Simulation and Experiment for Vehicle Driving Dynamics

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ABSTRACT

The thesis is to investigate the vehicle dynamic affected by the ABS system in a passenger car. We develop the equations of motion of the car with seven degrees of freedom including the longitudinal, lateral, yaw motion, and rotational motions of four wheels. The tire-ground forces are also considered in the model to evaluate the performance of the ABS system at different road conditions. The simulation investigates the ability of the braking controller. Two controllers are designed with the feedback of slip ratio and wheel angular velocity, respectively. They are tested on dry and wet road surface to evaluate the control performance. Then we adjust the Fuzzy controller to shorten the braking distance and time on various road surfaces. The experimental studies that use hardware in the loop simulation and combine the ABS hardware and the vehicle dynamics simulator are also investigated for comparison.

Keywords : ABS(Anti-lock Braking System), braking controller, Fuzzy control, vehicle dynamics, Hardware in the loop

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