Mishek Jair Musa

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Portfolio Website: mjmusa.github.io

EDUCATION

PhD in Mechanical Engineering — Anticipated May 2024

University of Arkansas, Fayetteville, AR
GPA: 4.00
Supervisor: Prof. Uche Wejinya

Master of Science in Mechanical Engineering — December 2021

University of Arkansas, Fayetteville, AR
GPA: 3.88
Supervisor: Prof. Yue Chen
Thesis Title: Respiratory Compensated Robot for Liver Cancer Treatment

Bachelor of Science in Mechanical Engineering — May 2019

University of Arkansas, Fayetteville, AR
GPA: 3.64
Minor: Mathematics

Associate Degree of Science in Math and Physics — June 2016

St. John's College Junior College, Belize City, Belize
GPA: 3.53

Student Program for Innovation in Science and Technology (S.P.I.S.E.) — July 2014

University of the West Indies, Barbados

Intensive four-week residential enrichment summer program for gifted Caribbean post-secondary students, modeled after the MITES program at MIT and is spearheaded by Dr. Cardinal Warde of the Electrical Engineering Department at MIT. Course work included physics, calculus, robotics, and electronics.

SKILLS

Software: Solidworks, Autodesk Fusion 360, Autodesk Inventor, EAGLE, Microsoft Office Suite, Blender, GIMP

Programming: MATLAB & Simulink, Python, Arduino, Machine Learning (TensorFlow), Raspberry Pi, C++, HTML5

Manufacturing: Additive Manufacturing (FDM, SLA, and SLS 3D printing), Milling (CNC and Manual), Lathe (Manual), Soft Robot Fabrication, Laser Cutting, PCB design

Language: English (fluent), Belizean Creole (fluent), Spanish (conversational)

PROJECT & WORK EXPERIENCE

PhD Researcher — January 2022 – Present

University of Arkansas, Fayetteville, AR

- Design and analysis of robotic systems for industrial applications
- Control system design and investigation of learning-based control strategies

Master's Researcher — June 2019 – December 2021

University of Arkansas, Fayetteville, AR

- Design, analysis, fabrication, and characterization of several robotic devices for percutaneous needle insertion procedures under intraoperative image-guidance
- Design and fabrication of soft robots for experimental validation of theoretical research, and design and fabrication of soft sensors for head motion detection in the MRI environment
- Authored several journal and conference papers, and assisted in the writing of several grants and proposals
- Supervised 6 undergraduate students conducting senior design projects and undergraduate honors research

Lead Mechanical Engineer **August 2018 – May 2019**

University of Arkansas Razorbotz, Fayetteville, AR

- Lead mechanical engineer for the excavation subsystem team for the NASA Robotics Mining Competition Team
- Supervised a team of 10 fellow undergraduate mechanical engineers
- Designed and built a functioning robot to perform excavation tasks in a simulated Martian environment

Assistant Engineering Technician **June 2015 – August 2015**

Guerra's Engineering Ltd., Belize City, Belize

- Assisted a technician in the installation, maintenance and servicing of air-conditioning units, refrigeration appliances and various electrical appliances.
- Assisted in the construction and installation of air-duct systems

TEACHING EXPERIENCE

Graduate Teaching Assistant **August 2019 – Present**

University of Arkansas, Fayetteville, AR

- **Spring Semester 2022**
  Lead Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 46 students
- **Fall Semester 2021**
  Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 24 students
- **Spring Semester 2021**
  Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 90 students
- **Fall Semester 2020**
  Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 15 students
- **Spring Semester 2020**
  Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 15 students
  Teaching Assistant for MEEG 4213 Control of Mechanical Systems – 20 students
- **Fall Semester 2019**
  Teaching Assistant for MEEG 3223 Introduction to Mechatronics – 15 students

PUBLICATIONS

Journal Papers

- **M. J. Musa***, A. B. Carpenter*, C. Kellner, D. Sigounas, I. Godage, S. Sengupta, C. Oluigbo, K. Cleary, and Y. Chen, "Minimally Invasive Intracerebral Hemorrhage Evacuation: A Review", *accepted for publication in Annals of Biomedical Engineering* (* indicates co-first author)
- **M. J. Musa**, S. Sengupta, and Y. Chen, "MRI-Compatible Soft Robotic Sensing Pad for Head Motion Detection," *in IEEE Robotics and Automation Letters,* doi: 10.1109/LRA.2022.3147892.
- **M. J. Musa**, K. Sharma, K. Cleary, and Y. Chen, "Respiratory Compensated Robot for Liver Cancer Treatment: Design, Fabrication, and Benchtop Characterization," in *IEEE/ASME Transactions on Mechatronics*, doi: 10.1109/TMECH.2021.3062984.
- Q. Xiao, R. Monfaredi, **M. J. Musa**, K. Cleary, and Y. Chen, "MR-Conditional Actuations: A Review," in *Annals of Biomedical Engineering* 48, 2707–2733 (2020). https://doi.org/10.1007/s10439-020-02597-8

Conference Papers

- S. Sengupta, **M. J. Musa,** and Y. Chen, "MoCoPad: A new soft sensor system for fast head motion detection and tracking in MRI," *in 31st International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting*
- **M. J. Musa**, S. Sengupta, and Y. Chen, "Design of a 6 DoF Parallel Robot for MRI-guided Interventions," *2021 International Symposium on Medical Robotics (ISMR)*, 2021, pp. 1-7, doi: 10.1109/ISMR48346.2021.9661513.
- **M. J. Musa**, K. Sharma, K. Cleary, and Y. Chen, "Design and Workspace Analysis of a Patient Mounted Liver Ablation Robot," in *11th National Image-Guided Therapy Workshop*.

Under Review

- **M. J. Musa**, S. Sengupta, and Y. Chen, "Design of a 6 DoF Parallel Robotic Platform for MRI Applications," *under review in Journal of Medical Robotics Research*.

PATENTS *(including pending)*

- Saikat Tarun Sengupta, Yue Chen, **Mishek Musa**, “Head Motion Correction in MRI Using a Soft Pressure Sensing Pad”, US Provisional Patent Application No. 63/306,067
- Yue Chen, **Mishek Musa**, Xiaofeng Yang, Nima Kokabi, “Image-Guided Robotic System and Method with Step-Wise Needle Insertion”, US Provisional Patent Application No. 63/299,304
- Yue Chen, **Mishek Musa**, “Respiratory Compensated Robot for Liver Cancer Treatment”, US Patent Application No. 17/525,461

PROFESSIONAL ACTIVITIES

Technical Reviews

- Provided technical reviews of publications submitted to IEEE Robotics and Automation Letters Special Issue: Autonomous Systems in Robotic Surgery (2021), International Symposium on Medical Robotics (2022)

Memberships

- IEEE Student Member
- IEEE Robotics and Automation Society Member
- Pi Tau Sigma – International Mechanical Engineering Honor Society

CERTIFICATIONS/AWARDS

- Certified SolidWorks Associate – License C-NUA8W3Y8QZ
- Treasurer of Pi Tau Sigma – International Mechanical Engineering Honor Society (2018 – 2019)
- Mechanical Engineering Ambassador – Promote and inspire freshmen to join the Mechanical Engineering Department at the University of Arkansas through talks and presentations
- University of Arkansas Caribbean Tuition Advantage Scholarship (2016 – 2019)