Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Phase diagram of the diffusive epidemic process[1] RONALD DICKMAN, DANIEL SOUZA MAIA, Universidade Federal de Minas Gerais — We study the absorbing-state phase transition in the one- dimensional diffusive epidemic process via mean-field theory and Monte Carlo simulation. In this model, particles of two species (A and B) hop on a lattice and undergo reactions B $\rightarrow$ A and A + B $\rightarrow$ 2B; the total particle number is conserved. A phase transition between the (absorbing) B-free state and an active state is observed as the parameters (reaction and diffusion rates, and total particle density) are varied. Mean-field theory reveals a surprising, nonmonotonic dependence of the critical recovery rate on the diffusion rate of B particles. A computational realization of the process faithful to the master equation the model is devised. Using the quasi-stationary simulation method we determine the order parameter and the survival time in systems of up to 4000 sites. Due to strong finite-size effects, the results converge only for large system sizes. We find no evidence for a discontinuous transition. Our results are consistent with the existence of three distinct universality classes, depending on whether A particles diffusive more rapidly, less rapidly, or at the same rate as B particles. We also perform quasi-stationary simulations of the triplet creation model, which yield results consistent with a discontinuous transition at high diffusion rates.

[1]CNPq and Fapemig, Brazil

Ronald Dickman
Universidade Federal de Minas Gerais

Date submitted: 18 Nov 2006 Electronic form version 1.4