

Impact of Inerter Nonlinearities on Vehicle Suspension Control

Fu-Cheng Wang and Wei-Jiun Su

Abstract

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