Smartphone application for optimizing charging patterns of electric vehicles

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This project will deal with the development of a generic application for smartphones that will make it easier for the user to optimize the charging behavior for electric vehicles and use of their electric vehicles. The charging process is a great challenge, therefore if the general population begins to adapt the electric vehicle in big scale. Users will typically charge their vehicle after coming home from work, which will result in heavy loads on the power grid. An intelligent charging behavior will reduce the CO^2 emissions and the costs of charging the battery of the electric vehicle. User guidance will help the user to decide whether a trip is possible with an electric vehicle or a conventional vehicle is needed, given the distance of the trip and battery size of the electric vehicle.

The charging optimization in this project is based on mathematical methods presented in a paper published at DTU [1] intended for use in the EDISION electric vehicle aggregator. This model uses day-ahead energy spot prices in order to predict the most optimal charging patterns.

Since this application is intended to be generic, several existing smartphone applications on the market made for electrical vehicle management has been analyzed. This analysis has concluded which features are most typical for this kind of application.

It became clear in the analysis that the must have features include statistics, notifications, general vehicle settings, charging stand information/location and power management. In addition to these features, charging stand reservation and Vehicle-to-Grid management/information (communication with the power grid to sell demand response services by either delivering electricity into the grid or by throttling their charging rate) would also be useful features in such an application. An additional feature implemented in this prototype is a trip planning feature. The electrical vehicle has today a limited range compared to the conventional vehicle, and if a user owns an electrical vehicle it will most certainly be in addition to a conventional vehicle. This application will help the user to decide whether it's possible to carry out a planned trip with the current battery capacity available. While driving conditions like air-conditioning and stereo turned on are important inputs to decide whether the trip is possible since these conditions drains significant amounts of the battery. The environmental and economic benefits of electrical vehicles compared to conventional vehicles will be presented to the user during the planning process.

In this project is made a prototype of such an application, intended to be adapted for any electrical vehicle.

REFERENCES

[1] Aabrandt Andreas, Andersen Peter Bach, Pedersen Bro Anders, You Shi, Poulsen Bjarne, O'Connell Niamh & Østergaard Jacob
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