INTERACTING PARTICLE MODELS: APPLICATIONS IN COMPLEX SYSTEMS AND APPROACHES FOR REDUCING THE COMPUTATIONAL COST

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ABSTRACT

The study of interacting particle models has attracted a lot of attention in recent years. Designed to describe the dynamics of entities that interact with each other according to certain rules, they have been broadly employed to explore complex systems that display self-organization or collective behavior. Such systems primarily arise within biological and social contexts, where they describe phenomena like swarming behavior, the spread of infectious diseases, tumor growth, pedestrian and crowd dynamics, and opinion formation. Moreover, inspired by the previous applications observed in nature, particle-based models have become a robust and effective framework for tackling difficult challenges also in optimization, sampling, and machine learning. This mini-symposium aims primarily to bring together young researchers who are exploring the diverse applications of interacting particle systems.

It is well recognized that conducting an in-depth study of particle-based approaches becomes increasingly difficult when dealing with large numbers of individuals. A common strategy involves analyzing these models across different scales, from the individual particles to the observable phenomena one. Additionally, investigating such models numerically often comes with substantial computational costs. However, recent decades have seen the development of various efficient numerical algorithms to address these challenges. Thus, researchers with expertise in optimizing the numerical aspects of these models are sought for fruitful discussions.

Ultimately, this mini-symposium seeks to foster collaboration and the exchange of ideas between young researchers who are engaged in both the modeling and efficiency aspects of interacting particle models.

Several young researchers have already shown interest in participating in the mini-symposium.