

Numerical issues in the stability analysis of linear dynamical systems

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Abstract

Linear dynamical systems can be solved exactly, at least in exact arithmetic. However, in practice, inaccuracies in the computation of the eigenvalues of the dynamics matrix may lead to errors in the classification of the system. Such inaccuracies may be due to numerical uncertainty in the initial data and/or rounding errors in the code used for the eigenvalues extraction. We give examples that show that even the best codes available (for instance in Matlab and LAPACK) may fail to compute accurately all the eigenvalues. In particular, we show that there is still scope for improvement in the accuracy of the codes when the matrix defines well all its eigenvalues to high relative accuracy.

Keywords: Linear dynamical systems; Eigenvalues computation;