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John R. Miller

Education

Carnegie Mellon University — Pittsburgh, PA
Ph.D. Student in Electrical and Computer Engineering — Expected May 2022
Advisor: Prof. Anthony Rowe
Frank J. Marshall Graduate Fellowship

University of Maryland — College Park, MD
B.S. Electrical Engineering / Mathematics, *cum laude* (GPA: 3.9) — Aug 2014
University Honors Citation
Electrical and Computer Engineering Honors Citation
President's Scholarship

Research

Asynchronous Time Warping for High-Speed Projection Augmented Reality — Pittsburgh, PA
Prof. Anthony Rowe, Carnegie Mellon University WiSE Lab — Aug 2018 – Present
Platform for handheld projection augmented reality "flashlight"
- Designed FPGA-based augmented reality platform for use with high-framerate DLP projector.
- Implemented IMU fusion algorithm for tracking projector pose at 1000 frames per second.

Indoor Localization Systems for Augmented Reality — Pittsburgh, PA
Prof. Anthony Rowe, Carnegie Mellon University WiSE Lab — Aug 2017 – Present
Research towards enabling persistent multi-user augmented reality applications on mobile devices.
- Designed algorithms and test scenarios for localization and mapping by integrating data from inertial sensors, magnetic field, visual odometry, and range from ultra-wideband beacons.
- Developed a remotely accessible IoT testbed for evaluating wireless time-of-flight ranging performance using ultra-wideband radio modules and Raspberry Pi computers.

An Infrastructure-Free Localization System for Firefighters — Pittsburgh, PA
Prof. Anthony Rowe, Carnegie Mellon University WiSE Lab, NIST — Aug 2017 – Present
Collaborative localization approach using point-to-point ranges and inertial data
- Chosen to present demonstration to U.S. Army representatives at AI Task Force kickoff event Feb 2019

A Human-in-the-Loop Asset Tracking and IoT Provisioning System — Pittsburgh, PA
Prof. Anthony Rowe, Carnegie Mellon University WiSE Lab, Texas Instruments — Aug 2017 – Present
Using augmented reality to assist in beacon placement and tracking of IoT devices

Parallel Support Vector Machine Implementations — College Park, MD
Prof. Uzi Vishkin, University of Maryland Institute for Advanced Computer Studies (NSF REU) — Sep 2013 – Sep 2014
Worked with the Explicit Multi-Threading (XMT) platform, an experimental desktop supercomputer architecture.
- Independently developed software for Support Vector Machine training on XMT in C, including serial and parallel implementations of two algorithms, with a focus on maximizing performance.

Field Programmable Analog Array — College Park, MD
University of Maryland Capstone – Mixed Signal VLSI Design — Feb – May 2014
- Led a team of 6 students to develop a programmable analog array (FPAA) integrated circuit on a 1 mm^2 die
- Designed an analog multiplication circuit, allowing the FPAA to perform nonlinear computations
- Wrote a 70-page report documenting the design process and providing detailed technical specifications and simulation results

Publications

Competition Entry: Realty and Reality: Where Location Matters. Miller, J. et al. The 17th International Conference on Information Processing in Sensor Networks. 2018. **1st Place, 3D Category**

Demo Abstract: Welcome to My World: Demystifying Multi-user AR with the Cloud. Rajagopal, N. et al. The 17th International Conference on Information Processing in Sensor Networks. 2018. **Best Demo Award**

Patent: Karvounis, J. et al. 2017. Reducing elevation error with environmental pressure anomaly compensation. U.S. Patent 9,823,068, filed February 10, 2016, and issued November 21, 2017.

Patent: Young, T. et al. 2017. Heading constraints in a particle filter. U.S. Patent 9,759,561 filed May 15, 2015, and issued September 12, 2017.

Industry Experience

TRX Systems, Inc. Greenbelt, MD
Electrical Engineer Sep 2014 – Jun 2017

- Independently developed novel algorithms for:
  - Tracking mounting location of a body-worn sensor, combining machine learning and heuristic approaches.
  - Classifying user posture and activity; detecting gait and environmental conditions
  - Calibrating magnetometer hard-iron offset at runtime without the need for user interaction.
  - Choosing an optimal kernel bandwidth for particle filter resampling.
- Implemented sensor polling, peripheral management, and signal processing firmware on ARM platform.
- Reviewed and refactored existing C framework, greatly consolidating codebase through modularization.
- Led team of interns in developing ad-hoc time-of-flight ranging system to aid firefighters in low visibility environments.
- Created visualization tools in C# and MATLAB for viewing inertial sensor data and evaluating system performance.

GAP Automation, LLC Winchester, KY
Electrical Engineering Intern Summers 2009 – 2013

- Designed and assembled PLC-based automation systems for automotive and pharmaceutical applications, primarily with Allen-Bradley control hardware and RSLogix software
- Travelled to car seat assembly plants to assist in installation and on-site debugging

Personal Projects and Activities

Project Website: https://calculatorsp.github.io

Xbox Bot – Computer-controlled button pressing coupled with computer vision algorithms allows autonomous playing of Halo and other Xbox/PlayStation games.

Gameboy Costume – Fully playable costume complete with capacitive touch sensing gloves (via conductive thread) and a 10.1" LCD display, utilizing emulator software.

Maryland Bowling Club, President May 2013 – May 2014
Silhouette Stages Community Theatre Pit Orchestra, Trumpet Player in *Blood Brothers* Jan – Mar 2011

Skills

Relevant Coursework: Computer Vision, Artificial Intelligence, Machine Learning, Wireless Spectrum Analysis, Parallel Architectures and Algorithms, Signal Processing and Harmonic Analysis, Statistics, Embedded Systems, Reverse Engineering

Software and Languages: C/C++, Python, OpenCV, AVR, ARM, C#, Java, MATLAB, x86 Assembly, MIPS Assembly, Arduino, AutoCAD, Keil Microvision, Microsoft Visual Studio, Soldering, UNIX, Linux, Windows, and Mac OS