

ON THE EXISTENCE OF HOMOCLINIC ORBITS FOR THE ASYMPTOTICALLY PERIODIC DUFFING EQUATION

FRANCESCA ALESSIO — PAOLO CALDIROLI — PIERO MONTECCHIARI

1. Introduction

In this article we are concerned with the asymptotically periodic Duffing equation in \mathbb{R} , that is

$$(1.1) \quad -\ddot{u} + u = a(t)|u|^{p-1}u,$$

where $p > 1$ and $a : \mathbb{R} \rightarrow \mathbb{R}$ satisfies:

- (a1) $a \in L^\infty(\mathbb{R})$, $\inf a > 0$,
- (a2) $a = a_\infty + a_0$, with a_∞ T -periodic and $a_0(t) \rightarrow 0$ as $t \rightarrow \pm\infty$.

Noting that 0 is a hyperbolic rest point for (1.1), we look for homoclinic orbits to 0, namely non trivial solutions to (1.1) such that $u(t) \rightarrow 0$ and $\dot{u}(t) \rightarrow 0$ as $t \rightarrow \pm\infty$.

The homoclinic problem for equation (1.1), possibly with a more general nonlinearity, as well as the analogous subcritical elliptic problem on \mathbb{R}^n , has been successfully studied with variational methods by several authors, for different kinds of behaviour of the coefficient a .

1991 *Mathematics Subject Classification*. Primary 34C37; Secondary 34C15, 58E05, 58F05, 70H05.

Key words and phrases. Duffing equation, homoclinic orbits, critical points, locally compact case, minimax arguments.

The first author was supported by Istituto Nazionale di Alta Matematica F. Severi (Borsa di Ricerca Senior 1997/98).