

The Impact of Inerter Nonlinearities on Vehicle Suspension Control

Fu-Cheng Wang and Wei-Jiun Su

Abstract

This paper discusses the nonlinear properties of Inerter and their impact on vehicle suspension control. Inerter was recently introduced as an ideal mechanical two-port element which is a substitute for the mass element with the applied force proportional to the relative acceleration across the terminals. Until now, ideal Inerter has been applied to vehicle, motorcycle and train suspension systems, in which significant performance improvement is achieved. However, due to the mechanical construction, some nonlinear properties of the existing mechanical models of Inerter are noted. This paper will investigate the Inerter nonlinearities, including friction, backlash and the elastic effect, and their influence on vehicle suspension performance. A testing platform will also be built to verify the nonlinear properties of the Inerter model.