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Boundary Controllability of Neutral Integrodifferential Systems in Banach Spaces

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Abstract: Sufficient conditions for boundary controllability of neutral integrodifferential systems in Banach spaces are established. The results are obtained by using the strongly continuous semigroup theory and the Schaefer fixed point theorem.

Key Words: Boundary controllability, neutral integrodifferential system, semigroup theory, fixed point theorem.

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1. Introduction

The theory of nonlinear neutral integrodifferential systems in Banach spaces has been studied by several authors [7,10,12]. Ntouyas and Tsamatos [12] discussed the existence results for neutral functional integrodifferential equations by means of the Schaefer fixed point theorem. Arino et al. [1] studied the existence results for initial value problem for neutral functional differential equations. Controllability of neutral functional integrodifferential systems in abstract spaces was first studied by Balachandran et al. [3]. Recently, Balachandran and Marshal Anthoni [2] discussed the controllability of second order neutral functional differential systems using the strongly continuous cosine family of bounded linear operators. Several authors [4,6,16] have developed many abstract settings to describe the boundary control systems in which the control must be taken in sufficiently smooth functions for the existence of regular solutions to state space system. Barbu [5] and Fattorini [8] discussed the general theory for boundary control systems. Lasiecka [11] established the regularity of optimal boundary controls for parabolic equations. Han and Park [9] derived a set of sufficient conditions for the boundary controllability of a semilinear system with nonlocal conditions. The aim of this paper is to derive a set of sufficient conditions for the boundary controllability of neutral integrodifferential systems in Banach spaces by using the semigroup theory and the Schaefer fixed point theorem.

2. Preliminaries

Let E and U be a pair of real Banach spaces with the norms $\|\cdot\|$ and $\|\cdot\|_U$ respectively. Let σ be a linear, closed and densely defined operator with $D(\sigma) \subseteq E$