CoCo Seminar Series
Fall 2014

Four Classes of Morphogenetic Collective Systems

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Wednesday October 22nd, 2014
8:30-9:30am
Biotechnology Building BI 2221
(ITC Conference Room)

We studied the roles of morphogenetic principles — heterogeneity of components, dynamic differentiation/redifferentiation of components, and local information sharing among components — in the self-organization of morphogenetic collective systems. By incrementally introducing these principles to collectives, we defined four distinct classes of morphogenetic collective systems. Monte Carlo simulations were conducted using an extended version of the Swarm Chemistry model that was equipped with dynamic differentiation/re-differentiation and local information sharing capabilities. Self-organization of swarms was characterized by several kinetic and topological measurements, the latter of which were facilitated by a newly developed network-based method. Results of simulations revealed that, while heterogeneity of components had a strong impact on the structure and behavior of the swarms, dynamic differentiation/re-differentiation of components and local information sharing helped the swarms maintain spatially adjacent, coherent organization.

Hiroki Sayama is an Associate Professor of Bioengineering and Systems Science and Industrial Engineering, and the Director of the CoCo Research Group, at Binghamton University. His research interests include complex dynamical networks, artificial life and chemistry, human and social dynamics, interactive systems, and computer/information sciences in general.

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