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Louis F Rossi* (rossi@math.udel.edu), Department of Mathematical Sciences, University of Delaware, Newark, DE 19716. *Dynamics and information transfer in swarms with covert leaders.*

We report on modeling and analysis of large three-zone swarms with *covert leaders*. In three-zone swarming behavior, individual behavior is driven by the position and orientation of neighboring individuals in each of three concentric zones: repulsion, orientation and attraction. The fundamental purpose of this research is to understand how interactions between individuals are mapped to the dynamics of the entire swarm.

A *covert leader* is treated no differently from a follower but has information that followers do not possess. In the continuum limit, swarms are represented as densities and velocities which are functions of space and time. The dynamics of the swarm is described by a system of partial differential equations capturing conservation principles and the local interactions (i.e. behavior) within the swarm.

Using this approach, we report on the fundamental dynamics (coherence and stability) of the swarm. We also report on the theoretical information transfer in the swarm and on the potential for using transfer entropy to distinguish between leaders and followers in swarms. (Received January 28, 2014)