

Solving moment hierarchies for chemical reaction networks

Wednesday, March 8, 2017 10:30 AM (45 minutes)

The study of Chemical Reaction Networks (CRN's) is a very active field. Earlier well-known results [1,2] identify a topological quantity called deficiency, for any CRN, which, when exactly equal to zero, leads to a factorized steady-state for these networks. No results exist however for the steady states of non-zero-deficiency networks. Here we show how to write the full moment-hierarchy for any non-zero-deficiency CRN obeying mass-action kinetics, in terms of equations for the factorial moments (FM). Using these, we can recursively predict values for lower moments from higher moments, reversing the procedure usually used to solve moment hierarchies. We show, for non-trivial examples, that in this manner we can predict to high accuracy, any moment of interest, for CRN's with non-zero deficiency and non-factorizable steady states.

1. M. Feinberg, Chemical reaction network structure and the stability of complex isothermal reactors – I. The deficiency zero and deficiency one theorems, *Chem. Enc. Sci.*, 42, 2229, (1987)
2. D. F. Anderson, G. Craciun, and T. G. Kurtz, Product-form stationary distributions for deficiency zero chemical reaction networks, *Bull. Math. Bio.*, 72, 1947 (2010)

Presenter: KRISHNAMURTI, Supriya (SU)