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THERMODYNAMICS OF SWARMS AND THERMOSTATTING IN THE FIXPOINT

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Abstract:

Systems may be complex in both their composition (typically many different kinds of components interacting with each other and their environments) and in the rich diversity of behavior. We discuss multiple Brownian particle models with nonlinear and long range forces. Numerical simulations show collapse to a point, freezing to static configurations or amorphous swarming behavior, respectively. Analytic understanding of the systems is provided by studying stability properties of equilibria and performing a detailed bifurcation analysis. We propose a new type of thermostats, whose meaning is to provide constant temperature for molecular dynamics simulations as fixpoint solutions of the time evolution.