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Existence of Even Homoclinic Solutions for a Class of Dynamical Systems

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Abstract: In this paper, we study the existence of even homoclinic solutions for a dynamical system

$$\ddot{x}(t) + A\dot{x}(t) + V'(t, x(t)) = 0,$$

where A is a skew-symmetric constant matrix, $t \in \mathbb{R}$, $x \in \mathbb{R}^N$ and $V \in C^1(\mathbb{R}\times\mathbb{R}^N, \mathbb{R})$, $V(t, x) = -K(t, x) + W(t, x)$. We assume that $W(t, x)$ does not satisfy the global Ambrosetti-Rabinowitz condition and that the norm of A is sufficiently small. For the proof we use the mountain pass theorem.

Keywords: *even homoclinic solution; dynamical system; mountain pass theorem; condition (C); critical point.*

Mathematics Subject Classification (2010): 34C37.

1 Introduction

The purpose of this work is to study the existence of even homoclinic solutions for the following system

$$\ddot{x}(t) + A\dot{x}(t) + V'(t, x(t)) = 0, \qquad (DS)$$

where A is a skew-symmetric constant matrix, $V \in C^1(\mathbb{R} \times \mathbb{R}^N, \mathbb{R})$, $V'(t, x) = \frac{\partial V}{\partial x}(t, x)$ and $x = (x_1, ..., x_N)$. We say that a solution $x(t)$ of dynamical system (DS) is homoclinic if $x(t) \to 0$ as $t \to \pm\infty$. In addition, x is called nontrivial if $x \not\equiv 0$. The theory of dynamical systems is a vast subject that can be studied from many different viewpoints. Particularly the existence of homoclinic solutions for DS is among the very important

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