Abstract

A series of impulse-type inputs has been extensively used to evaluate the critical response of an elastoplastic structure subjected to diverse types of pulse-type inputs, including a near-fault ground motion. In this paper, we consider the critical double-impulse input for a single-degree-of-freedom elastic–perfectly plastic structure, and study effects of structural uncertainties. When the natural frequency (or, equivalently, the stiffness) is fixed, the critical response of the structure does not necessarily decrease as the yield deformation (or, equivalently, the yield force) increases. As the first contribution, we give through investigation of this non-monotonicity property. Moreover, we present a systematic method for finding the worst-case scenario when the yield deformation and the stiffness of a structure assumed to be uncertain simultaneously. Numerical examples are presented to illustrate that the robustness of a structure does not necessarily improve when the yield deformation and/or the yield force is increased.

Keywords
Double impulse
Elastoplastic response
Critical response
Info-gap model
Robustness
Uncertainty