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EXACT AND TRAJECTORY CONTROLLABILITY OF SECOND ORDER EVOLUTION SYSTEMS WITH DEVIATED ARGUMENT

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Abstract: In this paper, we shall study the controllability of certain second order evolution problems with deviated argument in a Banach space X. Sufficient conditions are formulated and proved for the controllability of such systems. We establish controllability results by using a fixed point analysis approach. Finally, application of the proposed results is presented by giving an example.

Keywords. Second Order evolution problems, Deviated Argument, Exact and Trajectory controllability, Fixed point theorem.

AMS (MOS) subject classification: 34K35, 34K30, 93B05, 93C25.

1 Introduction

We consider a control problem represented by a second order evolution problem with deviated argument in a Banach space X

$$\begin{aligned} &x''(t) = A(t)x(t) + Bu(t) + f(t, x(t), x[h(x(t), t)]), \quad t \in J = (0, T], \\ &x(0) = x_0, \quad x'(0) = y_0, \end{aligned} \tag{1.1}$$

where $x : J \to X$ is the state function, $u(.) \in L^2(J, U)$ is the control function, $A(t)$ is a closed dense operator, U is a Hilbert space known as the control space, B is a bounded operator from $U \to X$ and the functions f, h are satisfying some suitable conditions will be specified latter.

Controllability is a qualitative property of any dynamical control system and it plays important role in control theory. If it is possible to steer dynamical control system from an arbitrary initial state to an arbitrary final state using the set of admissible controls, then the dynamical system is called controllable. A large number of scientific and engineering problems are nonlinear in nature and can be described in infinite dimensional spaces. Many