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Dissipative lattice dynamical systems

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Lattice dynamical systems (LDS) are essentially infinite dimensional systems of ordinary differential equations and are formulated as ordinary differential equations on Banach spaces of bi-infinite sequences. There have been many generalisations to include delayed, random and stochastic terms as well as multi-valued terms. LDS arise in a wide range of applications with intrinsic discrete structures such as chemical reaction, pattern recognition, image processing, living cell systems, cellular neural networks, etc. Sometimes they are derived as spatial discretisations of models based on partial differential equations, but they need not arise in this way.

There is an extensive number of papers on lattice dynamical systems. During the 1990s there was a strong emphasis on patterns and travelling waves in such systems. In recent decades attention focused on attractors with results summarised in the monograph [1].

This talk focuses on dissipative lattice dynamical systems and their attractors of various forms such as autonomous, nonautonomous and random. The existence of such attractors is established by showing that the corresponding dynamical system has an appropriate kind of absorbing set and is asymptotically compact in some way.

The main ideas and techniques are discussed and typical examples are presented including the approximation of Heaviside switching functions in LDS by sigmoidal functions.

[1] P. Kloeden, X. Han, *Dissipative Lattice Dynamical Systems*, World Scientific Publishing Co. Inc., Singapore, 2023.