Individual-based models of cell ocking

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Abstract

With the aim of understanding the emergence of collective migration from local interactions of organisms, we study biologically-inspired, inherently nonequilibrium models consisting of self-propelled particles. We focus on the implications of both an intrinsic motility and a local alignment interaction on pattern formation.

We study an off-lattice and a cellular automaton (CA) model and two basic interactions between neighboring oriented cells. Density-dependent interaction (CA only) provides a model of differential adhesion, while orientation-dependent interaction (both models) yields a model of collective motion or swarming. Analysis by a correlation function (off-lattice) and linear stability of the Boltzmann equation (CA) are shown.

Both analyses permit us to deduce important orientational and spatial aspects of simulation outcomes.