Ali Naqvi

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Education

McMaster University Hamilton, ON

*Bachelor of Engineering in Computer Engineering - **3.7/4.0 GPA*** *Sep. 2022 - Present*

- **Relevant Coursework: Digital Logic and RTL Design (3DQ5), Data Structures & Algorithms, Advanced Circuits & Microelectronics, Microprocessor Systems.**

Experience

Software Engineer Sep. 2024 - Present

McMaster Mars Rover Team *Hamilton, ON*

- Spearheaded firmware design for the rover's power distribution system using **FreeRTOS**. Developed preemptive multitasking for sensor polling, fault detection, and **CAN bus** communication.
- Designed and deployed an **I2C driver** for the MCP3221 ADC in **C**, achieving **98% accuracy** in voltage and current readings on high-power, **STM32** based rover systems.
- Conducted **PCB assembly** and hardware validation. Used soldering techniques for component integration and employed **oscilloscopes/logic analyzers** for debugging firmware.
- Created **ROS2** nodes, publishers and subscribers in **C++** for efficient data flow and communication for the rover's power distribution network.
- Optimized ROS2 build processes on **Linux** by leveraging **UNIX pipes** to streamline output handling and enhance inter-process communication.

Computer Chapter Member Sep. 2024 - Present

IEEE McMaster Student Branch *Hamilton, ON*

- Engaged in technical discussions during team meetings, mentoring members on hardware-software integration techniques and debugging strategies.
- Attended and helped organize multiple hands-on workshops on **Python** programming, **Arduino** prototyping, and **PCB** design.

Projects

FGPA Image Decompressor | *SystemVerilog, UART, TCL* Oct. 2024 - Nov. 2024

- Designed a custom image decompression system on an **Altera DE2-115 FPGA** that received compressed data via **UART**, stored and managed data in external **SRAM**, and drove a **VGA** controller for real-time image display.
- Implemented **RTL** code in **SystemVerilog** for DSP algorithms including: interpolation, inverse discrete cosine transform, and lossless decoding.
- Applied pipelining techniques across DSP stages to resolve timing violations and meet 50 MHz clock constraints on the FPGA.
- Created **TCL** scripts to automate pin assignments and streamline board configuration for various clock domains and peripheral interfaces.

3D Spatial Mapper | *Python, C, ARM Assembly, UART, I2C* Apr. 2024 - May 2024

- Engineered a LiDAR Spatial Mapper in **C** and **ARM Assembly** using a TI MSP432 microcontroller and a Time-of-Flight sensor mounted onto a stepper motor, enabling accurate 360-degree spatial measurements up to 4 meters away.
- Utilized **Python** to implement real-time data transmission via **UART** using **NumPy** and **Open3D** libraries to display accurate 3D models of the scanned environment on a PC.
- Integrated low level ARM **Assembly** routines with **I2C** protocol to efficiently acquire Time-of-Flight sensor data and coordinate with the MCU.

Technical Skills

Languages: C/C++, Python, SystemVerilog, Java, Javascript, Bash, R, Assembly, TCL, MATLAB, SQL.
Libraries & Frameworks: ROS2 (Robot Operating System), React, NumPy, Matplotlib, Open3D, Foxglove.
Tools & Technologies: Git/GitHub, Linux, VS Code, Visual Studio, PSpice, Simulink, STM32CubeMX, KiCAD.