

## New control scheme for combined regenerative and mechanical brakes in electric vehicles

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### Abstrak

Braking conditions could generate energy that can be reused again for energy conservation. The purpose of regenerative braking in electric vehicles is to use the excess energy from the braking system and convert it to electricity and then store it for further utilization. But when the back current is too high it can cause overvoltage which can result in broken electrical components. Therefore, a voltage limiter is required to limit the q-axis stator current which keeps DC link voltage at a certain value. However, this voltage limiter causes a decrease in the braking torque and actual speed that does not follow the reference speed. To overcome this problem, the mechanical brake should be combined with a regenerative brake in electric vehicles, so the vehicle speed can always follow the reference speed. A new control scheme for combining a regenerative braking system with mechanical braking system to overcome the overvoltage problem in electric vehicle is proposed in this paper. Using a combination between regenerative and mechanical braking, the actual speed could follow the reference speed even when voltage limiter is active. The effectiveness of the control scheme is validated through simulation. Actual speed could follow the speed reference with delays in about 1.5s-2.5s and by varying gain in IP controller, the delay could be reduced to become about 1 second, so the braking will be more accurate.