MONASH
ENGINEERING

MONASH University

Faculty of Engineering
Summer Research Program 2024-2025

Project Title: AI Flow Control of Bluff Body Wakes for Ground Based Vehicles

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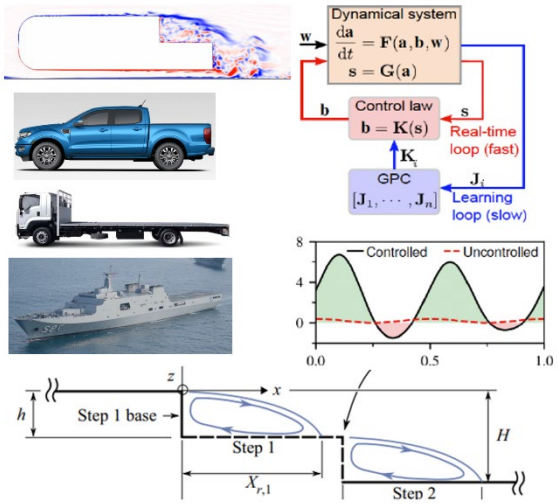
scholar.google.com.au/citations?user=7GABSfwAAAAJ&hl=en

Objective



This project applies Deep Reinforcement Learning (DRL) using Neural Networks to connect the flow states of simplified ground vehicle geometries to an active flow controller. The aim is to regulate aerodynamic parameters such as vortex shedding, wake formation, and ultimately, the drag. Active flow control is an emerging method with the potential to reduce drag on vehicles by a larger margin than previously researched passive devices. This technique applies local boundary, pressure or velocity perturbations to intelligently modify the bulk surrounding flow, though a range of challenges exist in implementing active control. With the rapid development of AI and machine learning algorithms, an opportunity is presented with application to active flow control. Real-time monitoring of the flow can allow AI systems to continuously and dynamically optimise the flow control, and therefore the performance. Through better understanding of active flow control around these simplified geometries, novel flow design features can reduce drag on ground transport vehicles helping create a more sustainable future.

Project Details

This research project will be conducted within the Monash Wind Tunnel Research Platform. Further upgrades to our existing flow control systems and development of machine learning algorithms for simplified ground vehicle geometries are required. A combination of engineering design, hands-on experimental work, instrumentation and software development, and data analysis will be essential to the project's completion. This project will particularly focus on the development of sensing systems, the wind tunnel measurements of and analysis of data for an AI based flow control system, and development of necessary instrumentation to implement improved AI algorithms.

Prerequisites

To be considered you must have completed at least 96 credit points of an undergraduate degree (usually 2 years) and have a weighted average mark of 80% or higher.