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Energy Management Control Strategy for Hybrid Energy Storage Systems in Electric Vehicles

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This study describes an energy flow distribution control strategy based on a combined method for hybrid energy storage systems to achieve multiple control objectives. The strategy including wavelet transform algorithm, fuzzy logic controller and Markov chain model. Firstly, Wavelet Transform based frequency control algorithm is introduced to extract low frequency power demand from load power for satisfying battery dynamics. At the same time, the remaining high frequency power demand is assigned to supercapacitor. Benefiting from this mode, the battery is protected from rapid heat generation because of high frequency charging and discharging operations. Then, to control battery peak current as small as, a fuzzy logic controller is constructed using a series of preset control logics. Besides, future driving cycle information is predicted by a Markov chain model to improve the fuzzy controller. Finally, the proposed strategy is validated by comparing with wavelet transform and dynamic programming algorithms based on a scaled down hybrid energy storage system experimental test platform.

Keywords: Electric vehicles, battery, hybrid system, energy management.

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