Robust Slip controller for an Anti-Lock Brake System

Javad Marzbanrad, Mojtaba Damroodi

Abstract

The cars today are getting more and more sophisticated in terms of control. Increasing information about the vehicle state together with more efficient ways to influence the vehicle, constitute the basis for new controllers to improve driving performance. Actively controlled actuators open many possibilities to control the vehicle in accordance to driver requests or for safety reasons.

Slip control in deceleration situation is a way to improve the vehicle control, which aims at maximizing traction force during braking to give shorter stopping distance and preventing from wheel lock by manipulating the angular velocity of the wheels. In order to achieve maximum force between the tire and the ground bye keeping wheel slip around the peak of μ-λ curve. For this, knowledge about the relationship between wheel slip and resulting force is needed. This is a non-linear relationship, which implies control difficulties. Hence, to control slip there is a need of a controller with ability to control non-linearity. It is a robust control method for non-linear systems. In this paper Sliding mode approach is applied ABS slip control. It can give robustness by invariance characteristic and order reduction. For vehicle model we use quarter vehicle model. The control scheme is verified and compares with uncontrolled scheme through the several numerical simulations with Matlab/simulink

Keywords:
Anti-lock brake system, wheel slip control, sliding mode approach, quarter vehicle model