

电动助力转向系统全工况建模及试验验证 Modeling and Verifying of EPS at All Operating Conditions

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摘要: 为克服以往车辆电动助力转向 (EPS) 模型的不足, 结合简化的原地转向轮胎模型和基于Doguff轮胎模型的七自由度整车模型, 建立了转向系统转向及回正时的力学模型。为得到车辆的转向力矩和回正性能特性, 对无助力转向全工况 (原地及行驶条件下) 转向操纵转矩和回正的转向盘残留转角进行仿真, 试验结果表明所设计的模型可以准确描述转向操纵转矩和回正特性。进而设计了基于滑模变结构电动助力转向控制策略进行助力和回正控制, 仿真和实车验证结果表明, 基于该模型设计的控制策略可以有效降低驾驶员的操纵转矩和提高车辆的回正性能。 In order to overcome the shortage of the previous model of EPS, the dynamic model for steering system in steering and aligning condition was established, based on the combination of tire model of parking steer and 7 degree-of-freedom vehicle model with Doguff tyre model. For obtaining the characteristic of vehicle steering moment and return ability, the steer torque and return ability of manual steering system was analyzed at all operating conditions. The simulation result and road test showed the model built can accurately describe steering torque and return ability well and truly. Finally, a control strategy for controlling power assistant and self-align was framed based on sliding mode control theory (SMC). The simulation result and road test showed the sliding mode control strategy based on the model improved the steering easiness and vehicle self-align capability effectively.

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