



Hamilton Institute

**Distributed Coordination and
Consensus in Mobile Agents:
From Bird Flocking and Fish Schooling to
Synchronization of Coupled Oscillators**

**Professor Ali Jadbabaie
Department of Electrical and Systems Engineering
University of Pennsylvania, USA**

Friday, June 24th, 2004



Abstract

In this talk we provide a unified view of several distributed coordination and consensus algorithms which have appeared in various disciplines such as statistical physics, biology, computer graphics, robotics, and control theory over the past 2 decades. These algorithms have been proposed as a mechanism for demonstrating emergence of a global collective behavior (such as social aggregation, schooling, flocking and synchronization) using purely local interactions.

Utilizing tools from spectral graph theory and control and dynamical systems theory, we provide a rigorous analysis of these algorithms. We then use these tools to study synchronization phenomena in networks of coupled nonlinear oscillators by extending current state of the art to interconnections with time delays, and arbitrary fixed and switching interconnection topologies.

Next, we provide a vision-based coordination scheme for formation control and velocity alignment of a set of kinematic robots in 2 the plan and 3d space. Finally, we use the same framework to analyze a recently proposed scheme for geographic routing in wireless adhoc networks which does not rely on location information.



Venue: Seminar Room, Hamilton Institute, Science Building,
NUI Maynooth

Time: 2.30 – 3.30pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie