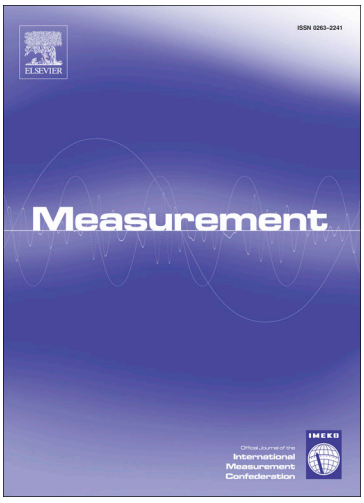

A Novel Fault Diagnosis Method for Lithium-Ion Battery Packs of Electric Vehicles

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A Novel Fault Diagnosis Method for Lithium-Ion Battery Packs of Electric Vehicles

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Abstract: This paper focuses on fault detection based on interclass correlation coefficient (ICC) method for guaranteeing safe and reliable of electric vehicles (EVs). The proposed method calculates ICC values by capturing the off-trend voltage drop and the voltages are extracted from Service and Management Center of electric vehicles. The ICC value is employed to analyze battery fault by ICC principle. The ICC value not only has advanced fault resolution by amplifying the voltage difference, but also can prolong the fault memory by setting moving windows. Moreover, a loop joints the first and last voltages is designed to locate faults in battery pack. In addition, simulation and experiment are employed to validate and analyze the voltage faults. Based on the simulation verification, the appropriate size of moving windows is set to ensuring sensitivity of fault detection method. The experiment results indicate the method can appropriately detect fault signals for EVs.

Key words: Electric vehicles, fault diagnosis, lithium-ion batteries, interclass correlation coefficient, service and management center for electric.

I. INTRODUCTION

Electric vehicles (EVs) have reigned supreme as the most popular transportation applications for their capabilities to protect environment including high performance, and non-pollution [1-3]. Battery pack is the core component in EVs, which can not only provide driving force but absorb braking energy. The battery pack typically consists of numerous battery cells in various series-parallel patterns due to limitations of voltage and capacity for each cell [4, 5]. During the EV operation, it is vitally important to ensure the safety and reliability by monitoring states of cells. Thus, a so-called battery management system (BMS) has been employed to collect the identification data and to estimate states for cells [6-8]. In addition, some applications of the BMS