



Adaptive Control of Mechatronic Vehicle Suspension Systems

By Guido Koch

Shaker Verlag Mai 2011, 2011. Buch. Condition: Neu. Neuware - The Thesis presents two new adaptive vehicle suspension control methods, which significantly improve the performance of mechatronic suspension systems by adjusting the controller parametrization to the current driving state. Thereby, ride comfort is enhanced while the dynamic wheel load and the suspension deflection remain uncritical. The first concept is an adaptive switching controller structure, which dynamically interpolates between differently tuned linear quadratic regulators. The required estimates of the state vector and the dynamic wheel load are provided by a new estimator concept based on parallel Kalman filters. The stability of the switching controller structure is analyzed employing a common Lyapunov function approach, that takes into account arbitrary fast controller parameter variations and the nonlinear damper characteristic. The performance of the concept is successfully validated in experiments on a quarter-vehicle test rig for a fully active suspension. To overcome the drawbacks of fully active systems, i.e. primarily their high power demand and complex actuators, a new suspension concept called hybrid suspension system is presented. It involves a continuously variable semi-active damper and a low bandwidth actuator integrated in series to the primary spring. The potential of the hybrid concept is shown...



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