On the Thermostatted Kinetic Models

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Different approaches inspired to equilibrium or non equilibrium statistical mechanics have been developed in an attempt to describe collective behaviors and macroscopic features of complex phenomena in nature and society as the result of microscopic interactions. Kinetic theory for active particles models have been developed in space homogeneity for complex systems where macroscopic external effects are neglected [2]. Accordingly the random interactions among individuals will eventually move the system towards equilibrium. If, on the other hand, an external force field acts on the system, the applied field does work on the system thereby moving it away from equilibrium [1]. The excess energy needs to be removed so as to achieve a steady state. A method, which is common in nonequilibrium molecular dynamics simulations, is the use of deterministic thermostats, which consists by introducing a damping term into the equations of motion [5].

This talk is concerned with the mathematical modelling of complex systems subjected to external force fields whose magnitude exerts an action on the particles. A Gaussian isokinetic thermostat is introduced in order to keep constant the energy of the system. The resulting model is expressed by means of nonlinear hyperbolic partial integro-differential equations [3]. The global in time existence and uniqueness of the solution to the relative Cauchy problem is shown for which the density and the energy of the solution are preserved [4].

References

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