

Accepted Manuscript

A novel control strategy of regenerative braking system for electric vehicles under safety critical driving situations

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PII: S0360-5442(18)30274-3

DOI: [10.1016/j.energy.2018.02.046](https://doi.org/10.1016/j.energy.2018.02.046)

Reference: EGY 12346

To appear in: *Energy*

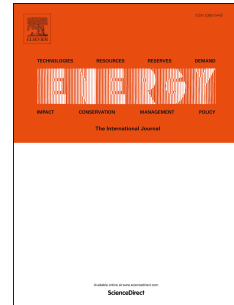
Received Date: 16 June 2017

Revised Date: 15 January 2018

Accepted Date: 10 February 2018

Please cite this article as: Qiu C, Wang G, Meng M, Shen Y, A novel control strategy of regenerative braking system for electric vehicles under safety critical driving situations, *Energy* (2018), doi: 10.1016/j.energy.2018.02.046.

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1 **A novel control strategy of regenerative braking system for electric vehicles**
2 **under safety critical driving situations**

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8 Abstract

9 This paper mainly focuses on control strategy of the regenerative braking system of an electric
10 vehicle under safety critical driving situations. With the aims of guaranteeing the electric vehicle
11 stability in various types of tire-road adhesion conditions, based on the characteristics of an electrified
12 powertrain, a novel control strategy of regenerative braking system is proposed for electric vehicles
13 during anti-lock braking procedures. Firstly, the main construction of the case-study electric car with
14 regenerative braking system is introduced. Next, based on the phase plane theory, the optimal brake
15 torque is calculated for ABS control of an electric vehicle. Then, an allocation control, wherein the
16 required optimal brake torque is divided into two parts that are disposed respectively by the friction and
17 regenerative brakes, is discussed. In addition, two parameters for evaluating regeneration braking
18 energy efficiency contribution while in the deceleration braking process are defined. Furthermore, a
19 novel regenerative braking control strategy named “serial control strategy” is proposed. Finally, the
20 road tests are implemented in four types of tire-road adhesion conditions under safety-critical driving
21 situations. The test results validate the effectiveness and feasibility of the proposed control strategy.

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