FAIZAN MUHAMMAD

Robotics - Human-Machine Augmentation - Computer Vision

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EXPERIENCE

Software Engineering Intern

CTRL Labs

May 2019 – August 2019 New York

- CTRL Labs is currently developing CTRL Kit: a non-invasive neural interface for general purpose human-machine interaction
- Mapped EMG-based neural signals to a hexapod robot to mimic user's hand state
- Developed a control scheme to play soccer through a hexapod using forearm movements
- Prototyped experimental features for CTRL Kit

Robotics Research Assistant

Autonomous Intelligent Robotics Lab

Jan 2018 – Ongoing Tufts University

- Proposed, designed and implemented an Augmented Reality interface for robots using Unity and ROS
- Designed and conducted pilot studies involving the use of this interface as a tool for Human-Robot Interaction
- Presented the system architecture and demos to HRI 2019 (South Korea), Tufts Engineering Advisory Board and Tufts Campaign Committee
- Currently planning the logistics and structure of a full study based on the feedback from the pilot study

Co-President

Tufts Robotics Club

Apr 2018 – Apr 2019 Tufts University

- Trained and mentored new members of the club
- Reformed club outreach strategy and internal dynamics to promote diversity, accessibility and member retention
- Led the design of a custom, modular club robot that can be specialized to several competitions *(ROS, Arduino, Raspberry Pi)*

Computer Vision Research Assistant

Center for Engineering Education and Outreach

Dec 2016 – Aug 2017 Tufts University

- Devised a programming paradigm for K-12 students to code robots using paper drawings *(C++, OpenCV, LabView, Lego Mindstorms)*
- Formulated a custom RESTful API for lab-based Internet of Things devices *(C++, HTML, Arduino)*
- Developed a teacher-assistance tool for digitization of classwork to promote discussion and collaboration *(C++, OpenCV)*

EDUCATION

BS Computer Science

Tufts University - School of Engineering

Sept 2016 – May 2020

GPA: 3.94

Senior Honors Thesis (Planned): Teaching Robots Object Manipulation through EMG-based Demonstrations

Elective Courses: Probabilistic Robotics | Autonomous Intelligent Robotics | Human Robot Interaction | Computational Models in Cog. Sci. | Machine Learning | Computer Vision

PROJECTS

Trinity College International Fire Fighting Robot Contest

Tufts Robotics Club

- 2018: Led the development of software architecture based on central Raspberry Pi Zero interfaced with an Arduino Mega
- 2019: Led the full-stack development containing dedicated real-time subsystems running on Arduinos and a central Raspberry Pi 3B+ running ROS

Sound Based Robot Localization

Probabilistic Robotics

Used acoustic signatures of spaces to identify them using Machine Learning *(Matlab)*

Clappy Bird

Digital Circuits

Recreated Flappy Bird video game on an FPGA using clapping as the control mechanism *(VHDL)*

Remote Virtual Reality for Service Robots

Autonomous Intelligent Robotics

Created a VR experience that lets a user see through the perspective of a remote service robot *(Unity, ROS, C#, C++)*

MEDIA AND PUBLICATIONS

Late Breaking Report, HRI 2019 - South Korea
Muhammad, F., Hassan, A., Cleaver, A., and Sinapov, J. "Creating a Shared Reality with Robots", *In Proceedings of Late-Breaking Reports Track at the 14th ACM/IEEE Annual Conference on Human-Robot Interaction, Daegu, Korea, Mar. 11-14, 2019.*

Featured Video - Future You @ NPR
"Digital Telekinesis For the Future You?" featured the hexapod application I developed for CTRL Labs
https://www.youtube.com/watch?v=9_9RNRNd9y8

Featured Article - Tufts Now
"Hands-on Research for Undergraduates" featured my Tufts Summer Scholars research
https://now.tufts.edu/articles/hands-research-undergraduates

Featured Video - Tufts University Social Media
"Visualizing a Robot's Perspective of the World" featured the Autonomous Intelligent Robotics Lab's aims, efforts and progress in the domain
https://www.youtube.com/watch?v=9_9RNRNd9y8

Demos, Documentation, Code and More
To find out more details about my work visit:
https://faizan-m.github.io

HONORS

Tufts Summer Scholar 2018
Received a grant to pursue the Augmented Reality Interface research project in Autonomous Intelligent Robotics Lab

Verizon 5G EdTech Challenge 2019
Augmented Reality Interface was part of the winning proposal for the grant

Trinity College International Fire Fighting Robot Contest
Won the Olympiad in Senior Individual Category in 2018 and 2019

International Mathematical Olympiad 2016
Participated as a member of the Pakistani Team

SKILLS

C++ | Python | C# | Go | Matlab | C | VHDL | LabView

ROS | Unity | OpenCV | Visual Studio | Git

Laser Cutting | 3D Printing | Circuitry

English | Urdu | Punjabi | Hindi