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Multistationarity in biochemical reaction networks' models

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Multistationarity is defined as the existence of several positive equilibria of an ordinary differential equations model. Multistationarity is a required property of biological switches- reaction networks that govern important cellular functions, such as cell differentiation and cell death. This is the case, because biological switches are modelled by differential equations systems whose solutions can approach different stable equilibria depending on the initial conditions. Many differential equations models of reaction networks are known to be multistationary for particular parameter values. However, reaction networks' properties are robust in nature. Thus, for multistationarity to be robust, a reaction network has to be multistationary in some open region of parameter space. We will describe a computational procedure for screening dissipative differential equations models of reaction networks for the existence of multistationary regions. For a model of the double phosphorylation cycle, we have obtained simple parametric inequalities that identify multistationary regions in parameter space.

This is a joint work with C. Conradi (HTW-Berlin), E. Feliu and C. Wiuf (both from the University of Copenhagen).

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