

Body-orientation dynamics

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During the last decades, there has been a growing effort to understand how complex self-organised patterns (or structures) can emerge from active particle systems when the number of particles becomes very large. Typical examples in the real world include the flock of birds, the swarm of bacteria or fish schools. A few years ago, Degond et al. proposed a model of “body-orientation dynamics” where the particles carry a complex geometrical structure: the particles are modelled by rigid bodies whose attitude (or body orientation) is described by an orthonormal frame which they try to align with those of their neighbours. Using a kinetic theory approach, this talk will review and present recent results on this model regarding the many-particle limit, phase transition phenomena, pattern formation and long-time behaviour. Geometry plays an important role for all these results. This is a joint work with Pierre Degond, Amic Frouvelle, Sara Merino-Aceituno and Mingye Na.

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