An uncoupled approach to online state of charge and state of health estimation for a Lithium-ion battery

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ABSTRACT

Real time monitoring and health managements of the battery require reliable estimation algorithms equipped with efficient adaptive schemes. In this talk, we introduce two forecasting models to track separately each fundamental state of the Lithium-ion battery known as the state of charge (SOC) and state of health (SOH) during real time operations. We separate the estimations by modeling battery degradation upon mathematical concepts. This replaces the traditional ageing parameters such as cycle numbers with a new variable that, together with terminal measured voltage, constitutes the SOC and SOH equations. Especially, the SOC model is constructed by fitting data to a logistic curve. We then split the corresponding domain into several regions to incorporate the corrections of local fluctuations and the health related factors via linear regression. Moreover, the SOH equation is simply determined as a linear equation of the ageing parameter without requiring any prior knowledge of SOC. Finally, we discuss the advantages of such uncoupled approaches, regarding the predictability and the real time adaption. One particular merit of the proposed methodologies is comprehensive applicability to Lithium-ion batteries even with arbitrary usage profiles. The manuscript of the paper has been submitted for publication.

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