

Smartphone's Potentials in Electric Vehicles Applications

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During the last few years there has been a growth in the interest of the electric vehicle (EV) market, with the big groups of the automobile sector introducing several new models into the market, both hybrid or pure electric. The cause for this gradual change is a larger, and growing, pressure both from governmental agencies and the consumer market for cleaner and safer transportation technology. The Electric Vehicles can comply with this requirement as they produce no gas emissions while operating and open new fronts for development of technology that will allow efficient and safer journeys [1].

Although relatively recent, the smartphones emergences had, and still have, a profound impact on the daily life of people. In the automobile sector, and in particular on EVs, the smartphone use is a functionality that may ease the transition to this new electric transportation technology. Contrary to the conventional vehicles, EVs based on batteries face strong constraints on the maximum distance traveled per battery charge. These constraints will introduce new challenges to the traditional driver, forcing him to a greater care in the planning of trips. We can see future phones as the preferred mode of interaction with electric vehicles, because the phone is always available and its improved hardware can provide a better and customizable user interface.

In this context, smartphones, with GPS capabilities, may aid the drivers in the EV management, suggesting travel routes that take in consideration the location of the recharge posts, an important factor in this initial stage of the electric transportation, where the electric recharge possibilities are scarce. Another functionality offered by the smartphone system is the possibility of the driver downloading the EV telemetry and operating data. This data can be important to aid drivers to improve their EV use efficiency: for example, they can check the amount of energy regenerated while braking, analyze the power peaks, and cross that data with the one from GPS to better understand the impact of their driving style in the vehicle efficiency and identify improvement points.

Based on these ideas, we started the development of a smartphone application for the uCar multi-motor electric vehicle prototype [2]. The vehicle has an electronic control unit which manages the vehicle operation and interfaces with the several EV components: the motor controller, the battery manager and charger, the GPS, etc. The smartphone application communicates with the electronic control unit and provides a simple graphical interface for the driver to access important information about the vehicle operation: i) the EV status and diagnostics, ii) the energy management state and preferences and iii) an interface for downloading the vehicle operating data.

References:

- [1] Chan, C. C., A. Bouscayrol, Chen, K. (2010). "Electric, Hybrid, and Fuel-Cell Vehicles: Architectures and Modeling." IEEE Transactions on Vehicular Technology 59(2): 589-598.
- [2] de Castro, R., Araújo, R. E., Freitas, D. (2010). "Reusable IP Cores Library for EV Propulsion Systems". IEEE International Symposium on Industrial Electronics, Bari, Italy.