

FREIE UNIVERSITÄT BERLIN Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

DISPUTATION

Dienstag, 18. April 2017, 15.15 Uhr

Ort: Raum E 2 (1.1.53) Arnimallee 14, 14195 Berlin

Disputation über die Doktorarbeit von

Herrn Bernhard Brehm

Thema der Dissertation:

**Bianchi VIII and IX vacuum cosmologies:
Almost every solution forms particle horizons
and converges to the Mixmaster attractor**

Thema der Disputation:

Sensitivity in networks and Murota's combinatorial canonical form

Die Arbeit wurde unter der Betreuung von **Prof. Dr. B. Fiedler** durchgeführt.

Abstract: A series of recent papers studies the sensitivity of chemical reaction networks to parameter perturbations [1, 2, 3, 4]. Perhaps surprisingly, structural sparsity patterns arise in response to steady state perturbations.

Quite abstractly, Murota [5, 6] studies mixed matrices M , i.e. matrices where each entry is either a rational number or algebraically independent from all other entries. The combinatorial canonical form is an upper block-tridiagonal mixed matrix, where the block structure is canonical.

In this talk, we will contrast these two viewpoints, to their mutual advantage. This simplifies and clarifies the presentation of the combinatorial canonical form, in the special case of invertible M , and gives different insights into the sensitivity analysis.

Literature

[1] Atsushi Mochizuki and Bernold Fiedler. Sensitivity of chemical reaction networks: A structural approach. 1. Examples and the carbon metabolic network. *Journal of theoretical biology*, 367:189-202, 2015.

[2] Bernold Fiedler and Atsushi Mochizuki. Sensitivity of chemical reaction networks: a structural approach. 2. Regular monomolecular systems. *Mathematical Methods in the Applied Sciences*, 38(16):3519-3537, 2015.

[3] Bernhard Brehm and Bernold Fiedler. Sensitivity of chemical reaction networks: a structural approach 3. Regular multimolecular systems. *arXiv:1606.00279*, 2016.

[4] Takashi Okada and Atsushi Mochizuki. Law of localization in chemical reaction networks. *Physical Review Letters*, 117(4):048101, 2016.

[5] Kazuo Murota, Masao Iri, and Masataka Nakamura. Combinatorial canonical form of layered mixed matrices and its application to block-triangularization of systems of linear/nonlinear equations. *SIAM Journal on Algebraic Discrete Methods*, 8(1):123-149, 1987.

[6] Kazuo Murota. *Matrices and matroids for systems analysis*, volume 20. Springer Science & Business Media, 2009.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission

Prof. Dr. B. Fiedler