Drive and handling dynamic simulation and control study for intelligent By-wire controlled vehicle

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ABSTRACT

The purpose of this study is to establish a dynamic simulation and control system for intelligent vehicle drive and handling performance evaluation. By controlling the wheel motor drive and brake and independent steer control motor, the vehicle can have better mobility and safer handling condition. When the vehicle is straight-line driving, the slip and skid control of wheels were used to ensure the wheel torque management to have stable drive behavior in case of wheel slip or lock conditions. The wheel speed difference, vehicle speed, yaw rate, side slip angle, and lateral acceleration during the turning maneuver conditions were used for wheel motor controller inputs which give commands to control each wheel speed to reduce the tire abrasive and vehicle unstable conditions. This study has constructed the plant and controller simulation methodology which integrate the control strategies including the traction control, antilock brake control, active steer, wheel motor torque management, and the Four-Wheel Steer, (4WS) control system to evaluate and improve the vehicle drive and handling performance. The active steer control system can adjust the steer gear ratio of each wheel and the ratio between front and rear according to the vehicle speed, steering wheel angle input and the vehicle yaw rate, lateral acceleration, and side slip angle were feedbacked for closed loop control to ensure safer turning maneuver. This study integrates and increasing the research and development capability in vehicle stability control system design area including mechanical, electronic control, computer, and communication which can then in connect with the world advanced vehicle industries and enhance the competition ability in the future intelligent vehicle electronics market.

Keywords : Intelligent Vehicle Drive-by-Wire Control, Vehicle Drive ad Handling Dynamic Simulation Control System, Hardware-in-Loop Simulation, IndependentWheel Drive-Steer Control Module

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