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LOCAL AND GLOBAL BIFURCATION FOR PERIODIC SOLUTIONS OF HAMILTONIAN SYSTEMS VIA COMPARISON THEORY FOR THE SPECTRAL FLOW

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Abstract. We obtain local and global bifurcation for periodic solutions of Hamiltonian systems by using a new way to apply a comparison principle of the spectral flow that was originally introduced by Pejsachowicz in a joint work with the third author. A particular novelty is the study of global bifurcation, which to the best of our knowledge has not been done via the spectral flow.

1. Introduction

We consider Hamiltonian systems

$$\begin{cases} Ju'(t) + \nabla_u \mathcal{H}(\lambda, t, u(t)) = 0, \quad t \in [0, 2\pi], \\ u(0) = u(2\pi), \end{cases} \tag{1.1}$$

where J denotes the standard symplectic matrix

$$J = \begin{pmatrix} 0 & -I_n \\ I_n & 0 \end{pmatrix} \tag{1.2}$$

and $\mathcal{H}\colon \mathbb{R} \times \mathbb{R} \times \mathbb{R}^{2n} \to \mathbb{R}$ is C^2. We assume that $\mathcal{H}(\lambda, t, u)$ is 2π-periodic with respect to t, that $\nabla_u \mathcal{H}(\lambda, t, 0) = 0$ for all $(\lambda, t) \in \mathbb{R} \times \mathbb{R}$ and consider bifurcation

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