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A Novel Battery State of Charge Estimation Based on the Joint Unscented Kalman Filter and Support Vector Machine Algorithms

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With the development of new energy sources becoming the mainstream of energy development strategies, the role of electric vehicle-powered lithium-ion batteries in the field of automobile transportation is becoming more and more obvious. An efficient the Battery Management System is necessary for the real-time usage monitor of each battery cell, which analyzes the battery status to ensure its safe operation. A complex equivalent circuit model is proposed and established. the Improved Equivalent Circuit Model is used to realize the precise mathematical expression of the power lithium-ion battery packs under special conditions. The State of Charge estimation method which is based on Unscented Kalman Filter has a good filtering effect on the nonlinear systems. Based on the State of Charge estimation of Support Vector Machine, the samples in the nonlinear space of lithium-ion battery are mapped to the linear space. It can be seen from the experimental analysis that a joint Unscented Kalman Filter and Support Vector Machine algorithms for State of Charge estimation has higher accuracy. The experimental results show that the tracking error is less than 1.00%.

Keywords: Battery Management System; State of Charge; Improved Equivalent Circuit Model; Unscented Kalman Filter; Support Vector Machine

FULL TEXT