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PERIODIC SOLUTIONS FOR p-LAPLACIAN LIKE SYSTEMS WITH DELAY

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Abstract. We study the existence of periodic solutions for a system involving p-Laplacian type operators with a fixed delay. We prove the existence of at least one periodic solution of the problem applying the Leray-Schauder degree theory.

Keywords. p-Laplacian, Leray-Schauder degree, systems with delay, periodic solutions
AMS (MOS) subject classification: 34B15, 34C25

1 Introduction

In the last years there has been a great interest in problems involving the p-Laplacian operator and its generalizations. Usually variational or topological methods are employed for studying this kind of problems (see for example [2], [3], [4]).

In this work, we apply the Leray-Schauder degree theory to study the existence of periodic solutions for a system involving p-Laplacian type operators, with a fixed delay.

When studying the existence of periodic solutions of quasilinear ordinary differential equations, usually the Leray-Schauder degree theory and Mawhin coincidence degree theory are applied (see for example [1]).

In [5] R. Manásevich and J. Mawhin have studied the existence of periodic solutions for nonlinear systems of the type:

$$\phi(u')' = f(t, u, u')$$

where $\phi : \mathbb{R}^N \to \mathbb{R}^N$satisfies some monotonicity conditions that ensure that ϕ is an homeomorphism onto $\mathbb{R}^N$. Namely, they have assumed the following conditions on ϕ:

1. For any $x_1, x_2 \in \mathbb{R}$ with $x_1 \neq x_2$, we have that

$$\langle \phi(x_1) - \phi(x_2), x_1 - x_2 \rangle > 0. \tag{1}$$