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Series of metastable states for Reversible Probabilistic Cellular Automata

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Abstract

Metastable states are very common in nature and are typical of systems close to a first order phase transition. Classical examples are the supersaturated vapor and the magnetic hysteresis. The full mathematical description of metastability is quite recent and still incomplete. In this framework, Probabilistic Cellular Automata pose challenging problems and show unexpected behaviors. Probabilistic Cellular Automata (PCA) are discrete-time dynamics consisting of cells interacting with each other according to a stochastic rule. They have been introduced as a stochastic generalization of Cellular Automata (CA), which are characterized by a deterministic evolution rule.

In this talk we study the metastability properties of a class of PCA with multiple (not necessarily degenerate) metastable states. In the presence of such deep wells, we prove an addition formula for the exit times from the metastable states in the case they form a series. With this expression we mean that the structure of the energy landscape is such that the system has two not degenerate metastable states and the system, started at the one with highest energy, must necessarily pass through the second one before relaxing to the stable state. This is a joint work with E.N.M. Cirillo (Rome University, Italy) and F.R. Nardi (TU Eindhoven, The Netherlands).