Flow Of Information In a Mechanically Quenched Confined Flock

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Living entities in a group communicate and transfer information to one another for a variety of reasons. It might be for foraging food, migration, or escaping threats and obstacles, etc. They do so by interacting with each other and also with the environment. The tools from statistical mechanics and information theory can be useful to analyse the flow of information among the living entities modelled as active (i.e. self-propelling) particles. Here we consider the active particles confined in a circular trap. The self-organisation of the particles crucially depends on whether the trap boundary is soft or hard. We quench the trap boundary from soft to hard instantaneously. After the mechanical quench, the particles suddenly find themselves in a hard potential. The self-organised cluster of the active particles, which was stable when the boundary was soft, becomes unstable. The cluster undergoes extreme deformation after the quench to find another stable configuration suitable for the hard potential. Together with the structural relaxation, information regarding the quench also flows throughout the deforming cluster. Here, we quantify the flow of information by computing local transfer entropy. We find that the flow spans the whole cluster, propagating ballistically.