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Domination of Hyperbolic Systems with Respect to the Gradient Observation

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Abstract: In this paper, we introduce the notions of domination for a class of controlled and observed hyperbolic systems. We study, with respect to the gradient observation, the possibility to make a comparison of input operators of a controlled system. We give various characterizations and main properties in the general case and then by means of the choice of actuators and sensors. As an application, we examine the case of a one dimension wave equation.

Keywords: *hyperbolic systems; domination; gradient; control; actuators; sensors.*

Mathematics Subject Classification (2020): 35L20, 93B05, 93B07, 93C20.

1 Introduction

Modeling a system consists in representing its dynamic behavior by a mathematical model. The mathematical model obtained is generally in the form of linear or nonlinear differential equations. The methods used in the analysis of linear systems are very powerful because of the existence of available tools. However, these linear analysis methods have several limitations because most systems are not linear, so linear methods are only applicable in a limited domain. These limitations explain the complexity and diversity of nonlinear systems and the analysis methods that apply to them. Therefore, there are no general theories for nonlinear systems, but there are several methods adapted to certain classes of nonlinear systems to overcome these difficulties, a linearization of the system and the output which consists in transforming the dynamics of the nonlinear system into a completely (or partially) linear system, so that the techniques of linear systems can be applied. Therefore, we can extend the concepts presented for linear systems to nonlinear

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