CCT Colloquium Series

Fluidic Self Assembly and the Network of Things

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Johnston Hall 338
January 25, 2008 - 11:30 am

Abstract:
Fluidic Self Assembly (FSA) is now a microhydrodynamic, particulate process for the integration of electrical, optical and mechanical devices, with examples including compound semiconductor devices on silicon substrates (e.g. communication lasers), silicon devices on glass or plastic substrates (pixel drivers for liquid crystal displays) and assembly of radio frequency ID (RFID) devices for auto identification. From a fundamental viewpoint, FSA is simply a "hydrodynamic steering" mechanism for guiding devices into complementary clefts etched in a substrate. Near-term opportunities for RFID in the world of supply chain optimization have rekindled interest in a collection of fundamental problems in fluid dynamics that are longstanding activities of the speaker. The balancing of "curiosity-driven" research and applied technology deployment is illustrated in the form of a computational strategy for modeling of fluidic self assembly including particle-particle and particle-cleft interactions in the presence of sharp corners and edges.

Speaker's Bio:
Sangtae "Sang" Kim is the inaugural Donald W. Feddersen Distinguished Professor of Mechanical Engineering and Distinguished Professor of Chemical Engineering at Purdue. The Feddersen Distinguished Professorship is supported by a substantial endowment targeting emerging opportunities at the interface of engineering and information technologies. Sang's recently completed eight-year voyage beyond the ivory tower spanned both the public (NSF Division Director at the launch of the Cyberinfrastructure Division) and private (VP level positions heading R&D IT in the pharmaceutical industry at the inflection point of the genomic revolution) sectors. During 1983-97, Sang was a faculty member in Chemical Engineering at the University of Wisconsin-Madison, where he engaged in mathematical and computational methods for microhydrodynamics (now more commonly known as microfluidics). His computational insights into "hydrodynamic steering" played an influential role in 1994-95 in the development of fluidic self assembly (FSA), the novel process employed today for manufacturing of low-cost RFID (radio frequency) tags. Sang is a member of the National Academy of Engineering and a fellow of the American Institute of Medical and Biological Engineers. His research citations include the 1993 Allan P. Colburn Award of the American Institute of Chemical Engineers, the 1992 Award for Initiatives in Research from the National Academy of Sciences and a Presidential Young Investigator award from NSF in 1985. His 1991 treatise, Microhydrodynamics, is considered a classic in that field and was recently selected by Dover Publications for its reprint series. A native of Seoul, but a product of the "K-11" public schools of Montreal, Sang received concurrent BSc and MSc degrees (1979) from Caltech and a PhD (1983) from Princeton.

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