Active Brownian Dynamics: Self-motion with Driver and Navigator Vectors

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The problem of self-motion for active particles is considered on the basis of Fokker-Planck and Langevin equations by introduction the time-dependent inner vector of active particles - "driver" - **D**, which characterizes ability of the biological objects (BO) to realize some choice of their dynamic behavior. This choice reflects influence of the different external signals and can be considered as a "meaningful" response of the BO on these signals. In parallel with the "driver" vector **D** we introduce another inner vector "navigator" - **N**, which characterizes some fixed (relatively to other points of the body) instantaneous direction inside the active particle. In general, there is some relative motion of the different points of BO in time, in particular during it motion. "Navigator" can be determined, for example, as the vector inside the body of an BO, taken in a rest ("equilibrium") state in the moment under consideration. For animals the navigator can be taken along the symmetry line of their body in a rest state. In general there is some non-zero, time dependent angle between these two vectors - **D** and **N**. Reaction of the BO on different external, internal or reflected (initially produced by the BO itself - location) signals, is described by introduction of the "biological field". The "driver" is directed along to the instantaneous acceleration of the BO, created by influence of these signals and related with the concept of "target point".

1. S.A. Trigger, *Phys. Rev.* **E 67**, 046403 (2003)