Michael McPhee

519-404-4826 | mimcphee@uwaterloo.ca | linkedin.com/in/michael-mcphee-uw/ | github.com/michaelmcphee

Technical Skills

Programming: MATLAB, Simulink, C/C++, Python, OpenCV, git, Linux
Design: SolidWorks, AutoCAD, 3D Printing, Machining
Embedded: STM32, Arduino, I^2C, SPI, UART

Experience

Robotics Engineering May 2025 – August 2025
Low Power Futures *Markham, ON*

- Designed and built a two-wheeled differential drive robot, creating a full SolidWorks model and combining 3D-printed and sourced components for the chassis, drivetrain, and electronics mounting
- Wired the robot's electronics, soldering the battery pack and custom I^2C breakout board, and connecting all sensors, motors, and controllers into a reliable modular system
- Developed Arduino firmware to control motors, read sensors, and implement PID loops for motion validation, ensuring accurate sensor readings and motor performance
- Created a MATLAB model of the robot's dynamics and sensor observations, implementing a Kalman filter for localization to estimate position and orientation

Engineering Research Assistant September 2024 – December 2024
University of Waterloo Ideas Clinic *Waterloo, ON*

- Designed an educational mass-spring-damper system using an ultrasonic sensor and motor encoder, with a Python script to plot real-time data over a UART serial connection to Arduino
- Redesigned a conveyor gearbox in SolidWorks, extending runtime from <10 minutes to continuous operation

Engineering Co-op January 2024 – April 2024
Research Grade Sports *Harrogate, UK*

- Developed an OpenCV Python program to calculate the speed and spin of a golf ball from video footage, utilizing a Raspberry Pi camera on an NVIDIA Jetson running Ubuntu
- Applied numerical integration in MATLAB to model golf ball rolling, optimizing parameters to minimize error, achieving a 0.31-meter RMS error through calibration with experimental data

Aeronautics Research Assistant May 2023 – August 2023
WISA Flight Simulator Lab *Waterloo, ON*

- Developed a MATLAB script utilizing haversine functions to calculate distances between latitude and longitude points, improving accuracy and efficiency of distance calculations
- Designed and implemented a MATLAB script for automated flight grading and data visualization, providing efficient feedback and enhancing pilot training effectiveness

Projects

STM32 Multithreaded Real-Time Operating System | *C, RTOS, STM32* August 2024

- Implemented a round-robin thread scheduler in C with stack management on an STM32 microcontroller, enabling seamless context switching and efficient multitasking for multiple user threads.
- Designed and tested kernel functions for thread creation, interrupt handling, and priority-based scheduling, ensuring robust and reliable system performance under varying loads

Digital Caliper Measurement Device | *SolidWorks, 3D Printing, Arduino* November 2023

- Designed and 3D printed a rack and pinion system using a potentiometer to measure distance
- Designed the circuit and developed Arduino code to convert potentiometer voltage into precise distance readings, optimizing accuracy with statistical linear regression to achieve a maximum uncertainty of ± 0.33 cm

Education

University of Waterloo September 2022 - Present
3B Mechatronics Engineering *Waterloo, ON*

- Achieved a 91% cumulative GPA, earning Dean's Honours List in Terms 2A and 2B and Term Distinction in 3A