Zain Merchant

www.zain-merchant.com
merchant.zain@outlook.com

Experience

NASA Langley Research Center *Hampton, VA*

Computer Engineer — Flight Software Systems Branch *January 2020 — Current*

- Support the design, development, and testing of embedded software for satellites and scientific instruments.
- Lead the development of a high fidelity simulator for the Navigation Doppler Lidar instrument. The simulator aided in the creation and verification of ground software, and was shipped to external partners for use in hardware-in-the-loop testing. Received the agency's *Superior Accomplishment Award* for the project based on feedback from users.
- Implemented flight software modules for interfacing with various peripherals (cryocooler, lidar, Iridium modem, sensors, etc.) over protocols such as SPI, I2C, UART, Ethernet, TCP/IP, and SpaceWire on ARM and RISC-V architectures.
- Created tools in Python / C++ for ground system control, test procedure automation, and data visualization.

Pathways Intern — Flight Software Systems Branch *May 2019 — July 2019*

- Created a memory access driver in C / FreeRTOS, allowing for thread-safe memory allocation, wear leveling, etc.
- Developed command and telemetry GUIs for debugging and interfacing with instrument subsystems using PyQt.

Pathways Intern — Flight Software Systems Branch *September 2018 — December 2018*

- Developed an equatorial mount subsystem in C / FreeRTOS and integrated it within existing flight software.
- Created Ruby scripts to automate test procedures and verify the functionality of multiple instrument subsystems.

The University of California, San Diego *La Jolla, CA*

Undergraduate Researcher (REU) — Engineers for Exploration *June 2018 — August 2018*

- Used C++ High Level Synthesis (HLS) to write FPGA overlays for I2C sensor data acquisition, PID motor control, and PWM signal generation for a Xilinx PYNQ (Zynq) development board.
- Developed similar functionality using a MicroBlaze to compare resource utilization, performance, and complexity against HLS design. Used Jupyter Notebooks for debugging and functional demonstrations.

NASA Johnson Space Center *Houston, TX*

Intern — Integrated Guidance, Navigation, and Control Analysis Branch *August 2017 — December 2017*

- Analyzed ascent abort procedures and assisted in creating models to characterize propellant slosh within the SpaceX Crew Dragon landing and orbit tanks using the Trick Simulation Environment.
- Created a 3D animation tool in Python to calculate and render propellant slosh for various tank geometries.

Massachusetts Institute of Technology *Cambridge, MA*

Undergraduate Researcher (REU) — Haystack Observatory *June 2017 — August 2017*

- Designed and implemented the foundations of an autonomous avionics system in FreeRTOS and Linux.
- Wrote software in C and C++ for a UART Iridium modem interface, autonomous system health monitoring, process management, GPIO sensor data collection, and power reduction optimizations.

Education

The University of Texas at Dallas

Bachelor of Science, Computer Science *December 2019*

Languages: C, C++, Python, MATLAB, SQL

Software & Tools: RTOS, Linux, Xilinx Vivado, Flask, Docker, Git, Make, Bash

Awards: 1st place Fall 2019 Senior Design Capstone Project, 1st place at HackNAU 2017, 1st place at Richardson Community Hack Week 2016 (incl. a $25,000 grant for continued project development)

Publications

B. Cain, **Z. Merchant**, I. Avendano, D. Richmond and R. Kastner, "PynqCopter - An Open-source FPGA Overlay for UAVs," in *2018 IEEE International Conference on Big Data (Big Data)*, Dec. 2018, pp. 2491-2498. [Online].
Available: https://ieeexplore.ieee.org/document/8622102