A U S H A N G

FREIE UNIVERSITÄT BERLIN

Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Mittwoch, 10. Dezember 2014, 10.15 Uhr

Ort: Pi-Gebäude, Raum 108/109, Arnimallee 6, 14195 Berlin

Disputation über die Doktorarbeit von

Herrn Hannes Klarner

Thema der Dissertation:

Contributions to the Analysis of Qualitative Models of Regulatory Networks

Thema der Disputation:

The attractor detection problem in discrete models of biological networks

Die Arbeit wurde unter der Betreuung von **Prof. Dr. A. Bockmayr** durchgeführt.

Abstract: Gene regulatory and signal transduction networks describe how genes interact with each other, via their RNA and protein products, and how signaling molecules transmit information to control processes like cell differentiation, proliferation and apoptosis. The states of signaling molecules and the patterns of gene expression change over time and predicting their dynamics is an important factor in understanding cellular decision making. Boolean and multi-valued logical networks are particularly simple and intuitive models that are frequently used as alternatives to systems of differential equations.

The focus of this talk is on the notion of the asymptotics of logical networks and the computation of the corresponding attractors. Logical networks are capable of producing two types of long-term behaviors: steady states, in which the activity levels of all network components are kept at a fixed value, and cyclic attractors in which some components are unsteady and produce sustained oscillations in the network. The biological relevance of each type of attractor is illustrated by the flower development of A. Thaliana and a cell cycle model. We will present the main computational difficulty in detecting attractors, the state explosion problem, and explain the key ideas behind two state of the art algorithms. The first one is the SAT-based algorithm of E. Dubrova and M. Teslenko for the computation of steady states and deterministic limit cycles. The second one is the BDD-based algorithm of A. Garg et al. for the computation of non-deterministic cyclic attractors.

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. A. Bockmayr