Modelling Poster Abstract

Hardware-in-the-loop (HIL) test of a Li-S battery module

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Abstract

It is vital for EV range prediction to exactly know state-of-charge (SOC) or 'remaining capacity' of the battery. This firstly needs a proper battery model. Among all battery modelling approaches, equivalent circuit network (ECN) models are fast enough to be used in real-time applications specifically for automotive application [1],[2]. Before applying a battery model or estimation algorithm in a real EV, a battery simulation environment is essential for testing the developed models and algorithms. This poster presents a hardware-in-the-loop (HIL) test rig (shown in figure 1) for test and development of EV battery parameterization and state-estimation algorithms in the presence of realistic real-world duty cycles. HIL testing of battery management system (BMS) algorithms is a common technique in the literature to validate the software functionality under read working condition [3],[4]. The rig includes two electric machines, a battery pack, a real-time simulator, a thermal chamber and a PC for human-machine interface. Other parts of a vehicle powertrain system are modelled and used in the real-time simulator. A generic framework has been developed for real-time battery measurement, model identification and state estimation. Measurements are used to extract parameters of an ECN model. Outputs of the identification unit are then used by an estimation unit trained to find the relationship between the battery parameters and SOC. At this stage, the test rig has been used for evaluation of the proposed algorithms using a NiMH battery module. However, a same size Li-S module has also been constructed ready to be tested in the rig. The primary results demonstrate that even with a high level of noise in the measurements (which is designed by purpose), the proposed identification and estimation algorithms are able to work well in real-time.

Figure 1: hardware-in-the-loop (HIL) test rig for test and development of EV battery management algorithms

References

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