

Population dynamics and pattern transitions in a nonlocal logistic map

We examine the pattern solutions in a generalized nonlocal logistic map that includes spatial kernels in both growth and competition terms. We show that this map includes as a particular case the nonlocal Fisher-Kolmogorov equation, and we demonstrate the existence of three kinds of stationary nonlinear solutions: one uniform, one cosine type that we refer to as wavelike solution, and another in the form of Gaussian. We also obtain analytical expressions that describe the nonlinear pattern behavior in the system, and we establish the stability criterion. We define thermodynamics quantities such as entropy and the order parameter. Based on this, the pattern-no-pattern and pattern-pattern transitions are properly analyzed. We show that these pattern solutions may be related to the recently observed peak adding phenomenon in nonlinear optics.

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