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Presentation of a Mix Algorithm for Estimating the Battery State of Charge Using Kalman Filter and Neural Networks

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Abstract : Determination of state of charge (SOC) in today’s world becomes an increasingly important issue in all the applications that include a battery. In fact, estimation of the SOC is a fundamental need for the battery, which is the most important energy storage in Hybrid Electric Vehicles (HEVs), smart grid systems, drones, UPS and so on. Regarding those applications, the SOC estimation algorithm is expected to be precise and easy to implement. This paper presents an online method for the estimation of the SOC of Valve-Regulated Lead Acid (VRLA) batteries. The proposed method uses the well-known Kalman Filter (KF), and Neural Networks (NNs) and all of the simulations have been done with MATLAB software. The NN is trained offline using the data collected from the battery discharging process. A generic cell model is used, and the underlying dynamic behavior of the model has used two capacitors (bulk and surface) and three resistors (terminal, surface, and end), where the SOC determined from the voltage represents the bulk capacitor. The aim of this work is to compare the performance of conventional integration-based SOC estimation methods with a mixed algorithm. Moreover, by containing the effect of temperature, the final result becomes more accurate.

Keywords : Kalman filter, neural networks, state-of-charge, VRLA battery
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