Intelligent trip-planning system for electric vehicles

Bakgrund

The today’s trip planning systems for battery electric vehicles (BEV) provide only a limited service. A typical navigation system presents a list of chargers along the route but waiting times, occupancy information and the expected arrival time at the charging station are generally not available. The calculated charging times assume that a slot at the fast charging station is available at the time of arrival and that the BEV battery is thermally pre-conditioned to accept high charging power. These assumptions do not always hold in practice and may result in long trip times that could be avoided. To overcome the limitations of existing systems, a solution is needed that can exploit the information provided by cutting-edge, BEV charging solutions.

Problembeskrivning

The aim of this project is to develop an intelligent trip planning system for electrified vehicles that optimally plans energy and thermal management and electricity charging over long routes, e.g. from Chalmers to Uppsala University. The system should incorporate predictive information on charging power availability to optimally manage charging from both the vehicular and infrastructure perspective. The idea is to also handle different electricity pricing and business models for charging. The hypothesis is that a holistic approach is necessary to avoid queues at some charging stations and underutilization of other stations, while minimizing travel time and energy consumption for the individual electric vehicle user. The project includes the following tasks:

- Develop stochastic models of the anticipated distribution of charging cost, power availability, waiting time and overstay cost at charging facilities. This requires building a software that logs a time-series data from existing public services.
- Develop a model of longitudinal vehicle dynamics and a driving route from Chalmers to Uppsala University.
- Develop an intelligent trip planner to answer the above-mentioned hypothesis.
- Demonstrate the results on a simulated vehicle using different pricing mechanisms for electricity charging.

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Projekt Rapport: Svenska eller Engelska