MATT BRYMER

AUTONOMY ENGINEER

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Toronto, ON

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
Data Analysis
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, autonomous or conventional, 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.

PROJECT EXPERIENCE

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

Summer project where I began 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

- Lead group of 4 team members in writing a simplified version of the FASTER trajectory planner
- Defined software interfaces to allow implementation in a series of 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

PROFESSIONAL AND VOLUNTEER EXPERIENCE

Algorithm Design and Development Engineer

General Motors Canada | Markham, ON | Feb. 2020 – June 2021

Developed embedded control system software 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 software for active clutch torque control and managing all wheel drive connection for a single clutch electromechanical all wheel drive system
- Verified performance and robustness of both software components using CarSim vehicle handling simulations

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 thermomechanical 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 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
- Designed a deployable mechanism to protect the SuperDraco engines from reentry heating. Developed a preliminary version for test on an engine test rig
- Collaborated with Propulsion, Thermal Protection and Avionics Engineers to resolve interfaces and ensure system level requirements met

Formula SAE Suspension Team Leader

University of Waterloo | Waterloo, ON | May 2011 – June 2014

Lead team of 4 members in performing all analysis, design, manufacturing and testing tasks for the suspension subsystem of the UW Formula SAE racecar

- Created MATLAB tools for vehicle dynamics tasks including processing tire test data and fitting models, Moment Method simulation and lap time simulation