Chaotic itinerancy. A set-oriented approach

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Chaotic itinerancy (CI), brought to attention, among others, by Ikeda et al. [1] and Tsuda et al. [2], is a trajectory through high-dimensional state space, characterized by periods of ordered motion near quasi-attractors, followed by chaotic transitions. Possible mappings, in which CI can occur include coupled map lattice (CML) [3]. We study such mappings using combinatorial methods presented in [4], for which we partition state space into finite grid $\mathcal{X}$ of n-cubes and define multi-valued mapping $\mathcal{F}\colon \mathcal{X} \to \mathcal{X}$ that for each cube $x \in \mathcal{X}$ assigns the set of cubes $A_x \subset \mathcal{X}$. Mapping $\mathcal{F}$ can also be seen as a directed graph, with cubes as vertices and individual mappings between them as weighted edges. This gives us the general view of global dynamics, e.g. one can search for invariant sets by computing strongly connected components in graph $\mathcal{F}$. In this talk, I will briefly describe the model and mathematical tools used to analyze it, as well as potential directions for the continuation of this research.

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