

Effective Test of Local Algebraic Observability — Applications to Systems and Control Theory

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Abstract

In control and systems theory, the problem of structural algebraic observability consists in deciding whether the state variables involved in a model can be determined in terms of commands and measures supposed perfectly known. Structural identifiability is a variant where one tries to know whether the parameters of a model are observable.

We propose a probabilistic algorithm with polynomial complexity to answer the question in the ordinary differential framework. This algorithm relies on seminumerical techniques (modular computations, series expansions, and Newton operator) that allow the computation of the generic rank of the Jacobian matrix of measures and their derivatives with respect to time.

To conclude, we present experimental results that illustrate the notion of algebraic observability and show the efficiency of our approach.