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A distributional approach to the dynamics of rigid blocks (Conference Paper)

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Abstract

The paper aims at providing an original fully distributional approach for the description of the pure rocking motion of a unilateral rigid system undergoing a dynamic excitation. Impulsive and dipolar terms arise in the dynamic equations, which do not seem to alter the piecewise well known solutions. Anyway, the introduction of a null distribution such that the time-displacement of the system is not formally altered is shown to produce non-null effects on the response of the system, with the impact obeying now to a strongly non-linear equation. © Civil-Comp Press, 2009.

Author keywords

Alfa-functions; Dirac; Distributional approach; Rocking motion; Structural dynamics; Unilateral model

Indexed keywords

Alfa-functions; Dirac; Distributional approach; Dynamic equations; Dynamic excitations; Null distribution; Piece-wise; Rigid block; Rigid systems; Rocking motion

Engineering controlled terms

Computer aided engineering; Structural dynamics

Engineering main heading

Environmental engineering

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Paper 173

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Keywords: rigid block, unilateral model, structural dynamics, theoretical set up, experimental tests.

Summary
The rocking response and the possibility of overturning of rigid bodies during earthquakes represent important features in seismic safety problems. During strong ground shaking, rigid structures (such as electrical equipment, retaining walls, liquid storage tanks, tall rigid buildings, tombstones, etc.) slide, bounce, rock or overturn, sometimes resulting in a final substantial damage [1,2,3,4].
Despite the apparent simplicity, the motion of rigid blocks poses difficult problems to solve. The analysis of the rocking response of rigid blocks has attracted the attention of many researchers, especially from a theoretical point of view, and the relevant dynamics are less understood than in many other non-linear vibration problems [5].
The cause of the interest in treating the dynamics of rigid blocks is mainly due to possible applications: for example a broadly similar response is actually exhibited, during earthquakes, by ancient stone temples and