Network dynamics as optimization algorithms: A new perspective to engineering networked dynamical systems

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Abstract:
The operation and management of complex engineering networks usually take a hierarchical structure: system-wide optimization that adapts to large but slow fluctuations, and distributed real-time control that reacts to fast but small fluctuations. We show that network dynamics with distributed control can usually be seen as optimization algorithm for solving a global optimization problem. This provides a new perspective to understanding collective behaviors arising from the interactions between local control and decision, and more importantly a way to engineer distributed control to achieve system-wide properties beyond stability. This tightly coupled design of system-wide optimization, distributed control, and network dynamics will be needed for complex engineering networks of the future that face relatively large but fast fluctuations. We will illustrate the idea and issues using examples from communication networks and power networks.

Bio:
Lijun Chen received a PhD in Control and Dynamical Systems from California Institute of Technology in 2007. His current research interests include optimization and control of networked systems, distributed optimization and control, convex relaxation and parsimonious solutions, and game theory and its engineering application.

Dr. Chen is currently an Assistant Professor of Computer Science and Telecommunications at University of Colorado at Boulder.

He is an editor for IEEE Transactions on Communications.

SEMINAR NOTES: (REFRESHMENTS SERVED AT 4 PM)