RAHUL RAMKUMAR

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EDUCATION

University of Waterloo, BaSc in Mechatronics Engineering Sept 2022 - Expected 2027

- GPA: 3.95 (91.5%)
- Awards: Dean's Honor List, President's Scholarship of Distinction
- Relevant Courses: RTOS (C), Sensors, Digital Logic, Embedded Systems, Power Electronics & Actuators

EXPERIENCE

Untether AI, *Hardware Engineer* | Toronto, ON. May 2025 - July 2025

- Engineered low-power, AI inference accelerators hardware based on RISC-V architecture for edge deployment
- Automated SPICE netlist generation for custom circuit components, accelerating simulation workflows
- Designed and optimized custom digital circuit schematics using Cadence Virtuoso, ensuring functional correctness and layout readiness for ASIC/SoC integration

University of Waterloo, *Undergraduate Robotics Research Assistant* | Waterloo, ON. March 2025 - Present

- Conducted research on soft robotics, focusing on the design and control of a pneumatically actuated humanoid hand
- Designed a PCB integrating Hall effect, capacitive, and pressure sensors for joint feedback via daisy-chained SPI
- Developed a custom STM32-based MCU board with USB DFU programming, 12V–3.3V buck conversion, and SWD headers, initializing SPI and I2C peripherals to interface with sensors and control solenoids using force feedback
- Developed embedded control system in C interfacing with sensors via SPI to drive solenoids via PWM drivers

KA Imaging Inc., *Electronics Hardware Engineer* | Waterloo, ON. Sept 2024 - Dec 2024

- Design PCBs and develop embedded software for x-ray imaging systems used in medical and industrial applications
- Wrote embedded C on AMD Dual ARM Cortex SoC to gather 14-bit ADC data in DDR mode for image sensor
- Built precision analog circuitry via PCB to deliver controlled sawtooth signals for verifying ADC accuracy, stability, and resolution on system motherboards.
- Debugged PMIC by interfacing with it via I2C protocol using a RPi to analyze real-time power data from registers
- Generated FPGA signals using a pattern signal generator to drive a CMOS image sensor for HIL testing to verify increased image capture frame rate from 0.5 to 5 MHz/pixel

DESIGN TEAM

Waterloo Aerial Robotics, *Embedded Flight Software Team Member* | Waterloo, ON. Jan 2023 - Present

- Collaborated to develop embedded software for a custom-built autonomous aerial UAV used in competition
- Utilized FreeRTOS to instantiate a telemetry manager thread and enable task scheduling through timer interrupts
- Developed UAV telemetry architecture using MavLink and byte circular queues for seamless message transmission
- Developed RFD900 UART driver for STM32 via DMA ISR using the STM32 Hardware Abstraction Layer

University of Waterloo Robotics Team, *Firmware & Software Team Member* | Waterloo, ON. Sept 2024 - December 2024

- Worked as a team to develop firmware and autonomous software for a rover used in University Rover Challenge
- Designed communication subsystem to transmit control and GPS data from STM32 to NVIDIA Jetson
- Configured UART for wireless transceiver module via DMA with encryption algorithm to provide data transmission
- Implemented watchdog timers to avoid deadlock and send data notifications via USB from STM32 to PC

PROJECTS

6-DOF Robotic Arm | C, FreeRTOS, Python, SolidWorks, ROS2/microROS, STM32, RViz

- Implemented multi-tasked FreeRTOS application on STM32 for micro-ROS communication, servo motor control using PWM driver via I2C, and joystick signal filtering to enable reliable motion control in a real-time system

Automated Measurement System | C, C++, Python, OpenCV, STM32, RPi, KiCad, Fusion360

- Developed object-oriented C++ driver to control NEMA-17 stepper motor with micro stepping capabilities to rotate camera arm and base of system
- Established communication between RPi and STM32 using UART interrupts used in a computer vision script
- Wrote a computer vision script using OpenCV that isolated object via edge-based segmentation and bounding boxes to approximate pixels

SKILLS

Software	C, C++, Python, FreeRTOS, ROS/ROS2, Git, GDB, MATLAB, VHDL, Java
Technologies	STM32, Arduino, Raspberry Pi, OpenCV, FPGA, Linux, Pandas, NumPy, Matplotlib, Docker, YoloV8
Electrical	Cadence Allegro PCB Designer, Altium, KiCad, DMM, Oscilloscope, Logic Analyzer, Soldering (SMT, THT)
Mechanical	SolidWorks, Fusion 360, GD&T
Protocols	UART, SPI, I2C, CAN, MAVVLINK, HTTP, USB, TCP/IP