

**A GRANAS TYPE APPROACH TO SOME
CONTINUATION THEOREMS AND PERIODIC
BOUNDARY VALUE PROBLEMS WITH IMPULSES**

RADU PRECUP

Dedicated to Ky Fan

1. Introduction

In this paper we study periodic solutions of a second order differential equation

$$x'' = f(t, x, x') \quad \text{for a.e. } t \in [0, 1],$$

subject to some impulses at certain points. Our work was inspired by a paper by Capietto–Mawhin–Zanolin [1], where the case of no impulses was treated. The major difference between paper [1] and ours is that instead of topological degree, we use the elementary method based on essential maps. In this context, we also give some new contributions to Granas' theory of continuation principles.

The famous Leray–Schauder continuation principle, a very efficient tool in proving the existence of solutions for operator equations, can be stated, in one of its variants, as follows:

Let X be a real Banach space, K a subset of X and Ω an open subset of K . Whenever we shall be concerned with a subset of K or of $K \times [0, 1]$, all topological notions (open set, compact set, closure, boundary) will be understood with respect the topology induced on K and $K \times [0, 1]$, respectively.

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