

Education

University of British Columbia, Sept 2018 - Present
Bachelor of Applied Science: 3rd Year Engineering Physics
Cumulative Average: 86.3%
Expected Graduation: May 2023

Technical Skills

- Electrical:**
- Experienced with component selection, schematic capture and PCB Layout using Altium Designer
 - Construction of analog circuits (LCR, Op-Amps, FETs, BJTs) and digital circuits (Logic Gates, Flip-flops, Counters)
 - Experience with test and measurement equipment: oscilloscope, multimeter, signal generator
 - Soldering: surface mount, through hole, general wire connections
 - Circuit simulation and design verification using LTSpice
 - Knowledge of designing circuitry for power regulation, filters, signal communication
 - Familiar with communication protocols: SPI, I2C, CAN, ethernet, PWM, RS422
- Software:**
- Languages: Python, C, C++, Java, BASH, MATLAB
 - UNIX/Linux shell proficiency
 - Git and Continuous Integration
 - Robotics: ROS, Gazebo, Rviz, OMPL
 - Experience with OpenCV, Keras
 - Markup: HTML, CSS, LaTeX
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Electrical Hardware Experience

UBC Rocket – Electrical Team Member

Sep 2020 – Present

Designing electrical hardware with power regulation, sensor data collection, telemetry, and position tracking over time for UBC Rocket's launch to the Karman Line in the Base 11 Space Challenge.

- Designed layout of the rocket's 4-layer power regulation and computing PCB with a NXP MK66, which regulates a Li-ion battery power source into 24V, 5V and 3V3, collects data from sensors via I2C, SPI, RS422, Ethernet, and CAN to communicate flight critical data and detect apogee.
- Impedance matched CAN, ethernet, and RS422 transmission lines to minimize signal reflections.
- Fully responsible for the design of a Reaction Control System PCB including component selection, schematic capture, layout design, and coordination with mechanical sub-team.
- Ensured PCB design met manufacturer capabilities and assisted with BOM and manufacturing files generation.

Engineering Physics Autonomous Robot Competition Finalists: 4th out of 16 teams

May 5 – August 6, 2020

Website: <https://zephko.github.io/enph-253-robot/>

Built a fully autonomous robot capable of tape following, picking up cans, and depositing them in an 8" tall bin. Visit the site for video, full circuit schematics, and CAD models.

- Oversaw and managed strategy for all the electrical systems and presented them in a design proposal.
- Designed power regulation, control circuitry for sensors, and IR frequency sensor with an amplifier and band pass filter to detect an 1kHz IR Beacon from 4 feet away.
- Designed and soldered optocoupled H-bridge circuits to process microcontroller signals and control DC motors with PWM.
- Implemented PID tape following by measuring IR reflectance using a phototransistor with analog threshold values.
- Developed C++ embedded software for a STM32F3 MCU including signal processing, PID control loops, motor actuation.
- Constructed circuit simulations in LTSpice for design verification.
- Troubleshooting of crucial sensor and motor problems with both software and hardware tools.

Work Experience

UBC Collaborative Robotics Laboratory

Robotics Research Intern

Jan 2020 – May 2020

Developed robotics software and debugged hardware for a CS/robotics research team, creating a control system and interface for cognitively impaired adults to learn to drive powered wheelchairs while sharing control with a trainer

- Wrote clean, well-documented Python code to develop ROS wheelchair control system capable of interfacing with control from analog electronics, Bluetooth, USB, and Wi-Fi on an embedded ARM-Linux board.
- Debugged and tested electrical hardware and SPI for digital-to-analog conversions on a custom PCB BeagleBone shield.
- Automated network configuration and robot startup processes using Bash and Python scripting, reducing total start time by over 50%.
- Integration of LiDAR data to perform SLAM and navigation in both physical environments and Gazebo simulations.
- Developed Gazebo simulation for trainers to practice remote control over a shared control wheelchair.

Design Team Software Experience

UBC Sailbot – Motion Planning Software Team Member

Jan 2020 – Sept 2020

Developing path planning software for a fully autonomous sailboat to compete in the Vic-Maui International Yacht Race

- Developed a path-finding module using RRT* to generate paths for obstacle avoidance, adapt to changing wind conditions, and perform tacking maneuvers.
- Designed and implemented algorithms for state validity checking, obstacle avoidance, and evaluating paths.
- Created local pathfinding visualization tool in Python to display optimized boat path on a map with dynamic obstacles and wind sensor data.
- Wrote unit tests for using Python unittest framework and created ROS nodes for testing special pathfinding cases.

Relevant Coursework

ELEC 204 (A+, 100%) – Linear Circuits. Basic concepts and analysis techniques in the context of electric and electronic circuits including Bode plots and the Laplace transform. Treatment of RLC circuits, phasors, op-amps. Introduction to nonlinear circuit elements, diodes, BJT, FET circuits.

ENPH 253 (A+, 95%) – Introduction to Instrument Design. Practice in engineering design and instrument development including mechanical and electrical design, and communications with sensors, actuators. Micro-controller implementation and system integration.

ENPH 259 (A, 87%) – Experimental Techniques. Experimentation, measurement, and data collection in electronic systems. Construction and analysis of analog and digital circuits. Use of laboratory tools: oscilloscope, multimeter, signal generator.