



Center for Soft Matter and Biological Physics

Discussion Meeting

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"Passive and active sensing in the Vicsek model "

Friday, April 12, 2019

4:00pm - 5:00 pm

304 Robeson Hall

While many social animals move in groups using passive senses like vision, bats form very large colonies while using on sonar for navigation. Sonar is a so-called active sense, which relies on a self-generated signal (sound) rather than one already present in the environment (e.g., light for vision). From an engineering perspective, using active sensing in large groups poses many challenges centered around interference between signals produced by peers. However, experimental work with bats suggests that these animals may be capable of using their peers' signals for passive sonar, which may ameliorate some of these complications. Taking this system as inspiration, we explore the possibility of combining passive and active sensing in a well-studied model which shows collective behavior, the Vicsek model. The Vicsek model enforces a local alignment rule in groups of self-propelled particles perturbed by noise. Phase transition is observed in both the presence and absence of passive sensing, yet the range of parameters for which ordered and disordered group states exist dramatically changes when passive sensing is used. Notably, we find numerous cases of the model for which the implementation of passive sensing increases the robustness of the collective behavior to noise.

