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Invariant regions for systems of lattice reaction-diffusion equations

We study systems of lattice differential equations (i.e., equations with discrete space and continous time) of reaction-diffusion type. Such systems frequently appear in population dynamics (e.g., predator-prey models with diffusion).

After establishing some basic properties such as the local existence and global uniqueness of bounded solutions, we proceed to our main goal, which is the study of invariant regions. Our main result can be interpreted as an analogue of the weak maximum principle for systems of lattice differential equations. It is inspired by existing results for parabolic differential equations, but its proof is different and relies on the Euler approximations of solutions to lattice differential equations. As a corollary, we obtain a global existence theorem for nonlinear systems of lattice reaction-diffusion equations.