



Center for Complex Systems and Brain Sciences

DOCTORAL DEFENSE

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DATE: Friday, October 12, 2018

TIME: 02:00 PM

PLACE: Behavioral Sciences Bldg., BS-12,
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TITLE: *The coordination dynamics of multiple agents*

Abstract: Complex systems (living animals, human societies, brain etc.) often consist of many components, coordinating with each other and giving rise to dynamic patterns at multiple levels of description (activities in an animal at the level of molecules, cells, organs etc.). Existing studies of coordination often focus on gross-level features in systems of very many components (large-scale), or finer dynamics in systems of few components (small-scale). To connect the many and the few, this dissertation is grounded in intermediate-sized systems (mid-scale), which are just large enough to exhibit gross-level features (e.g. grouping) and small enough so that the finer dynamics is not too high-dimensional to analyze. A new experimental paradigm was developed to study rhythmic coordination in an ensemble of people ($N=8$), where individual's movement frequency and the network connectivity between them was systematically manipulated. Based on this paradigm, an experiment with 120 human subjects (15 ensembles) was conducted, and their coordinative behavior was analyzed on multiple levels of description. A theoretical model was subsequently developed to capture and explain experimental observations, which united well-known models of large- and small-scale coordination (the Kuramoto and the extended HKB model respectively). To analyze the complex dynamic patterns observed, a novel method is introduced for detecting coordinated switching between dynamic patterns based on their topological features. Together, through the study of midscale multiagent coordination, this dissertation extends the existing empirical, theoretical and data analytical frameworks of coordination dynamics.

ALL ARE WELCOME