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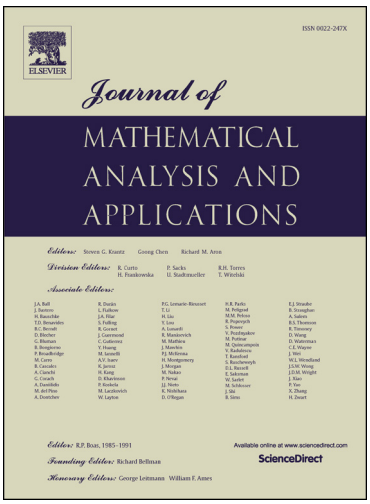

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Extremal solutions and strong relaxation for nonlinear multivalued systems with maximal monotone terms

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Abstract

We consider differential systems in $\mathbb{R}^N$ driven by a nonlinear nonhomogeneous second order differential operator, a maximal monotone term and a multivalued perturbation $F(t,u,u')$. For periodic systems we prove the existence of extremal trajectories, that is solutions of the system in which $F(t,u,u')$ is replaced by $\mathrm{ext}F(t,u,u')$ (= the extreme points of $F(t,u,u')$). For Dirichlet systems we show that the extremal trajectories approximate the solutions of the "convex" problem in the $C^1(T,\mathbb{R}^N)$-norm (strong relaxation).

Keywords: Maximal monotone map, differential inclusion, extremal trajectories, strong relaxation, bang-bang controls

2010 MSC: 34B15, 34C25, 47H06

1. Introduction

The starting point of our work in this paper is the following periodic system

$$\begin{cases} a(u'(t))' \in A(u(t)) + F(t,u(t),u'(t)) \quad \text{for a.a. } t \in T = [0,b], \\ u(0) = u(b), \quad u'(0) = u'(b). \end{cases} \tag{1}$$

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