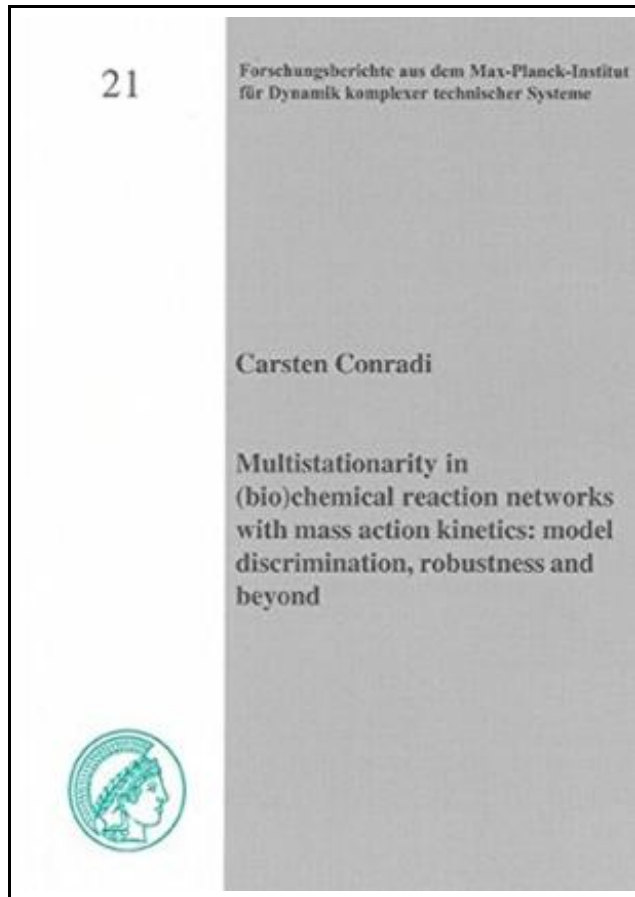


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MULTISTATIONARITY IN (BIO)CHEMICAL REACTION NETWORKS WITH MASS ACTION KINETICS: MODEL DISCRIMINATION, ROBUSTNESS AND BEYOND



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Shaker Verlag Mai 2008, 2008. Taschenbuch. Book Condition: Neu. 21x14.8x cm. Neuware - Multistationarity means the existence of at least two positive steady state solutions to a system of Ordinary Differential Equation (ODEs) derived from a biochemical reaction network. It is an interesting question in its own right: one is looking for the number of positive solutions to a system of polynomial equations in the unknown concentrations with, in most application cases, unknown rate constants. From a mathematical point of view this question is still unanswered. There exists a variety of results that gives an upper bound for the number of (positive) solutions to a system of polynomials. However, whether or not a given system of polynomials actually has the predicted number of zeros can usually not be decided (among these results are Descartes rule of signs for positive solutions and Bernstein's and Bezout's Theorem for all solutions, including negative and complex; see, for example, [13, 14] and [62]). Moreover, all of these results hold for systems of polynomials with known coefficients. The question whether or not a system of polynomial equations with unknown coefficients can admit at least two positive solutions has received little attention in mathematics. In Chemical Engineering, in the so-called Chemical Reaction Network Theory (CRNT) by Martin Feinberg and his co-workers this question has received some attention [30, 24, 25, 26, 55, 28, 22, 21]. Here, the special structure of equations defined by a (bio)chemical reaction network with mass action kinetics is used to derive necessary and sufficient conditions for the existence of at least two positive solutions. These results, however, require that that the network under consideration has certain structural properties. Only recently these results have been recognized in the mathematical literature, for example in [33, 35]. The approach taken in this thesis is inspired...

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