Topological Methods in Nonlinear Analysis
Journal of the Juliusz Schauder Center
Volume 1, 1993, 113–137

PERIODIC SOLUTIONS OF SOME SEMILINEAR WAVE EQUATIONS ON BALLS AND ON SPHERES

A.K. Ben-Naoum — J. Mawhin

Dedicated to the memory of Karol Borsuk

1. Introduction

The existence of weak radially symmetric solutions for the problem

$$\begin{aligned} &u_{tt} - \Delta u + g(u) = f(t,x), && (t,x) \in \mathbb{R} \times B_a^n, \\ &u(t,x) = 0, && (t,x) \in \mathbb{R} \times S_a^{n-1}, \\ &u(t+T,x) = u(t,x), && (t,x) \in \mathbb{R} \times B_a^n, \end{aligned}$$

has been recently considered by Smiley [11], using the alternative method. Here,

$$\Delta = \left(\sum_{i=1}^{n} \frac{\partial^2}{\partial x_i^2}\right),$$
$$B_a^n = \{x \in \mathbb{R}^n,\ \|x\| < a\}$$

and

$$S_a^{n-1} = \{x \in \mathbb{R}^n,\ \|x\| = a\}, \qquad \text{with } \|x\| = \left(\sum_{i=1}^{n} x_i^2\right)^{1/2}.$$

In [11] the nonlinear term g is required to be Lipschitz continuous and strictly monotone. The ratio a/T is a rational number, and some restrictions are imposed on the Lipschitz and monotonicity constants. Those restrictions are not

1991 *Mathematics Subject Classification.* 35B10.