Title: An implementation of Decentralized Consensus Building in Sensor Networks

Lei Chen (PhD student in Electrical Engineering)
Advisors: Jeff Frolik (School of Engineering)
X. Sean Wang (Department of Computer Science)

Abstract:

In a sensor network, achieving consensus among the sensor nodes without requiring centralized control is an important attribute that enables quick and reliable network decisions. Decentralized consensus building can be achieved through a process called self-synchronization, which may be implemented through iterative information exchange among sensor nodes. While much of the literature has concentrated on developing self-synchronization theory, minimizing the number of iterations is necessary in practice to reduce energy consumption.

In this work, we present an approach aimed at solving this problem. First, existing theoretical, continuous-time results are reformulated so that they can be implemented in physical, discrete-time hardware. Second, several discretization methods to approximate continuous time system are compared and we show that the number of iterations needed to achieve consensus can be minimized a priori for a given network topology. Finally, we illustrate our results through numerical analysis and hardware implementation. The possible applications of self-synchronization sensor network design are proposed.