pub.4]

Researcher, Joint-limit haptic feedback, Trinity College Dept. of Engineering — Dec 2018 - Jul 2019
- Implemented point cloud generation/retrieval models for providing haptic feedback in teleoperated robots.
- Co-authored research paper published at IEEE ICARM, 2019. [Pub. 5]

RESEARCH PRESENTATIONS

Boston University Graphics Seminar x 2
- External paper presentation: Monte-Carlo Geometry Processing, published at SIGGRAPH 2020 (Jun 2022).
- Presented our ongoing research in computational knitting (Nov 2021).

IEEE International Conference on Advanced Robotics & Mechatronics (ICARM, 2019) — July 2019
- Presented our paper on joint-limit haptic feedback. [Pub. 5]

TEACHING

Teaching Assistant x 5, Trinity College CS, Engineering Dept. — Jan 2019 - May 2021
- Data Structures & Algorithms (Head TA, Spring '21), Intro. Mechanics (Fall '20), Data Structures & Algorithms (Spring '20), Intro. Computing (Spring '19), Intro. Engineering Design (Spring '19).

SKILLS

Programming: C++, Python, C, Mathematica, Matlab HTML CSS, Javascript, SQL, SML
Sofware & Technologies: Git, Blender, MeshLab, Gurobi, libigl, RaspberryPi

PUBLICATIONS

[1] **R. Mitra**, K. Boyd, D. Subedi, D. Chitrakar, E. Aldrich, A. Swamy, K. Huang,"Contact Sensing via Active Oscillatory Actuation", IEEE International Conference on Mechatronics, Robotics and Automation (ICMRA), Shanghai, China, 2020.

[2] K. Huang, D. Chitrakar, **R. Mitra**, D. Subedi, and Y.H. Su,"Characterizing Limits of Vision-Based Force Feedback in Simulated Surgical Tool-Tissue Interaction", Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Montreal, Canada, 2020.

[3] D.Chitrakar, **R. Mitra**, and K.Huang,"Haptic Interface for Hexapod Gait Execution", IEEE International Conference on Robotic Computing (IRC), Taichung, Taiwan, 2020.

[4] K.Huang, **R. Mitra**, I. Yung, D. Chitrakar,"Telelocomotion - Remotely Operated Legged Robots", MDPI Applied Sciences, 2020.

[5] K.Huang, Y.H. Su, M. Khalil, D. Melesse, and **R. Mitra**,"Sampling of 3DOF Robot Manipulator Joint-Limits for Haptic Feedback," 2019 IEEE International Conference on Advanced Robotics and Mechatronics (ICARM), Osaka, Japan, 2019.