

Department of Civil Engineering and Engineering Mechanics
Columbia University

**The Dynamics of Rigid Bodies on
Moving Deformable Support Media**

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Location: 644 Mudd

The rocking motion of a solid block on a moving deformable base is a dynamic problem, that despite its apparent simplicity, involves a number of complex dynamic phenomena such as impacts, sliding, geometric and material nonlinearities and, under some circumstances, chaotic behavior. For that reason, since the first model proposed by G.W. Housner in 1963, a number of alternative models have been proposed for its mathematical simulation. Although, with very few exceptions, the previous models in the literature make the simplified assumption that this motion is planar, this is usually not true since a body will probably not be aligned with the direction of the ground motion. Thus, even in the case where the body is fully symmetric, the rocking motion involves three dimensional rotations and displacements. Moreover, for reasons more related to functionality than safety, it is not uncommon for heavy mechanical and electrical equipment to be placed on wheels. Examples of such devices are medical carts, mechanical equipment in hospitals, electrical transformers and recently even supercomputers. Although wheels facilitate the operation of these devices, they also affect the response of these objects during earthquakes; not necessarily in a beneficial way. In this work suitable models are developed for simulating the previous dynamic problems. The equations of motion and suitable contact models are developed for each case. The importance of phenomena often neglected in the literature is stressed. Suitable examples illustrate the complex dynamic character of the problems examined.

Biography: Manolis Chatzis obtained his PhD degree from the Department of Civil Engineering and Engineering Mechanics of Columbia University in 2012. Having obtained a diploma and masters' degree from the National Technical University of Athens, he joined the CEEM Department in 2008, being the recipient of the Presidential Fellowship of the Fu Foundations School of Engineering and Applied Science, and graduated in 2012. Currently, he continues working in the Department as a Postdoctoral Research Scientist. His PhD and postdoctoral advisor is Professor Andrew W. Smyth.