Jackson Empey

Engineering graduate experienced in robotics and simulation

Experience

CAE | Software Developer (Aerodynamics)
Jul 2022 – Jul 2023 | Montreal, Quebec | Contracted by Vaco

- Contributed to the development of new flight dynamics assets for a prototype full-flight simulator. Key contributions include: refining data-processing logic to extract valuable state from flight test data, coordination with other subsystems to ensure all performance systems worked together to accurately match flight test data, and, development on a Qualification Test Guide package for FAA certification.
- Maintained aerodynamics simulation assets for legacy level-D full-flight simulator and supported FAA qualification for five simulators
- Maintained the aerodynamics codebase of a high-volume aircraft simulation product

McGill Aerospace Mechatronics Lab | Graduate Researcher
Sept 2020 – Jul 2022 | Montreal, Quebec

- Researched and developed wind rejection strategies for agile fixed-wing UAVs
- Developed an online estimator to address challenges related to propeller flow interference in airspeed measurements, enabling wind estimation on UAV platforms with sensor placement restrictions
- Designed a feedforward controller to substantially improve position-tracking performance of agile fixed-wing UAVs in windy conditions
- Implemented controller and estimator on flight hardware in C++ using the PX4 flight-stack
- Demonstrated controller and estimator performance through flight tests and simulation
- Published and presented two papers at the International Conference on Unmanned Aerial Systems (ICUAS) 2022 held in Dubrovnik

Exactus Energy Inc. | Data Entry Administrator
Jun - Aug 2020

- Maintained and grew database of solar permitting authority requirements across the United States, providing up-to-date regulations to the residential solar design team

Queen's University BDAT Lab | Undergraduate Research Assistant
May - Aug 2019 | Kingston, Ontario

- Supported several research projects in assistive technology by automating data processing and designing both mechanical components and analog circuitry

Queen's University Oleschuk Lab | Undergraduate Research Assistant
May - Aug 2018 | Kingston, Ontario

- Assisted analytical chemistry research projects through electrical and mechanical design of test-rigs and microfluidic mixing systems. Fabricated microfluidic test samples using laser micromachining.

Publications

J. Empey and M. Nahon, "Feedforward Control for Wind Rejection in Fixed-Wing UAVs", International Conference on Unmanned Aircraft Systems(ICUAS), 2022
J. Empey and M. Nahon, "In-Flight Validation of Propeller Slipstream Model", International Conference on Unmanned Aircraft Systems(ICUAS), 2022

Projects

ICUAS '22 UAV Competition | ROS / Gazebo / Python

- Developed a ROS node to detect and estimate the location of an AR Tag from a quadrotor
- Designed a library to compute obstacle free paths for a quadrotor to a goal point, directly from pointcloud data, using A* for efficient path-planning
- Placed 2nd out of 50 teams in the in-person ICUAS '22 UAV Competition in Dubrovnik

Contact

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Portfolio: www.jgme.io

Skills

Robotics • Controls • UAVs

Programming

Experienced:
C++ • C • Python
MATLAB • LaTeX

Familiar:
Javascript • Dart • Go
Java • ANSYS APDL

Tools/Frameworks

ROS • PX4 • Gazebo • Svelte
PlatformIO • Simulink • Linux
OpenFOAM • Git • Flutter

Design and manufacture

Solidworks • KiCad
Composite manufacturing

Collaborative

Project Management
Critical Problem-Solving
Leadership

Education

McGill University

M.Sc. in mechanical engineering
Sept 2020 - Oct 2022 | Montreal, QC
Cum. GPA: 3.94

Queen's University

B.ASc. in Mechanical Engineering
Sept 2016 - May 2020 | Kingston, ON
Cum. GPA: 3.71

Coursework

- Control Systems
- Spacecraft Dynamics
- Computer Vision
- Aircraft Performance and Control
- Mechanics of Composite Materials

Embedded Multi-Tasking Library Github.com/15jgme/Ardutask | C++ / PlatformIO

- Created a platformIO library to quickly implement multi-tasking processes. The project is multi-platform and compatible with Windows, Linux, and embedded platforms.
- Designed to be easily extensible to additional embedded platforms

Docker Container Managment CLI Github.com/15jgme/Tusk | Go / BubbleTea

- Developed a lightweight command-line tool in Go, utilizing BubbleTea, for updating docker container instances
- Designed to allow for quick updates of single container deployments when images are built by GitHub actions

UCI Chess Engine Github.com/15jgme/uci-shallow-red | Rust

- Created a UCI compatible chess engine with alpha-beta pruning. The engine implements transposition tables, iterative deepening, and quiescent search.

Avionics System for Model Rockets Github.com/15jgme/RX1 | PCB design / C++ / Python / MQTT

- Designed a custom PCB compatible with Feather boards, and accompanying C++ firmware, to enable data-logging, parachute deployment, and wireless telemetry on small model rockets
- Developed ground-station receiver in Python to display telemetry data in real-time using Grafana

Webapp for Arxiv Browsing Github.com/15jgme/Moonflower | Javascript / Typescript / Svelte / HTML

- Developed a user-friendly web application for exploring Arxiv, offering daily paper suggestions, browsing new papers, and showcasing research other users are interested in
- Composed of a front-end in Svelte, back-end using Pocketbase, and an agent that interfaces with the Arxiv API written in Javascript

Design Teams

Queen's Rocket Engineering Team | President

Apr 2019 – Aug 2020 | Kingston, Ontario

- Led a team of 50 students in designing and constructing high altitude sounding rockets, competed against 150 international teams at the Spaceport America Cup
- Oversaw the successful transition to the 30,000ft altitude category, resulting in the team achieving its best-ever finish at the 2019 Spaceport America Cup in Las Cruces, New Mexico
- Responsible for all aspects of the team both technical and administrative
- Developed teaching initiatives to introduce new members to rocketry in a hands-on environment

Queen's BioMechatronics Team | CoFounder and CTO

Sept 2019 – May 2020 | Kingston, Ontario

- Oversaw all technical aspects of a 15-member team dedicated to bio-mechatronics projects
- Led the strength amplifying exoskeleton project, actively managing its development and implementation