Cymer Center for Control Systems and Dynamics

Stochastic Processing Networks with Resource Sharing

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Stochastic processing networks are used as models for complex systems involving dynamic interactions subject to uncertainty. Application domains include manufacturing, the service industry, telecommunications, and computer systems. Networks arising in modern applications are often highly complex and heterogeneous, with network features that transcend those of conventional queueing models. The control and analysis of such networks present challenging mathematical problems. In this talk, a concrete application will be used to illustrate a general approach to the study of stochastic networks using more tractable approximate models. Specifically, we consider a data network model that represents the randomly varying number of flows present in a network where bandwidth is shared fairly amongst elastic documents. This model, introduced by Massoulie and Roberts, can be viewed as a stochastic processing network with simultaneous resource possession. Elegant fluid and diffusion approximations will be used to study the performance of this model. The talk will conclude with a summary of the current status and description of open problems associated with the further development of approximate models for general stochastic processing networks. This talk is based in part on joint work with W. N. Kang, F. P. Kelly, and N. H. Lee.

Ruth Williams is a Professor of Mathematics at the University of California at San Diego (UCSD). Her research interests are in probability, stochastic processes and their applications. She is a Fellow of the American Association for the Advancement of Science and the Institute of Mathematical Statistics. Ruth Williams has been a U.S. National Science Foundation (NSF) Presidential Young Investigator (1987-93), an Alfred P. Sloan Fellow (1988-92), a Guggenheim Fellow (2001-2002) and was an invited speaker at the International Congress of Mathematicians held in Berlin in 1998.