TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

INSTITUT FÜR MECHANIK UND MECHATRONIK
Mechanics & Mechatronics

Master Thesis

Lithium-ion cell modelling for automotive application

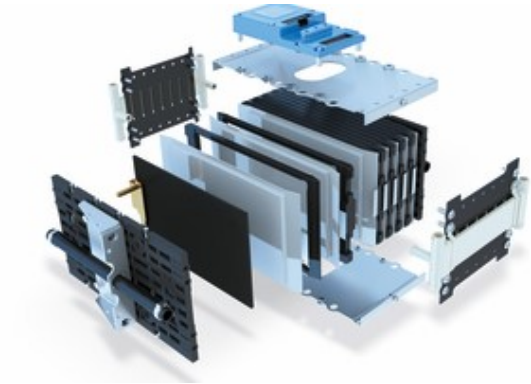
AVL

Content of the proposed master thesis:

Efficient and intelligent electric vehicle operation rely on the capability of estimating battery power, ageing and charge states over the vehicle lifetime. This is relevant for predictive maintenance, safety, range and being compliant with existing regulations. In order to achieve these goals, an accurate model, which is able to predict the battery behaviour under realistic current loads and operating conditions is required.

In Battery Management Systems (BMS), these cells are often modelled by simple equivalent circuits, which work well for most, but not all, existing use cases. To overcome that, more accurate and computationally expensive cell models exist.

The goal of this master thesis is to implement one of these cell models in MATLAB, namely a pseudo-2D lithium-ion cell model ("Doyle-Fuller Newman Model"), identify the model parameters and validate the results against real battery data. This will be done by investigating the sensitivity of the model parameters to check what is possible to identify from testing data and what needs to be determined a priori. Finally, the identified model will be validated against experimental data from a Battery Testbed belonging to our project partners. See picture of a depiction of a battery pack below.



General tasks:

- Familiarize yourself with relevant literature regarding lithium-ion cell modelling
- Implement the aforementioned model in MATLAB
- Check which parameters can be identified from real driving data
- Validate and compare the identified model performance against other commonly used approaches/drive cycles

Requirements:

- Basic programming skills
- Previous knowledge on electrochemistry, system identification and finite element methods are a plus
- High motivation

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