

Improved tools for structured matrix computations

December 8 2015, by Mikael Hansson

To design and analyze a model of a mechanical system such as an electrical network or a chemical reaction process is often a complex problem that requires high-quality mathematical theories and computational tools. The parameters and data are often influenced by the various types of disturbances and, in addition, there may be errors in the model description. Andrii Dmytryshyn defends his thesis on December 11th, at Umeå University.

To compute system characteristics is normally an ill-posed problem, which means that small perturbations of input data can have large impact on the computed system characteristics.

One way to examine such problems is by using stratification theory for structured matrix pencils. Here, a matrix can be viewed as a large table (with many rows and columns) of numbers. A matrix pencil, in turn, consists of a pair of matrices and relates to the so-called generalized eigenvalue problem.

In his thesis work, Andrii Dmytryshyn, Department of Computing Science at Umeå University has constructed stratification graphs, which in turn provide information for a deeper understanding of how the characteristics of the underlying physical system can change under small perturbations.

Of particular interest is to identify more degenerate and more generic nearby systems of a given system. This knowledge can, for example, lead

to a better understanding of how different types of control systems can be made more robust.

Notably, results which form the basis of the dissertation have been awarded the internationally prestigious SIAM Student Paper Prize 2015. According to the statutes, the purpose of the Prize is to recognize outstanding scholarship by students in applied mathematics or computing.

Provided by Umea University

Citation: Improved tools for structured matrix computations (2015, December 8) retrieved 20 September 2024 from <https://phys.org/news/2015-12-tools-matrix.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.