

Performance Benefits in Passive Vehicle Suspensions Employing Inerters

Malcolm Smith and Fu-Cheng Wang

Abstract

A new ideal mechanical one-port network element named the inerter was recently introduced, and shown to be realisable, with the property that the applied force is proportional to the relative acceleration across the element. This paper makes a comparative study of several simple passive suspension struts, each containing at most one damper and inerter as a preliminary investigation into the potential performance advantages of the element. Improved performance for several different measures in a quarter-car model is demonstrated here in comparison with a conventional passive suspension strut. A study of a full-car model is also undertaken where performance improvements are also shown in comparison to conventional passive suspension struts. A prototype inerter has been built and tested. Experimental results are presented which demonstrate a characteristic phase advance property which cannot be achieved with conventional passive struts consisting of springs and dampers only.