

The Discrete Conceit: Agent-Based Biological Aggregation Models

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Abstract:

The scientific literature includes hundreds, if not thousands, of agent-based models of biological aggregations. This tutorial-style talk will introduce some of the most influential models of the past 70 years, discuss their distinctive ingredients, and show that they can reproduce certain behaviors seen in the natural world. We will also present two detailed cases studies. The first case study begins with a qualitative field observation of flying locust swarms and develops a high dimensional system of nonlinear differential equations whose behavior can be better understood using ideas from statistical mechanics. The second case study begins with experimental data for the motion of aphids and develops a two-state correlated random walk model that reveals information about the aphids' social behavior.