基于SIMS/GPS的汽车运动状态组合测量系统

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关键词： 汽车 位置姿态 SIMS/GPS组合测量 Kalman滤波器 道路试验

摘 要： 建立了汽车基本坐标系并推导捷联惯性位置姿态测量基本算法，从工程易实现角度给出了中低精度SIMS和载波相位模式差分GPS在位置/速度/航向角间接反馈松散组合模式下的误差状态方程和量测方程，基于改进自适应Kalman滤波器对测量模型进行了仿真，并对组建系统进行了实车试验验证。分析表明，仿真结果和实车试验结果一致性好，测量模型满足实际汽车主动安全性试验要求。 The strapdown inertial measurement algorithm was firstly derived on the basis of the set coordinate systems. Secondly, both the state and the measure equations of errors were established based on the indirect feedback and non-tight integrated position/velocity/course angle measuring model between the middle-and-low precision IMU (inertial measurement unit) and the high precision CP-DGPS (carrier-phase-differential GPS). Then the improved self-adapting Kalman filter was employed to simulate the measurement model. Finally, the measurement system was developed for the model certification and the roadway tests were conducted. The comparative study on the simulation and the roadway tests showed that the simulation results are in good agreement with the experimental result, which further justified the effectiveness of the developed integrated system for the vehicle active safety roadway test.

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