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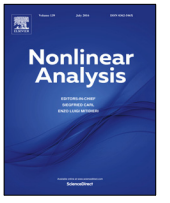

Resonance of bounded isochronous oscillators

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ABSTRACT

An oscillator is called isochronous if all motions have a common period. When the system is forced by a time-dependent perturbation with the same period the phenomenon of resonance may appear. We give a sufficient condition on the perturbation in order that resonance occurs when the period annulus of the isochronous oscillator is bounded. In this context, resonance means that all solutions escape from the period annulus.

1. Introduction

An oscillator with equation

$$\ddot{x} + V'(x) = 0 \tag{1}$$

is called isochronous if it only has one equilibrium point and all solutions in a neighborhood are periodic with a fixed period, lets say $T = 2\pi$. When a small periodic perturbation with the same period as the isochronous center is added to the force, the phenomenon of resonance may occur. That is, all solutions of the non-autonomous equation

$$\ddot{x} + V'(x) = \varepsilon p(t) \tag{2}$$

are unbounded for $\varepsilon \neq 0$ small. In the recent years the classical theory of resonance has been extended from the linear oscillator to nonlinear isochronous oscillators. We refer for instance [3,7] for the construction of forcings and [10] for sufficient conditions to produce resonance. Also [2,5] where the authors treated the specific case of the asymmetric oscillator.

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