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## **RIDE COMFORT AND BODY ATTITUDE COMPATIBLE CONTROL USING NONLINEAR $H_{\infty}$ THEORY IN SEMI-ACTIVE SUSPENSION**

<sup>1</sup>Honma, Motohiko\*, <sup>1</sup>Hozumi, Jin, <sup>1</sup>Mizuta, Yuichi, <sup>1</sup>Liu, Yanqing, <sup>2</sup>Okimura, Kotaro, <sup>2</sup>Hayashi, Taisuke, <sup>2</sup>Watanabe, Takahito  
<sup>1</sup>Toyota Motor Corporation, Japan, <sup>2</sup>Toyota Technical Development Corporation, Japan

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**ABSTRACT** - Semi-active suspension systems that optimally and variably control damping force by means of electric shock absorbers in response to road conditions, acceleration, deceleration, cornering and so on (hereafter referred to as “damping control systems”) have been widely commercialized. However, it has been difficult to simultaneously improve the body attitude performance in the low-frequency region and the ride comfort in the middle-frequency region. A control algorithm that employs status feedback using nonlinear  $H_{\infty}$  theory to simultaneously suppress the heave, roll angular, and pitch angular accelerations of a full vehicle model was proposed in this paper. Additionally, the controlling effects of the proposed control algorithm were explored using simulations and actual vehicle testing. The heave acceleration, the roll angular acceleration, and the pitch angular acceleration could be controlled independently. The body attitude in the low-frequency region and the ride comfort in the middle-frequency region were simultaneously improved. Moreover, based on the proposed control algorithm, the vibration suppression in the rolling direction that could not be achieved using a controller in a quarter vehicle model was realized.