Graduiertenkolleg
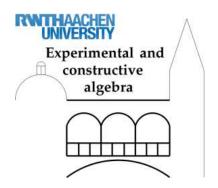
Experimentelle und konstruktive Algebra

RWTHAACHEN UNIVERSITY

Experimental and constructive algebra

Vortrag

Dienstag, 11. März 2014, 11:00 Uhr, Seminarraum Lehrstuhl A für Mathematik (HG 248)

Dimitris Goussis (National Technical University of Athens, Athen, Griechenland): *Algorithmic Singular Perturbation Analysis*

Singular Perturbations analysis is a very important topic in Mathematics and is widely used in Engineering and Natural Sciences. The classical singular perturbation theory grew mainly due to the need to study celestial mechanics and its foundations go back to the papers of Henri Poincare and Thomas Stieltjes, both published in 1886. Significant contributions were provides around the 50's that systematized the existing theories. Since then, significant physical understanding has been acquired in a large number of phenomena related to the fields of Mechanical, Chemical and Electrical Engineering, Physics, Chemistry, Biology, etc.

The traditional Singular Perturbations analysis is hindered by the requirements to set the mathematical model in the proper non-dimensional form, to find the proper small parameter, to identify the number of fast time scales and of the fast variables and to implement the proper expansion of variables. Clearly, the successful completion of these tasks is very difficult, when dealing with the complex systems that are of interest today.

In this seminar an algorithmic methodology will be presented that can perform singular perturbations analysis, which is not hindered by these problems or the size of the mathematical model. This algorithm was developed within the framework of the Geometric Singular Perturbations theory that focuses on the structures that develop in phase space, on which the neighboring trajectories are attracted.

Simple examples (van der Pol, Semenov and Rossler problems) will demonstrate the usefulness of the algorithm.

Wir laden alle Interessierten herzlich ein.