
Preview control for a semi-active suspension system

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Abstract: The use of preview, i.e. 'look-ahead', information about the road surface input, has been shown to offer substantial performance benefits for fully active and limited bandwidth active suspension systems. This paper investigates whether similar levels of performance improvements can be obtained for semi-active systems, bearing in mind this class of system is only capable of dissipating energy, in contrast to active systems which can also input energy. The study is theoretical and is based on a quarter-car model. The Pade approximation technique is used to represent the effect of preview time associated with the look-ahead sensor information about the ground input. The results reveal an important finding, i.e. that the semi-active system with preview provides the same level of performance as the fully active system without preview.

Keywords: control law, damper, equations of motion, look-ahead preview, Pade approximation technique, r.m.s. values, semi-active suspension.

Reference to this paper should be made as follows: Soliman, A.M.A. and Crolla, D.A. (1996) 'Preview control for a semi-active suspension system', *Int. J. of Vehicle Design*, Vol. 17, No. 4, pp.384–397.

Notation

A_1, B_1, C_1 , coefficient matrices in first order equations of motion

A_η, B_η, C_η constant matrices

c_a actual damping coefficient

c_d demand damping coefficient

G road roughness coefficient

J performance index

k_1, \dots, k_4 system feedback control gains

k_5, k_6 system feedforward gains

k_M system feedback and feedforward gain vector

M measurement matrix

m_b quarter-car body mass

m_w wheel mass