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Dynamics of interacting agents – applications to bird swarms and traffic flow

Abstract: By modifying type and strength of interaction between individually moving agents (as, for example, migrating birds or humans in a pedestrian zone) we use a simple stochastic multi-particle simulation model to reproduce characteristic phenomena appearing in such 'dynamic swarms': global coherence and local avoidance, overall persistence of mean direction and local alignment, as well as pulsating or travelling waves of global or local condensation and relaxation. In addition to showing numerical simulations and their statistical analysis, some results are presented concerning approximative stochastic (fluid dynamical) partial differential equations that can be obtained in the continuum limit for infinitely dense, but still ordered swarms.