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Self Propelled particle systems: A study of the onset of organized motion AJINKYA KULKARNI, SRIKANTH VEDANTAM, MAHESH PANCHAGNULA, IIT Madras — Swimming micro-organisms in liquid suspensions are known to produce interesting patterns. The objective of this study is to investigate the onset of organized motion in Self Propelled particle systems in confined two-dimensional spaces. A dynamic Vicsek model including particle inertia has been proposed. In this approach, the particles are modeledas soft disks with finite mass. The particles are required to align their local motion to their immediate neighborhood, similar to standard Vicsek model. We study the dynamics of organized motion and diffusion properties of the particles as a function of the local co-ordination coefficient (LCC) and thrust generation ability. Firstly, we observe a hysteretic phase transition from disorganized thermal motion to organized vortical motion as LCC is increased. In addition, we observe a sensitive dependence of the realized state of the system to the initial conditions for the particles near to the critical LCC. Finally the energy budget of the system – including potential and kinetic energies as well as dissipation with time – is used to understand the motivation for the phase transition.

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