Experimental Analysis of Drive-by-Wire Electronic Throttle Control Hardware-In-the-Loop Simulation

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ABSTRACT

This study is proposed to establish the integration technology and methodology through Controlled Area Network (CAN) by using proper Drive-By-Wire (DBW) control strategy and by using object-oriented program design controller parameters to develop a vehicle Adaptive Cruise Control (ACC) dynamic simulation system. The purpose of this study is to integrate electronic throttle control for DBW system and the active brake control to assure the ACC vehicle can maintain the safety relative distance and the required specifications. This research used system identification method to build the electronic throttle model according to the electronic accelerator pedal of input driver command signal and electronic throttle position sensor output responses. Different controller parameters were calculated by optimization simulation tool for different accelerator pedal positions. ACC Fuzzy logic controller parameters were adjusted based on the safety distance formula, to control the electronic throttle and brake pressure output in order to adjust the vehicle speed, so that the vehicle relative distance can maintain in the expected safety margin. This research used vehicle dynamic simulation software CarSimR, to simulated controlled ACC vehicle on different straight line drive conditions. This study evaluated and analyzed ACC vehicle performance and adjusted related parameters to conform international ISO-15622 standard. Finally the controlled area network signal is connectted with the simulation system to establish the hardware in the loop modeling platform. This simulation confirmed electronic throttle dynamic response, and revised the model and the controller parameters, enabled the compatible adaptive cruise controller can be design with faster and more reliable approach to achieve the required performance. This simulation tool thus can reduce the time and expanse of future ACC vehicle research and development.

Keywords : Drive-by-Wire, Electronic Throttle Control, Fuzzy Logic, Adaptive Cruise Control

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