Pattern-non-pattern transition for a nonlocal population dynamics

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In this paper we propose a most general equation to study pattern formation for one-species population and their limit domains in systems of length L [1]. To accomplish this we include nonlocality[2] in the growth and competition terms where the integral kernels are now depend on characteristic length parameters α and β. Therefore, we derived a parameter space (α, β) [3] where it is possible to analyze a coexistence curve $\alpha^* = \alpha^*(\beta)$ which delimits domains for the existence of pattern formation in population dynamics systems. We show the existence of a new order parameter ρ which measures the pattern-no-pattern transition for the population system [4]. We show that this new parameter has an analogy with classical order parameter in thermodynamics and critical phenomena physics. We have successfully compared this model with experimental data for diffusion of Escherichia coli populations.

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