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REMARKS ON CONTROLLABILITY OF PSEUDO PARABOLIC EQUATION WITH MEMORY

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Abstract. In this paper, we establish the Carleman estimate for a pseudo parabolic equation with memory using moving controls. The estimates are derived separately for the adjoint of the elliptic equation and the equation with memory using the same singular weights and the results are then combined. As a consequence, its observability and controllability properties are also discussed.

Keywords. Carleman estimate, Controllability, Observability, Pseudo parabolic equation.

AMS (MOS) subject classification: 45K05, 93B05, 93B07.

1 Introduction

Various physical phenomena such as the non-steady flow of second order fluids, soil mechanics, the theory of seepage of homogeneous fluids through fissured rocks, etc., have led to the study of pseudo parabolic equations which belong to a general class of equations of the Sobolev-Galpern type. These equations are characterized by having mixed time and space derivatives appearing in the highest order terms of the equation. Pseudo parabolic equations with memory term describes yet another variety of important physical processes, whose applications include analysis of heat conduction in materials with memory, electric signals in nonlinear telegraph line with nonlinear damping, viscous flow in materials with memory, etc.,

Consider the following pseudo parabolic equation with memory

$$\begin{cases} y_t(x,t) - y_{xx}(x,t) - y_{xxt}(x,t) \\ -\int_0^t g(t,\tau) [y(x,\tau) - y_{xx}(x,\tau)] d\tau = 1_{\omega(t)} u, \\ (x,t) \in \Omega \times (0,T) \\ y(x,t) = 0, \quad (x,t) \in \partial\Omega \times (0,T) \\ y(x,0) = y_0(x), \quad x \in \Omega \end{cases}$$
(1.1)