AIChE Webinar Series

Computing & Systems Technology Division (CAST) Welcomes

Martha Grover

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Feedback Control of Microscale Colloidal Assembly

Abstract:
The control of micro- and nanoscale assembly is challenging, due to the high-dimensional nonlinear stochastic dynamics and the difficulty of real-time sensing. In the colloidal assembly process discussed here, the goal is to drive a collection of micron-sized particles into a highly ordered crystalline structure, for application to optoelectronics. The process is monitored in real-time using optical microscopy, with particle positions fed back to a controller that adjusts the voltage. The voltage influences all particles in a position-dependent manner, creating an underactuated control system. We developed stochastic models for the process and used a Markov decision based dynamic programming method to construct the optimal control policy. Both simulation and experimental studies will be discussed.

Biography:
Martha Grover is an Associate Professor in the School of Chemical & Biomolecular Engineering at Georgia Tech. She earned her BS from the University of Illinois, Urbana-Champaign, and her MS and PhD from Caltech. She joined Georgia Tech as an Assistant Professor in 2002, and received an NSF CAREER award in 2004. In 2011 she received the Outstanding Young Researcher Award from the Computing and Systems Technology Division of AIChE. Her research program is dedicated to understanding, modeling, and engineering the self-assembly of atoms and small molecules to create larger scale structures and complex functionality. Her approach draws on process systems engineering, combining modeling and experiments in applications dominated by kinetics, including surface deposition, crystal growth, polymer reaction engineering, and colloidal assembly.

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