

Faculty of Engineering

Summer Research Program 2023-2024

Project Title: Drive cycle modelling and analysis of powertrain parameters for electrification of trucks.

Supervisor(s): A/Prof Behrooz Bahrani, David Klink

Department: ECSE

Email: david.klink@monash.edu

Website profile of project supervisor:

<https://www.monash.edu/engineering/behroozbahrani>

Objective

The goal of this project is to create simulation infrastructure to better understand the requirements of heavy vehicles (trucks) and barriers to electrification. For example, how much energy is used in a typical drive cycle, where is the energy “lost” (drag, powertrain losses, braking), what are the powertrain parameters (torque, speed, power) required to achieve suitable levels of gradeability and acceleration. These outcomes can be used to identify areas of improvement in powertrain design - i.e. to understand which parameters are critical - and under which conditions. A heavy long distance hauling truck has a very different profile to a municipal waste removal truck.

The general question is: a large proportion of the cost of transportation is the energy requirement - is it worthwhile to invest in a highly efficient powertrain which increases upfront cost but reduces energy cost?

Project Details

Create a simulation model in Python which enables modeling of typical truck duty cycles, including relevant powertrain model inputs / outputs such as batteries, motor controller, motors, gearboxes and relevant tyre dynamics. This model will be leveraged in the latter part of the project to investigate powertrain parameters which affect energy consumption and range of heavy vehicles under a range of conditions.

Cost-benefit analysis will be performed to better understand the trade-offs between these parameters and application specific requirements.

Prerequisites

Experience with vehicle dynamics, electric powertrains for EVs and system modelling.

Experience with coding (Python).