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A simple model for swarming with nonlocal sensing

We present a simple conservation law model describing the population level swarming of organisms. The organism's speed of motion results from the combination of a nonlocal, long range, attraction and short range repulsion. The kernel of the long range attraction term is not symmetric and can be thought of as modeling the response of higher organisms to visual cues where the organisms sense others primarily in the direction in which they are moving. The resulting model has compact travelling waves (swarms) whose speed increases with the swarm "mass" up to a largest swarm. There are also front and periodic solutions. We discuss a possible kinetic model that leads to our conservation law and some extensions of our macroscopic model.

This is joint work with Xu Yang.