JOURNAL OF
FUNCTION SPACES AND APPLICATIONS
Volume 5, Number 2 (2007), 167-174

http://www.jfsa.net

On an abstract nonlinear second order integrodifferential equation

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(*Communicated by Nigel Kalton*)

2000 Mathematics Subject Classification. Primary: 45J05, Secondary: 34K30, 47G20.

Keywords and phrases. Fixed point, global existence of solutions, intregrodifferential equation, Lerray-Schauder alternative, nonlinear second order equation.

Abstract. The aim of the present paper is to study the global existence of solutions of nonlinear second order integrodifferential equation in Banach space. Our analysis is based on an application of the Leray-Schauder alternative and rely on a priori bounds of solutions..

1. Introduction

Let X be a Banach space with norm $\|\ \|$. Let $B = C([0,T],X)$ be the Banach space of all continuous functions from $[0,T]$ into X endowed with supremum norm

$$\|x\|_B = sup\{\|x(t)\| : t \in [0,T]\}.$$

The purpose of this paper is to prove the global existence of solutions of the following initial value problem for second order integrodifferentioal equations of the form

$$(r(t)x'(t))' = f\left(t, x(t), \int_0^t k(t,s)g(s,x(s))ds\right),\ t \in [0,T] \tag{1.1}$$

$$x(0) = x_0, \quad x'(0) = 0; \tag{1.2}$$