Self-organization in a large population of swarmalators

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In nature various types of self-organization have been observed: Swarming, synchronization, and alignment, for example. The most desirable direction for future study is to more fully explore the interplay among these various types of self-organization, but we have mainly focused on the swarming and synchronization. The swarming is a kind of the self-organization in space, while the synchronization is the self-organization in time. Despite the similarity between them, the two areas are not connected and rarely have they been studied together. We here propose a simple model of large population of swarmalators that can sync and swarm in space, and explore the collective behavior of the system. We find that the model settles into one of five states in the long term. Effects of the noise and alignment dynamics on the swarmalators have been also studied, which will be discussed in the presentation†.