E-Pico Master's Thesis

Battery management control strategies for Electric Vehicles

Over the last decade Electric Vehicles (EVs) drawn the attention, and the continuous improvements in the battery technology and the incentives from the authorities guarantee EVs an assured future with a fast and considerable development. Such an increase will certainly lead to positive effects on the environmental impact of mobility and transportation. However, this could mean a huge increase in the energy consumption, and hence several concerns also arise.

The **goal** of this call is to invite students to prepare their thesis to address such challenges.

On the one hand, they can study the *battery modelling and control*, and methods for the estimation of State of Charge (SoC), State of Health (SoH), Remaining Useful Life (RUL), etc., as well as control tools to reduce power losses in the charging process, while considering the inherent uncertainty on the battery's behaviour and the non-linearity of the problem. In this regard, several methods already exist, among which Neural Networks, Support Vector Machine, PI and H infinity controllers, Sliding Mode Observer, Kalman filter, and so on. It is therefore expected that students focus their attention on developing and testing hybrid methods that combine the available approaches to overcome the detected drawbacks and to achieve better results.

On the other hand, they may focus their attention on the problem of *grid control* for fleets of heterogeneous EVs, with the final aim of ensuring optimal charging strategies while taking into account load profiles and peaks in the energy consumption. In this regard, given the characteristics of modern electricity markets, distributed and decentralized architectures in a consensus-based framework are both worth of investigation, jointly with the opportunities of Vehicle-to-Grid connections, and the arising control problem.

Thesis proposals on other aspects related with the same research field are also welcome.

Requirements

You should have a good understanding of *Hybrid Electric Vehicles models, Vehicle dynamics, Automatic Control Theory, Connected Vehicles, MATLAB-SIMULINK*.

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