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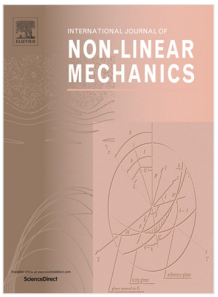

Metamorphoses of resonance curves in systems of coupled oscillators: The case of degenerate singular points

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PII: S0020-7462(17)30203-2
DOI: http://dx.doi.org/10.1016/j.ijnonlinmec.2017.07.004
Reference: NLM 2877

To appear in: *International Journal of Non-Linear Mechanics*

Received date : 15 March 2017
Revised date : 5 July 2017
Accepted date : 5 July 2017

Please cite this article as: J. Kyzioł, A. Okniński, Metamorphoses of resonance curves in systems of coupled oscillators: The case of degenerate singular points, *International Journal of Non-Linear Mechanics* (2017), http://dx.doi.org/10.1016/j.ijnonlinmec.2017.07.004

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Metamorphoses of resonance curves in systems of coupled oscillators: the case of degenerate singular points

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Abstract

We study dynamics of two coupled periodically driven oscillators. The internal motion is separated off exactly to yield a nonlinear fourth-order equation describing inner dynamics. Periodic steady-state solutions of the fourth-order equation are determined within the Krylov-Bogoliubov-Mitropolsky approach and we compute the corresponding amplitude profiles.

Metamorphoses of these amplitude curves induced by changes of control parameters as well as the corresponding changes of dynamics are studied within the framework of theory of differential properties of algebraic curves. The major finding is that there is a very rich dynamics in neighborhoods of degenerate singular points.

Keywords: coupled oscillators, metamorphoses of amplitude curves, degenerate singular points

2010 MSC: 34C15, 74H10, 14H20

1. Introduction

In this work dynamics of two coupled nonlinear oscillators, one of which is driven by an external periodic force, is studied. This system is described by the

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