

ezBioNet: a Modeling and Simulation System for Biological Reaction Networks

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Abstract. A living body is composed of complicated regulation mechanisms ranging from gene regulations to signal transduction to sustain its life. For understanding such life phenomena, an integrated analysis tool that performs techniques and computer simulations on the regulation mechanisms of biological reactions as well as new experimental methods for measuring biological phenomena and high-precision analysis methods is absolutely required. In this paper, we design and implement a modeling and simulation system for biological reaction networks. The system simultaneously performs an integrated modeling of various responses occurring inside cells, ranging from genomes to gene expressions and signaling processes. In addition, it performs computer simulations based on ordinary differential equations. Its plug-in-based modular design framework allows various functional expansions. A researcher can perform the integrated modeling and information management of the regulation mechanisms from genome information to signaling networks through the system. Moreover, it can be utilized as a tool capable of analyzing the interactions between regulation mechanisms as well as the understanding of the regulation mechanisms using computer simulations in the future.

Keywords: Systems Biology, Simulation, Biological Network, Signal Transduction Analysis

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