MA04-005 - Modelling the Dynamics of Cellular Networks using Inverse Methods

Abstract

Genetic and metabolic reaction networks of cells are modeled by multidimensional nonlinear ODEs using a purpose oriented software package (MiniCellSim) developed in house. This conventional (forward) analysis of biologically relevant dynamical systems will be complemented by usage of existing and design of novel methods to solve inverse problems. Unknown or inaccurately accessible parameters will be reconstructed from recorded solution curves (Level I) and the qualitative behavior of the dynamical systems will be engineered by means of calculated changes in the external conditions (Level II). Reverse engineering techniques will be applied to experimentally accessible chemical reaction networks containing autocatalytic terms, which lead to typical nonlinear phenomena. The algorithms will be scaled up to the size of small modules of cellular metabolism in order to be ready for applications to real biological problems.

Keywords:
Inverse Methods, Systems Biology, Reaction Kinetics, Software Engineering

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Principal Investigator: Peter Schuster

Institution: University of Vienna



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Further links to the persons involved and to the project can be found under
https://www.wwtf.at/funding/programmes/past/ma/MA04-005/