عنوان مقاله:

Nonlinear Model-Based Estimation of Vehicle Side-Slip Velocity Using Unscented Filter

محل انتشار:

چهاردهمین کنفرانس سالانه مهندسی مکانیک (سال: 1385)

تعداد صفحات اصل مقاله: 6

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خلاصه مقاله:

Real-time information of vehicle side-slip velocity is essential for vehicle stability control systems. The main hindrance in estimation of this parameter is due to hard nonlinear characteristics of tire forces. To overcome this problem, this paper considers a new technique called unscented filter (UF) which employs a nonlinear vehicle model directly. The observer is compared with an extended Kalman filter (EKF) based on linearized model that has often been used before in state estimation of vehicle handling dynamics. Since discrete time form of the model is needed for UF, this study uses a straight forwards 4th order Rung-Kutta integration scheme to discretize the model numerically. Both filters employ a low order (2DOF) vehicle handling model along with Pacejka nonlinear tire model. Simulations are carried out for time-varing and noisy steering input. A performance comparison with EKF shows promising results for UF that provides high accuracy without linearization and calculation of Jacobians.

کلمات کلیدی:

Vehicle handling dynamics - Non-linear state estimation - Side-slip velocity - Unscented filter - Extended Kalman filter

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