AN APPLICATION OF COINCIDENCE DEGREE THEORY TO CYCLIC FEEDBACK TYPE SYSTEMS ASSOCIATED WITH NONLINEAR DIFFERENTIAL OPERATORS

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Dedicated to Professor Jean Mawhin on the occasion of his 75th birthday

ABSTRACT. Using Mawhin's coincidence degree theory, we obtain some new continuation theorems which are designed to have as a natural application the study of the periodic problem for cyclic feedback type systems. We also discuss some examples of vector ordinary differential equations with a ϕ-Laplacian operator where our results can be applied. Our main contribution in this direction is to obtain a continuation theorem for the periodic problem associated with $(\phi(u'))' + \lambda k(t, u, u') = 0$, under the only assumption that ϕ is a homeomorphism.

1. Introduction

The aim of this paper is to apply Mawhin's coincidence degree theory in the study of the periodic boundary value problem for some classes of first order differential systems of cyclic feedback type. From this point of view, our work continues the research initiated in [8] and is also partially inspired by the results in [18] on periodic ODE systems with a ϕ-Laplacian differential operator.