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Low Harmonics Plug-in Home Charging Electric Vehicle Battery Charger Utilizing Multilevel Rectifier, Zero Crossing, and Buck Chopper: State of Charge Estimator Using Current Integration Algorithm for Embedded System

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Authors:

Arof S.,
Ahmad M.R.,
Yaakop N.M.,
Mawby P.,
Arof H.,
Noorsal E.,
Bakar A.A.,
Ali Y.M.

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Abstract:

SOC is an indicator that represents the available charge stored in the battery under an energy management system (EMS) of an electric vehicle (EV). The SOC is necessary not only for optimal management of the energy in the EV but also to protect the battery from going to the deep discharge or overcharge. During charging the battery voltage cannot be determined as it is equivalent to the terminal charging voltage. This causes the difficulty to determine whether the battery has fully charged using the voltage reading method. To determine the exact battery voltage while charging, it requires to detach the charging voltage connection before making the voltage reading, and this causes a difficulty and slows down the charging process. This paper focuses on the current integration method for estimating the battery's state of charge which is inclusively associated with a control algorithm for controlling the process to determine the battery state of charge (SOC). The MATLAB/Simulink software is used to test the control algorithm. The simulation results with MATLAB/Simulink software shows that the proposed control algorithm is able to perform the expected operation.