Active Brownian Motion:
Effects of Noise on Self-Propelled Particles

Abstract

I consider self-propelled particles under the influence of noise, a concept which was called "active Brownian motion".

First, I discuss the influence of active fluctuations or motor noise, as an independent stochastic sources in the direction of motion and velocity. Such description leads to an accumulation of probability at vanishing speed values. Secondly, effects of correlations in the noise and of Levy noise on the motion of the active particles are investigated. I present transport properties as the mean flux and the diffusion coefficient in different situations, e.g. overdamped, or with inertia, or with constant speed, and affected by additional torques etc. Furthermore, I consider interacting active Brownian agents. I focus on the problem how the onset of collective motion depends on the choice of the specific noise. Special attention is paid for the occurring large scaled spatial structures of chemo-tactically interacting Brownian agents. Finally, I propose a generic model which exhibits a turbulent behavior of the self-propelled particles. Macroscopic properties of these particles are in good agreement with experimental findings.