Design and simulation of an active cell balancing controller

The move towards sustainable transportation was initiated to mitigate the effects of global warming and decrease CO₂ emissions. Electric vehicles are at the forefront of this revolution and rapid technological advancements have been made in the development of the electric powertrain’s components, especially li-ion batteries. These breakthroughs have played a huge role in increasing the vehicle’s performance and range prompting automotive companies to accelerate their shift to provide more sustainable offerings to their consumers.

High level description

Knightec is developing a prototype Battery Management System (BMS) as a knowledge-sharing platform, through which developers increase their know-how on components involved in an electric powertrain. One area of focus is how to solve imbalanced State of Charge (SoC) in battery packs using active cell balancing methods.

A previous thesis has designed a converter-based circuit for active cell balancing. Now we want you to come up with a control strategy for the circuit to balance the li-ion cells. The control algorithm shall be proven by modelling and simulation in Matlab Simulink.

Who are we looking for?

We are looking for students interested in e-mobility, battery systems and control theory. Students pursuing their master’s degree in Electrical or Mechatronics engineering with focus on control theory would be suitable for this thesis. Experience working with Matlab Simulink and knowledge about battery systems are considered beneficial.

Project description

The active cell balancing circuit is provided from previous thesis. A literature review shall be performed around modelling of electric circuits and battery systems. Further, also review of the literature about control strategies for active cell balancing. Model the circuit in Simulink, then design and simulate the balancing algorithm.

Purpose

The aim of this project is to evaluate different control strategies for active cell balancing and implement a suitable technique to make a li-ion battery pack more energy efficient and improve system performance.

Important information to you who will apply for a thesis project

- The thesis is to be done during the spring term of 2023.
- If you would like to co-write your thesis, both of you need to apply separately and conduct the tests. Just make sure to inform us in your application that you would like to write in pairs and who your thesis partner is.
- Apply using the link https://knightec.se/Student/design-and-simulation-of-an-active-cell-balancing-controller/, not by email. However, you are welcome to send your questions to the email listed below.
- We will update you regarding the process via e-mail so make sure to stay tuned.
- Applications are considered on a rolling basis.

Contact information for questions

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