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Phase-transition and critical behavior in the chase-escape Model.

Chase-Escape is a simple stochastic model that describes a predator-prey interaction. In this model, there are two types of particles, red and blue. Red particles colonize adjacent empty sites at an exponential rate $\lambda_R$, whereas blue particles take over adjacent red sites at exponential rate $\lambda_B$, but can never colonize empty sites directly. Numerical simulations suggest that there is a critical value $p_c$ for the relative growth rate $p := \lambda_R / \lambda_B$. When $p < p_c$, red particles will always go extinct, and when $p > p_c$ mutual survival of both types of particles becomes possible. In particular, $p_c \approx 0.50$ for the square lattice case ($\mathbb{Z}^2$). In this talk, we will discuss the critical behavior near $p_c$ as well as a few special cases where we can prove the existence of such a phase transition and find the precise value of $p_c$. (Received August 04, 2020)