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Random Interacting Particle Systems: Numerics for the Zero-Diffusion Limit

Collective behavior of large systems of interacting agents, or swarming, can be described mathematically using a general framework which applies to situations as various as flocks of birds and opinion dynamics. We investigate swarming in domains with boundaries and quantify the effect of adding linear diffusion to the model, or Brownian motion at the particle level. Using a Monte-Carlo sampling algorithm combined with particle simulations, we show numerically that in the zero-diffusion limit, solutions to the aggregation-diffusion equation converge to solutions of the plain (non-diffusive) aggregation model at the predicted analytical rate.