School of Nano Science

School of PHYSICS

IPM Condensed Matter & Statistical Physics Group

Weekly Seminar

Gaussian theory for derivation of continuum equations of self-propelled particles

Invited Speaker:

Dr. Hamid Seyed-Allaei

Guest researcher at school of nano science- IPM

Abstract:

The collective behavior of active matters, e.g. colony of micro swimmers and flocks of birds can be modeled with self-propelled particles. It is evident that a continuum description of such systems is useful in determining the collective behavior in large and long scales. One can make continuum equations in active matter with the help of symmetry arguments. However, the equation is in a phenomenological level with undetermined transport coefficients. It is possible to construct the continuum equations from microscopic rules to find the transport coefficients in terms of microscopic parameters with approximations. One of the usual approximations called truncation method is to truncate the Fourier series of the orientation distribution of the particles. Although the truncation method gives a reasonable description of ordered to disordered transition, the resulting transport coefficients are not correct in low noise limit. Here in this talk, we introduce another technique that we refer to it as Gaussian approximation. In this technique the distribution of the particles orientations is approximated by a wrapped Gaussian distribution function. We show that the resulting continuum equations describe qualitatively all features of the system in all range of noise intensities. Moreover, the resulting continuum equations describe quantitatively and accurately the behavior of the system in low noise intensities. Finally we will present the ability of the Gaussian approximation by an example of self-propelled particles confined in a geometry.

Wednesday, 17 Aban 1396 (November . 8, 2017), 14:00-15:00

Seminar Room (classroom A), Farmanieh Building, IPM