Philippe Decoste

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EDUCATION

Master of Applied Science in Mechanical Engineering – *DECAR Systems Group*[§] **Sept. 2021 – Dec. 2023**

McGill University, Montreal, Canada — Advisor: James Richard Forbes[§]

- Research in autonomous navigation and Bayesian state estimation (SLAM) in challenging settings using thermal cameras.
- Author on a paper[§] presented at the International Conference on Robotics and Automation (ICRA), the top conference in the field of robotics, for my contributions to a robust homography-based navigation method employing Lie groups.
- Built core expertise in optimization, state estimation, and differential geometry to derive Lie group-based Kalman filters and batch solvers, incorporating covariance quantification for robust navigation in uncertain environments.
- Prototyped a thermal signature-based visual-inertial navigation backend through numerical modeling, path-planning, and simulation in Python, enabling rapid, low-cost iteration prior to hardware deployment.
- Integrated a thermal camera–IMU rig with ROS for real-world data collection and visual-inertial sensor fusion validation.
- Validated the thermal navigation system against motion capture ground truth, significantly outperforming conventional feature-based methods by leveraging a novel adaptation of a perception method from the field of control theory.
- Classes covered subjects such as model predictive control, machine/deep learning and optimization proofs; projects include building an optimal path planner in unknown environments and a numerical optimization library.

Bachelor of Engineering, Aerospace, *Space Systems Design, Co-op Option* **Sept. 2016 – April 2021**

Carleton University, Ottawa, Canada

- Graduated with high distinction and obtained senate medal for high academic achievement.
- Design and analysis of aircraft, spacecraft, and rockets. Emphasis on performance & control theory of flights and orbits.

WORK EXPERIENCE

Navigation Systems R&D Specialist **February 2024 – August 2024**

ARA Robotique, Montreal, Canada

- Engineered a state estimation framework for long-range (1.5+ km) dynamic object tracking, fusing monocular vision with GNSS data to provide uncertainty-informed position and velocity estimates, achieving <5% error in field tests.
- Integrated the algorithm into an aerial drone, using Lie theory to clearly and efficiently model dynamic frames of reference for real-time object tracking.
- Improved the project's documentation process by providing clear and concise explanations of complex mathematical concepts with a switch to LaTeX-based derivations and diagrams, leading to quicker onboarding of new team members.
- Developed the algorithm and its ROS integration in C++ / Python through collaboration on Git with proper CI/CD practices and unit/integration tested code achieving increased edge case coverage.

Co-op Student in Aerostructures (Stress & Design) and Airworthiness **May 2019 – March 2020**

Bombardier Aerospace / DeHavilland Aircraft of Canada Ltd. – Q400 Program, Toronto, Ontario

- Designed and 3D modeled structural components using CATIA, integrating them with existing aircraft structure to handle new loading requirements of aircraft modification project; interpreted relevant technical drawings.
- Led meetings with technical experts to assess impact on aircraft safety, reaching solutions for risk mitigation multilaterally across departments.

SKILLS

Software: ROS, OpenCV, OpenGL, Linux, Docker, CMake, Git, Jira, CATIA, Solid Works, Onshape, Ansys STK certified
Programming: Python, C++, MATLAB, Simulink
Research and Documentation: Access and LaTeX
Analytical Skills: Numerical methods/optimization, computer vision, system modelling/simulation, data/statistical analysis

INTERESTS

Skiing • Rock Climbing • Cycling • Soccer • Simulation development