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Wasiur R. KhudaBukhsh* (khudabukhsh.2@osu.edu), **Hye-Won Kang**, **Eben Kenah** and **Grzegorz A. Rempala**. *Incorporating age and delay into models for biophysical systems*.

In many biological systems, chemical reactions or changes in a physical state are assumed to occur instantaneously. For describing the dynamics of those systems, Markov models that require exponentially distributed inter-event times have been used widely. However, some biophysical processes such as gene transcription and translation are known to have a significant gap between the initiation and the completion of the processes, which renders the usual assumption of exponential distribution untenable. We consider relaxing this assumption by incorporating age-dependent random time delays into the system dynamics. We do so by constructing a measure-valued Markov process on a more abstract state space, which allows us to keep track of the "ages" of molecules participating in a chemical reaction.

We study the large-volume limit of such age-structured systems. We show that, when appropriately scaled, the stochastic system can be approximated by a system of Partial Differential Equations (PDEs) in the large-volume limit, as opposed to Ordinary Differential Equations (ODEs) in the classical theory. We show how the limiting PDE system can be used for the purpose of further model reductions and for devising efficient simulation algorithms. (Received August 17, 2020)