APPLIED MATHEMATICS COLLOQUIUM

SWARMING AND AGGREGATION PHENOMENA

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ABSTRACT:

There is growing interest in biological aggregation phenomena as a possible design paradigm for artificial swarms. We consider a family of models used to study aggregation phenomena in which nonlocal interactions lead to motion that can also involve internal self propulsion. We discuss the role of H-stability, defined for conservative particle systems, as a measure of how the energy of the system per particle scales with the number of particles, applied to nonconservative particle systems with self-propulsion and drag. We also consider a family of kinematic models for continuum aggregation. For such systems we discuss nonlinear pattern formation and a proof of finite time blowup of solutions in the case of a common biological interaction kernel.

The talk will include some discussion of the papers listed below, available on my website: www.math.ucla.edu/~bertozzi

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1. C.M. Topaz, A.L. Bertozzi and M.A. Lewis. A nonlocal continuum model for biological aggregation. Bulletin of Mathematical Biology, 2006.

2. Maria R. D'Orsogna, Yao-Li Chuang, Andrea L. Bertozzi and Lincoln Chayes, Self-propelled particles with soft-core interactions: patterns, stability, and collapse, Physical Review Letters, 96, 104302, 2006.

3. A. L. Bertozzi and T. Laurent, Finite-time blow-up of solutions of an aggregation equation in R^n, preprint 2006.

4. Y.-L. Chuang, M. R. D'Orsogna, D. Marthaler, A. L. Bertozzi and L. Chayes, State Transitions and the Continuum Limit for a 2D Interacting, Self-Propelled Particle System, preprint 2006.

MONDAY, SEPTEMBER 25, 2006
4:00 PM
Building 2, Room 105

Refreshments at 3:30 PM in Building 4, Room 174
(Math Majors Lounge)

Applied Math Colloquium: http://www-math.mit.edu/amc/fall06
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