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THIRD PRIZE

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Self-Learning Enhancement of Measurement Quality with Artificial Intelligence

Measurements play an important role in the power trains of Electric Vehicles (EVs). For example, the distribution and limitation of provided power per time step are based on High Voltage (HV) current measurements. A low measurement quality, that is large deviations between HV current measurements and actual values can cause severe problems in the power train of Electric Vehicles (EVs). As an example, they can lead to inaccurate performance coordination and unnecessary power limitations during driving or charging. Our goal is to minimize these deviations which are mainly caused by time delays between the distributed sensor systems of EVs and measurement inaccuracies. To correct the measurement inaccuracies, we propose a fleet-based framework to classify hardware faults and measurement faults. The detected measurement faults are then corrected with *Compressed Sensing*. To correct the deviations caused by time delays, we introduce a variance minimization-based time delay detection. We further evaluate several algorithms for time series prediction to retrieve measurement values in the actual time step of delayed signals. Our results show that we can minimize the deviations with the proposed methods from 25% to less than 5% of the maximum current. Thus, we are able to increase the performance as well as the cruising range of EVs without additional sensors. Because of our data driven approaches we have no need of manual calibration.

Key Characteristics

Electric vehicles • Fleet-based framework • Compressed sensing • Measurement inaccuracies

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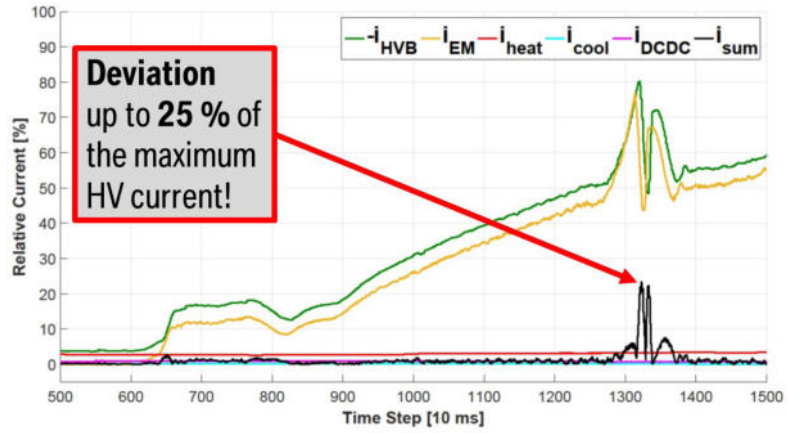

Fig. 1. All HV currents of a single node system. Experiments show that the measurement deviation can be up to 25%.

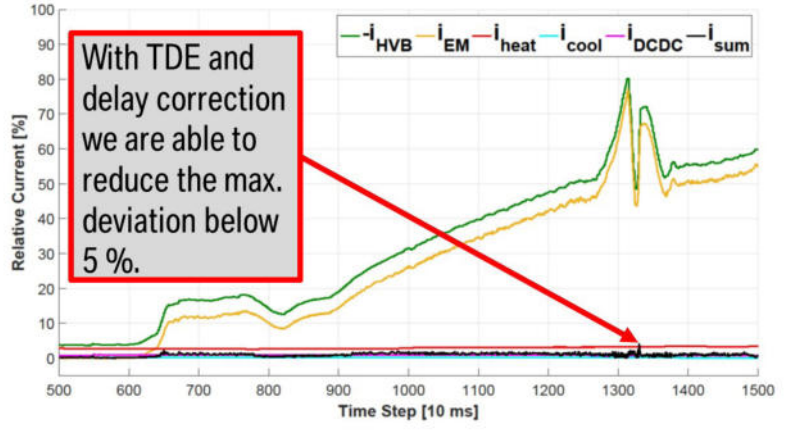

Fig. 2. As in Fig. 1, with Variance Minimization the maximum deviation is below 5%.