8th CONFERENCE on
DYNAMICAL SYSTEMS
THEORY AND APPLICATIONS
December 12-15, 2005. Łódź, POLAND

Vibration of flexible beams subjected to a longitudinal impact

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ABSTRACT

Nowadays the theory of nonlinear dynamics of plates and shells plays important role in application in many branches of industry. Challenging research in this field is mainly oriented on stability, bifurcation and chaos of such continual systems [1, 2, 3]. Here we propose a novel research direction including impact phenomenon in addition to the so far mentioned investigations.

In this work complex vibrations of flexible beams subjected to longitudinal impacts are studied. As control parameters serve the mass of an impacting body and its velocity. Investigations are carried out using theory of differential equations and nonlinear dynamics. We show that depending on the impacting body velocity, a few Hopf bifurcations occur for a ratio of the impacting body and the studied beam equal to one. Feigenbaum constant has been computed. Critical time instant parameters, where longitudinal and transversal vibrations start interacting, are detected. Furthermore, it is illustrated how increase of the impacting body velocity reduces significantly the mentioned critical time instants.

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