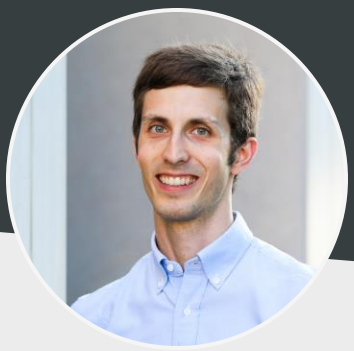

MATT BRYMER

AUTONOMY ENGINEER

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Mountain View, CA

EDUCATION

Master of Engineering
Aerospace Engineering
University of Toronto
2021-2022

Bachelor of Applied Science
Mechanical Engineering
University of Waterloo
2009-2014

SKILLS

Control Theory
State Estimation
Sensor Fusion
Motion Planning
C++, Python
MATLAB, Simulink
ROS
Simulation
Optimization

Initiative
Communication
Teamwork
Problem Solving
Time Management

PROFESSIONAL PROFILE

I'm a highly motivated engineer who's passionate about enabling agile motion in vehicles and robotics. Flight vehicles, ground vehicles or dynamic systems in general, I like seeing things go. My technical interests span the full software stack including control systems, state estimation, motion planning, perception and optimization.

My past experience in fast paced environments demonstrates my ability to take ownership, communicate effectively and drive design decision making. My background in the areas of simulation and vehicle dynamics has given me a strong ability to analyze data and identify underlying system dynamics.

PROFESSIONAL EXPERIENCE

Senior Software Engineer, Controls | Mar. 2024 – Present
Software Engineer, Controls | Dec. 2022 – Feb. 2024
Kodiak | Mountain View, CA

Designed control system and estimation algorithms for autonomous semi-trucks and ground vehicles, implemented in C++ and validated through physical testing

- Led creation of a common controller software architecture to support code reuse across 5 platforms of differing vehicle types and actuation interfaces
- Applied this architecture to implement and bring up lateral and longitudinal controllers for 3 new truck platforms, with each being approved for public road operation within 60 days of build completion
- Developed an Extended Kalman Filter for vehicle mass estimation capable of detecting a mass mismatch within 1 minute of merging onto a highway
- Created system identification tools and test procedures for deriving vehicle dynamics models based on steady state and frequency response data

Algorithm Design and Development Engineer
General Motors Canada | Markham, ON | Feb. 2020 – June 2021

Developed embedded control algorithms for all wheel drive systems for application across the GM fleet and implemented in Simulink to autogenerate C code

- Designed an electric all wheel drive controller for fault scenarios. Deployed within an entirely new software component bundling speed control and actuator constraints and brought to production release in 9 months
- Developed algorithms for active clutch torque control and managing engage state for a single clutch electromechanical all wheel drive system
- Verified performance and robustness of both software components using CarSim vehicle handling simulations

SELECTED COURSEWORK

AER 1517 – Control for Robotics
Optimal control, dynamic programming, MPC, reinforcement learning

AER 1513 – State Estimation for Robotics
Recursive linear and nonlinear Gaussian estimation, batch estimation, sigma point transform, rotation formalisms for probability, optimization and estimation

ROB 501 – Computer Vision for Robotics
Camera models and calibration, pose estimation, feature detection, stereo vision, visual odometry, deep learning

CSC 2506 – Probabilistic Learning and Reasoning
Probabilistic models, variational inference, Bayesian regression, kernel methods, Gaussian processes, variational autoencoders

AWARDS

Canadian Society for Mechanical Engineering Gold Medal
University of Waterloo, 2014

In recognition of outstanding academic achievement

HOBBIES

Hiking
Traveling
Running
Snowboarding
Quadcopters
Reading
Board games

PROFESSIONAL EXPERIENCE CONTINUED

Structures Engineer
Multimatic Technical Centre | Markham, ON | Mar. 2016 – Jan. 2020

Performed a wide variety of finite element simulations ranging from linear statics to nonlinear explicit dynamics using LS-DYNA, ABAQUS and OptiStruct in support of various automotive OEM programs

- Modelled an array of phenomena including carbon fibre composites, crash simulations and hot blow forming of boron steel structures
- Effectively communicated simulation results and recommendations to design engineers and program managers through reports and in person to drive design decision making

Dragon Structures Engineer
Space Exploration Technologies | Hawthorne, CA | Feb. 2015 – Feb. 2016

Structures engineer responsible for all structure directly interfacing with the Super Draco abort engines on Dragon 2

- Developed the design of forged metallic structures to mount the SuperDraco engines, react their thrust and protect the vehicle from reentry heating
- Collaborated with Propulsion, Thermal Protection and Avionics Engineers to resolve interfaces and ensure system level requirements were met

PROJECT EXPERIENCE

Visual-Inertial Relative Pose Estimation for Quadrotor Landing
University of Toronto | AER 1810 - MEng Project | May - Aug. 2022

Summer project developing a quadrotor capable of autonomously flying to a target location and landing based on visual-inertial navigation

- Developed a Multiplicative Extended Kalman Filter for fusing IMU data with AprilTag pose measurements to estimate relative pose over the landing pad
- Implemented filter in a C++ ROS node and deployed on a custom quadrotor platform powered by an NVIDIA Jetson Nano and industrial vision camera
- Evaluated in RotorS simulations and achieved estimation error below 50 mm at a height of 2 m
- Validated in manual flight tests including sweeping flights and simulated landings after 3 months of development

Hierarchical Trajectory Planning for Quadrotor Flight in Unknown Environments
University of Toronto | AER 1516 – Motion Planning for Robotics | Jan. - Apr. 2022

Course project where teams were tasked with researching and implementing an advanced motion planning algorithm

- Led group of 4 team members in writing a simplified version of the FASTER trajectory planner in Python ROS nodes
- Implemented the local planner to determine the final trajectory by solving a MIQP using MOSEK while respecting vehicle dynamic limits, continuity and collision constraints
- Validated in Gazebo simulations achieving flight speeds of up to 4.2 m/s at replanning rates of 10 Hz