

Naveed Riaziat



nriaziat



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naveedriaziat.me



EDUCATION

PhD Mechanical Engineering **Johns Hopkins University**

2020-Present

Advisor: Prof. Jeremy D. Brown

MSE Robotics **Johns Hopkins University**

2020-2022

BS Mechanical Engineering **Purdue University**

2016-2020

SKILLS AND COURSEWORK

Software: C++, Python, OpenCV, MATLAB, ROS, Linux

Hardware: Solidworks, CAD/CAM, DFM, GD&T

Misc: Sensor integration, PCB Design, Microcontrollers, Signal Processing, Statistics

Robotics/Control: Robust, Adaptive, and Nonlinear Control, Linear Systems, Algorithms for Sensor Based Robots, Robot Kinematics and Dynamics

Mathematics: PDEs, Linear Algebra, Intro. Group Theory/Abstract Algebra

Misc: Mechatronics (TA), Electromechanical Motion Devices, Digital Logic Design, Analog Circuit Design, Haptic Interface Design (TA), Human Robot Interaction

PROJECTS

Haptic Feedback for Ungrounded Magnetically Actuated Robots

- Developed real-time localization and control framework using OpenCV, Python, and C++.
- Designed and manufactured novel EMI-resistant force sensing PCB and brain aneurysm phantom for mock aneurysm coiling task.
- Implemented kinesthetic haptic interface and novel Tikhonov Regularization control.

Control Arbitration for Robot-Assisted Minimally Invasive Surgery

- Designed trackers for custom tool localization via Atracsys Fusion Track camera.
- Developing blending-mode controller with haptic feedback to improve performance on electrocautery dissection.

Multi-Modality Haptic Feedback for Surgeons [1]

- Evaluated impact of multiple haptic modes on surgeon performance (vibrotactile and wrist squeezing).
- Implemented signal processing algorithm to render haptic feedback from contact accelerations while preserving spatial and frequency characteristics.
- Adapted offline FFT algorithm to run online in C++.
- Integrated user study data collection system in ROS.

“An Open-Source Ungrounded Hapkit for Educational Application”

- Presented at 2021 IEEE World Haptics Conference, Published in IEEE Xplore.
- Created a pedagogical tool for teaching ungrounded haptic interface design using simple off the shelf components.
- Modified open-source tools with additional sensors and software (control on Arduino and visualization in Processing).

Wireless Smart Obturator (sponsored by Intuitive Surgical)

- Led design team to reduce complication rate in first-access procedures.
- Designed high signal fidelity low-power PCB to measure strain gauges and 6-DoF obturator pose from IMU (via Madgwick Filter) on ARM Cortex-M4 microcontroller.
- [Purdue Abstract Link](#)

Autonomous Power-Line Inspection Vehicle

- Presented at 2019 Purdue Industrial Advisory Committee meeting.
- Design OpenCV algorithms for novel IR-light based localization to control a non-holonomic robot with poor dynamic performance in rough terrain.

PUBLICATIONS

1. Machaca, S., Karachiwalla, Z., Riaziat, N. D. & Brown, J. D. *Towards a ROS-based Modular Multi-Modality Haptic Feedback System for Robotic Minimally Invasive Surgery Training Assessments* in *2022 International Symposium on Medical Robotics (ISMR)* ISSN: 2771-9049 (Apr. 2022), 1–7.
2. Miller, A. J., Riaziat, N. D. & Brown, J. D. *An Open-Source Ungrounded Hapkit for Educational Applications* in *2021 IEEE World Haptics Conference (WHC)* (July 2021), 1155–1155.

WORK EXPERIENCE

Mechanical Engineering Intern Intuitive Surgical May - Aug 2020

- Developed hardware, software, and electronics for new testing equipment.
- Used PLCs to control and measure electromechanical systems.
- Performed dynamics analysis for life cycle evaluation and material selection.
- Produced design documents and manufacturing drawings.

Mechatronics Intern Intuitive Surgical May - Aug 2019

- Prototyped Next-Generation System Components.
- Analyzed Workflow and Operating Room (OR) integration.
- Introduced Electromechanical Systems for Improved Testing.
- Designed Fixtures for System Characterization.
- Coordinated with CDE's, Surgeons, Engineers to Inform Design Requirements.

CMC Manufacturing Eng. Intern Rolls-Royce High Temperature Composites May - Aug 2018

- Introduced novel machining fixtures for 5-Axis Machines.
- Instated Tool Tracking to predict tool wear for purchasing.
- Launched SOP/TI development for new capabilities.

Motion Algorithms Intern TDK Invensense May - Aug 2018

- Developed Motion Algorithms for navigation with 9-axis MEMS.
- Streamlined signal processing with Python, C++, MATLAB to be implemented on FPGAs.
- Leveraged time and frequency domain signal analysis for motion identification.
- Characterized sensor performance in high shock or vibration environments.

AWARDS

NSF GRFP Honorable Mention May 2020

LCSR Distinguished Graduate Fellowship Aug 2020

Purdue Senior Design First Place May 2020

- “Smart Tool for First Access in Laparoscopic Procedures”

Purdue Presidential Scholarship Aug 2016 - May 2020

Purdue Bottomely Scholarship 2019

- Awarded to select Purdue Mechanical Engineering Undergraduate Researchers