Louis, Pierre-Yves

Ergodicity of PCA: equivalence between spatial and temporal mixing conditions. (English)

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Summary: For a general attractive probabilistic cellular automaton on $S^{\mathbb{Z}^d}$, we prove that the (time-)convergence towards equilibrium of this Markovian parallel dynamics, exponentially fast in the uniform norm, is equivalent to a condition $(\mathcal{A})$. This condition means the exponential decay of the influence from the boundary for the invariant measures of the system restricted to finite boxes. For a class of reversible PCA dynamics on $\{-1,+1\}^{\mathbb{Z}^d}$ with a naturally associated Gibbsian potential φ, we prove that a (spatial-)weak mixing condition $(\mathcal{WM})$ for φ implies the validity of the assumption $(\mathcal{A})$; thus exponential (time-)ergodicity of these dynamics towards the unique Gibbs measure associated to φ holds. On some particular examples we state that exponential ergodicity holds as soon as there is no phase transition.

MSC:

60K35	Interacting random processes; statistical mechanics type models; percolation theory
60G60	Random fields
37B15	Dynamical aspects of cellular automata
37H99	Random dynamical systems
60J10	Markov chains (discrete-time Markov processes on discrete state spaces)
82C26	Dynamic and nonequilibrium phase transitions (general) in statistical mechanics

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