

Approximation of large-scale dynamical systems: An overview^{*†}

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August 31, 2001

Abstract

In this paper we review the state of affairs in the area of approximation of large-scale systems. We distinguish among three basic categories, namely the **SVD**-based, the **Krylov**-based and the **SVD-Krylov**-based approximation methods. The first two were developed independently of each other and have distinct sets of attributes and drawbacks. The third approach seeks to combine the best attributes of the first two.

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1 Introduction and problem statement

Differential equations are one of the most successful means of modeling dynamical systems. In this paper we will deal with the problem of *simplification* or *model reduction* of dynamical systems described by differential equations. Model reduction has a long history in the systems and control literature. In fact, the general topic of dimension reduction in dynamical systems is pervasive in the applied mathematics literature. The systems we will

^{*} This work was supported in part by the following NSF Grants: DMS-9972591, CCR-9983393, and ACI-0082645.

[†] This paper was presented at the MTNS, Perpignan, June 19-23, 2000.

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