Richard **Matthews**

University of Waterloo 4B Mechatronics Engineering, Class of 2020

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Skills

Software

- C, C++, Python, Matlab, Assembler, TCL, Perl
- Embedded Development: device drivers and firmware
- Real Time Operating Systems
- Digital Controls (PID, State-Space)
- Display Drivers, EFI

Hardware

- ARM-Cortex M, AVR Microcontrollers
- Schematic capture, PCB Layout, Assembly and Rework
- Power Electronics including inverters, regulators, and rectifiers
- I^2C, SPI, SD SPI, UART, CAN protocols

Tools

- Altium, Eagle, LTSPICE, Vector CANdb++
- Oscilloscope, Function Generator, DMM, Logic Analyzer
- Git, SVN, CVS
- Unix, Shell Scripting, GNU Make
- GoogleTest Unit Test Framework

Work Experience

Embedded Software Developer

May 2019 - August 2019

Blackberry

- Added support to camera driver for synchronizing white balance and exposure between multiple cameras
- Improved ADAS algorithm api by automatically handling buffer management for algorithms with multiple sensor inputs
- Developed driver to provide h264 encoded stream from IP camera by modifying the multimedia graph
- Responsible for debugging multiple customer issues, such as identifying bug in sensor api that reused sensor buffer headers for multiple data buffers
- Refactored code to be safety certifiable by removing dynamic memory allocation during runtime and replacing it with static buffer array

Embedded Software Developer

May 2018 - August 2018

Apple

- Created test automation framework for EFI display driver code, and implemented tests to verify display setup
- Modified EFI display driver code to intelligently determine failure causes and save information for use in testing
- Created tests that will prevent numerous common bugs that were occurring with increasing frequency
- Implemented saving of debug data relating to EFI display setup for devices in field

Embedded Software Developer

September 2017 - December 2017

Nokia

- Implemented communication API for product simulator using interprocess shared memory between Linux daemon and QEMU VM
- Shared memory communication decreased message transfer time by 75% vs old communication API
- Developed unified API for communication between main processor and FPGAs, replacing numerous redundant functions

Hardware Design Intern

January 2017 - April 2017

Lumotune

- Implemented automatic firmware tests to verify hardware integrity on system startup
- Designed a PI control algorithm to maintain output voltage of DC-AC inverter with varying output loads
- Developed automatic capacitor bleed circuit and voltage quadrupler circuit to generate high voltage DC from AC input

Software Developer, Solace Systems

May 2016 - August 2016

Embedded Software Developer, Alcatel-Lucent

September 2015 - December 2015

Personal Projects

Waterloo Formula Electric

January 2017 - Present

Firmware Lead, 2019 Vehicle Firmware

- Responsible for managing team of 5 students, including one full-time co-op
- Developed firmware for vehicle ECUs managing low and high voltage batteries, and controlling motors
- Implemented Battery Monitoring System (BMS) ensuring cell voltages and temperatures remain within safe limits
- Developped balance charging algorithm safely coordinating charging using HV charger and BMS
- Implemented driver for LTC6811 battery monitor chip, communicating over Isolated SPI bus
- Created python script to generate C code for sending and receiving CAN messages based on message and defect code database

Quadcopter Flight Controller

July 2017 - December 2017

- Designed, assembled, and developed software for control board to stabilize the flight of a quadcopter
- Created schematics and PCB layout for board which included an ARM-Cortex M4 processor and multiple MEMS IMU sensors