Richard **Matthews**

University of Waterloo 3A 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
- Control Algorithms

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++
- Oscilloscopes, Function Generators, DMMs, Logic Analyzer
- Git, SVN, CVS
- Linux, Bash Scripting, GNU Make
- GoogleTest Unit Test Framework

Work Experience

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 will prevent numerous common bugs that are occurring with increasing frequency
- Implemented saving of debug data relating to EFI display setup for devices in field
- Major display bug causing recall would have been prevented or mitigated in future due to new tests and debug data
- Developed tool for storing GPU information in Serial EEPROM during manufacturing

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
- New API replaced numerous redundant functions with one interface to access all FPGA memory regions

Hardware Design Engineer, 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
- Modelled all new circuitry in LTSPICE circuit simulator to verify and optimize designs
- Debugged switching voltage regulator with high output ripple by reworking board to test out multiple types of output filters

Software Developer, Solace Systems *May 2016 - August 2016*

Embedded Software Developer, Alcatel-Lucent *September 2015 - December 2015*

Software Tester, Alcatel-Lucent *January 2015 - April 2015*

Personal Projects

2018 Vehicle Firmware, Waterloo Formula Electric

January 2018 - Present

Firmware Subteam Lead

- Created state machines documenting desired behaviour of all vehicle electrical control units (ECUs)
- Created python script to generate C code for sending and receiving CAN messages based on message and defect code database
- Implemented CAN driver with interrupt driven message transmit/receive and abstraction layer to support multiple processors
- Developed vehicle control unit state machine, controlling motors based on driver input and data from battery management system

Data Acquisition Unit, Waterloo Formula Electric *January 2017 - April 2017*

- Developed firmware for onboard Data Acquisition Unit (DAU) running FreeRTOS, which logged data from analog and digital sensors
- Developed SD card driver to initialize, read and write data over the SD card SPI interface
- Synchronized multiple tasks to read from sensors at varying frequencies and log output to SD card

Quadcopter Flight Controller

July 2017 - December 2017

- Designed, assembled, and developed software for control board to stabilize the flight of a quadcopter
- Used Altium Designer to create schematics and PCB layout of board which included an ARM-Cortex M4 processor and multiple MEMS IMU sensors
- Developed control software, using FreeRTOS, to stabilize quadcopter flight by controlling motor speeds based on sensor input
- Implemented sensor fusion algorithm to combine sensor inputs and cascaded PID control to perform quadcopter auto levelling
- Developed asynchronous reading of sensors over I^2C using DMA reducing CPU load and allowing faster control loop frequency