

四轮驱动电动汽车差动助力转向系统联合仿真与试验 Co-simulation and Test of Differential Drive Assist Steering Control System for Four-wheel Electric Vehicle

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摘要: 基于AMESim软件建立了四轮独立驱动电动汽车动力学仿真模型,并应用Matlab/Simulink建立了差动助力转向控制系统模型,在此基础上研究了旨在降低转向盘手力和辅助转向轮回正的左右前轮转矩分配控制策略,并采用后轮差动实现车辆横摆校正。联合仿真结果表明,该差动助力转向控制策略在满足转向轻便性、路感回馈及辅助回正基本要求的同时,还可以补偿前轮差动驱动对车辆稳定性的影响,提高了差动助力转向技术的实际应用能力。通过差动助力转向控制系统的快速原型实车双移线道路试验进一步验证了该系统的转向助力可行性和路感保持能力。The dynamics model of electric vehicle with motorized-wheel-drive based on AMESim was built, and the differential drive assist steering (DDAS) control system model was built using Matlab/Simulink. On this basis, the control strategy of torque distribution between right and left front steerable wheels was presented, aiming for the reduction of the steering efforts and assisting the steering wheel return to center, as well as the yaw compensation produced by differential drive of the rear two wheels. The co-simulation results validated that the proposed DDAS control system could improve steering handiness, steering feel and returnability of the steering wheel, including stability compensation and practicability enhancement for DDAS system. Furthermore, the double-lane change road experiments for rapid control prototyping of DDAS control strategy were conducted. Experimental results verified the feasibility of providing steering assistance and the ability to keep road feeling of DDAS system.

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