Output-only damping estimation of friction systems in ambient vibrations

Working with dynamics in civil engineering applications, it is experienced that real structures have nonlinear damping. The nonlinearity of the damping can be induced by the hysteresis phenomenon, that occurs due to friction or softening geotechnical boundary conditions. Along these lines, this article focusses on assessing the performance of two output-only methods estimating the linear damping of a friction-induced nonlinearly damped system subjected to random vibrations. In particular, the method that employs auto regressive models and poly-reference, and the poly-reference Least Squares Complex Frequency method are included in the study. The methods are comparatively assessed by comparing their linear damping estimates of friction-induced nonlinear numerical simulations with theoretically derived estimates of equivalent linear damping. It is concluded that the output-only methods underestimate the damping when compared to theoretically derived equivalent linear damping for the present case of Coulomb-type friction-induced nonlinear damping.

General information
Publication status: Published
Organisations: Department of Civil Engineering, Structures and Safety, Centre for oil and gas – DTU, Technical University of Denmark, Aarhus University
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Number of pages: 11
Publication date: 2018
Peer-reviewed: Yes
Electronic versions:

Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 153935178
Research output: Contribution to conference › Paper – Annual report year: 2018 › Research › peer-review