ON WEAKLY NONLINEAR BOUNDARY VALUE PROBLEMS WITH IMPULSES

Daniel Maroncelli 1 and Jesús Rodríguez 2

1Department of Mathematics
North Carolina State University, Raleigh, NC 27695-8205, U.S.A
2Department of Mathematics
North Carolina State University, Raleigh, NC 27695-8205, U.S.A
Corresponding author email: rodrigu@math.ncsu.edu

Abstract. In this paper we discuss the existence of solutions to weakly nonlinear boundary value problems of the form

\[ x'(t) = A(t)x(t) + g(t) + \varepsilon f(t, x(t)), \quad t \in [0, 1] \setminus \{t_1, t_2, \ldots, t_k\} \]

\[ x(t_i^+) - x(t_i^-) = w_i, \quad i = 1, \ldots, k \]

subject to boundary conditions

\[ Bx(0) + Dx(1) = 0. \]

We present a qualitative analysis of the dependence of solutions on the “small” parameter \( \varepsilon \). Emphasis will be placed on the resonant case.

Keywords. Boundary value problems, Contraction mapping theorem, Implicit function theorem, Lyapunov-Schmidt, Impulsive differential equations

1 Introduction

In the following we will be analyzing problems of the form

\[ x'(t) = A(t)x(t) + g(t) + \varepsilon f(t, x(t)), \quad t \in [0, 1] \setminus \{t_1, t_2, \ldots, t_k\} \]  (1)

\[ x(t_i^+) - x(t_i^-) = w_i, \quad i = 1, \ldots, k \]  (2)

subject to boundary conditions

\[ Bx(0) + Dx(1) = 0. \]  (3)
References


Received May 2012; revised October 2013.

email: journal@monotone.uwaterloo.ca
http://monotone.uwaterloo.ca/~journal/