Department Seminar:

Monday, April 13, 2015, at 11:00 a.m.;
— all are invited to meet at around 10:40 for a chat and coffee —

Prof. Dr. Andreas Weber
Multimedia, Simulation and Virtual Reality Group,
Institute of Computer Science II,
University of Bonn).

Detection of Hopf Bifurcations in Chemical Reaction Networks Using Convex Coordinates

Richard-Willstätter-Haus, Faradayweg 10

Abstract:

We present efficient algorithmic methods to detect Hopf bifurcation fixed points in chemical reaction networks with symbolic rate constants, thereby yielding information about the oscillatory behavior of the networks. Our methods use the representations of the systems on convex coordinates that arise from stoichiometric network analysis.

One of our methods then reduces the problem of determining the existence of Hopf bifurcation fixed points to a first-order formula over the ordered field of the reals that can be solved using computational logic packages.

The second method uses ideas from tropical geometry to formulate a more efficient method that is incomplete in theory but worked very well for the examples that we have attempted; we have shown it to be able to handle systems involving more than 20 species.