PARTIAL AND REGIONAL OBSERVABILITY OF A CLASS OF DISTRIBUTED PARAMETERS SYSTEMS

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Abstract. In this work, the problem of regional observation of distributed parameter linear systems was considered. By using new definitions of partial and regional observation, it has been shown that regional observation is obtained from partial observation and regional state reconstruction is a restriction of partial reconstruction on the observable region. It has also been shown that there are two types of systems, first one admits an observable region even if it is not observable, the second one does not admit an observable region if it is not observable. Characterizations are given for each system type. The largest observable region of the system was determined for the first type. In the end, it was shown based on an example, that regional reconstruction can be done without errors for the first type systems. Our approach links two very important concepts and gives a clearer image of regional observation.

1   Introduction

A dynamical system is a kind of several objects interacting with each other. Mathematically, this interaction can be simulated by a model of equations and sings. The system is linked to its environment through the input elements (the physical elements acting on the system through actuators) and outputs (the measurements or observations given by sensors).

The analysis of several concepts is necessary to better understand a given dynamical system and its functioning in order to optimize its use. Some of the fundamental concepts that constitute system analysis include controllability, observability, stability and stabilizability [4–14].

Partial and regional analysis is necessary because a dynamical system is not always observable, controllable or stable. Let us mention the two works of Kalman [2] and [3] who considers the composition of the space states of a finite dimensional linear dynamical system from observable and non observable initial stats. We can also cite the work of G. Santoboni and all [24] in what application of partial observability