

Intelligent Semi-Active Suspension Control of a Electric Model Vehicle System

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Abstract : A four-wheel drive electric vehicle was built with hub DC motors and FPGA embedded control structure. A 40 steps manual adjusting motorcycle shock absorber was refitted with DC motor driving mechanism to construct as a semi-active suspension system. Accelerometer and potentiometer sensors are installed to measure the sprung mass acceleration and suspension system compression or rebound states for control purpose. An intelligent fuzzy logic controller was proposed to real-time search appropriate damping ratio based on vehicle running condition. Then, a robust fuzzy sliding mode controller (FSMC) is employed to regulate the target damping ratio of each wheel axis semi-active suspension system. Finally, different road surface conditions are chosen to evaluate the control performance of this semi-active suspension and compare with that of passive system based on wheel axis acceleration signal.

Keywords : acceleration, FPGA, Fuzzy sliding mode control, semi-active suspension

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