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1.4.2.3. Bicycle model 1.4.3. Roll dynamics and lateral load transfer evaluation; 1.5. Summary; Chapter 2. Estimation Methods Based on Kalman Filtering; 2.1. Introduction; 2.2. State-space representation and system observability; 2.2.1. Linear system; 2.2.2. Nonlinear system; 2.3. Estimation method: why stochastic models?; 2.3.1. Closed-loop observer; 2.3.2. Choice of the observer type; 2.4. The linear Kalman filter; 2.5. Extension to the nonlinear case; 2.6. The unscented Kalman filter; 2.6.1. Unscented transformation; 2.6.2. UKF algorithm
2.7. Illustration of a linear Kalman filter application: road profile estimation 2.7.1. Motivation; 2.7.2. Observer design; 2.7.3. Experimental results: observer evaluation; 2.7.3.1. Comparison with LPA signal; 2.7.3.2. Comparison with GMP signal; 2.8. Summary; Chapter 3. Estimation of the Vertical Tire Forces; 3.1. Introduction; 3.1.1. Related works; 3.2. Algorithm description; 3.3. Techniques for lateral load transfer calculation in an open-loop scheme; 3.3.1. Lateral acceleration calculation; 3.3.2. Roll angle calculation; 3.3.3. Limitation of the open-loop model
3.4. Observer design for vertical forces estimation 3.5. Vertical forces estimation; 3.5.1. Observer OFzE design; 3.5.2. Observer OFzL formulation; 3.6. Analysis concerning the two-part estimation strategy; 3.7. Models observability analysis; 3.8. Determining the vehicle's mass; 3.8.1. Experimental validation of the vehicle's weight identification method; 3.9. Detection of rollover avoidance: LTR evaluation; 3.10. Experimental validation; 3.10.1. Regulation of observers; 3.10.2. Evaluation of observers; 3.10.3. Road experimental results; 3.10.3.1. Starting-slalom-braking test
3.10.3.2. Circle-braking test

Sommario/riassunto

Vehicle dynamics and stability have been of considerable interest for a number of years. The obvious dilemma is that people naturally desire to drive faster and faster yet expect their vehicles to be "infinitely" stable and safe during all normal and emergency maneuvers. For the most part, people pay little attention to the limited handling potential of their vehicles until some unusual behavior is observed that often results in accidents and even fatalities.This book presents several model-based estimation methods which involve information from current potential-integrable sensors.