

# Approximating the Solution of the Chemical Master Equation by Aggregation

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The chemical master equation (CME) is a continuous time discrete space Markov model of chemical reactions. It is used in preference to the (deterministic) kinetic rate equations when the copy numbers of the species involved are low. In this case noise is an important driver of the reactions. Applications include gene regulatory networks and signalling networks in molecular biology.

We will discuss the solution of the CME using an adaptation of a finite volume method based on state space aggregation. Error bounds will be given for this method and effect of high dimensionality (which occurs for systems with a large number of different species) will be considered. The numerical solution will be compared to alternative strategies based on simulation, i.e., Monte Carlo. This is a continuation of the work presented at HPSC 2006 in Hanoi and is joint work with Per Loetstedt, Uppsala.