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NONLINEAR PERIODIC SYSTEMS WITH UNILATERAL CONSTRAINTS

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Dedicated to the memory of Ioan I. Vrabie

Abstract. We consider a general periodic system driven by a nonlinear, nonhomogeneous differential operator, with a maximal monotone term which is not defined everywhere. Using a topological approach based on Leray–Schauder alternative principle, we show the existence of a periodic solution.

1. Introduction

In this paper, we study the existence of solutions for the following periodic system

$$\text{(P)}\qquad \begin{cases} a(u'(t))' \in A(u(t)) + f(t,u(t),u'(t)) & \text{for a.a. } t \in T := [0,b], \\ u(0) = u(b), \quad u'(0) = u'(b). \end{cases}$$

In this problem, $a\colon \mathbb{R}^N \to \mathbb{R}^N$ is a continuous, strictly monotone (hence maximal monotone too) map which satisfies certain polynomial growth conditions. As a special case, the differential operator $u \to a(u')'$ incorporates the vector p-Laplacian $u \to (|u'|^{p-2}u')'$, where $|\cdot|$ denotes the $\mathbb{R}^N$ norm. However, we stress that a is not in general homogeneous. On the right-hand side of (P),

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