

Applications of Statistics and Stochastic Systems Theory in Real World Problems: A Few Examples



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Thursday, March 6, 2003

1130ME Conference Room starting at 3:30 p.m.

Abstract

With the advancement of computer technology, thousands of pieces of data are collected from a multitude of sensors in many dynamics processes. The real-time data and databanks will become gold mines of knowledge if accurate and relevant information could be extracted and utilized in a timely manner. Multivariate statistical methods have proved to be powerful tools to handle high dimensional and correlated process variables. Three examples of applying multivariate statistical analysis are presented in the first part of the talk, process monitoring and fault detection in the papermaking process, lakebed classification using remote sensing technology, and extracting information from drill data collected in the mining industry. Our effort in integrating multivariate statistical method with the model-based approach will also be presented. The second part of the talk presents examples of applications of stochastic systems theory in real-world problems. In the first example, Markov chains are used in the simulations of (1) a drug delivery process, and (2) cell population dynamics. The second example concerns problem formulations and solution procedures of production planning and inventory management with applications to the paper industry.

Biography

Karen Yin received her M.S. in Chemical Engineering (1982) from Beijing Institute of Chemical Technology, M.S. in Mathematic statistics (1990) and Ph.D. in Chemical Engineering (1991), both from University of Maryland at College park. She was an Assistant Professor (1991-1996) and an Associate Professor (1996-1998) in the Department of Chemical Engineering, University of Minnesota Duluth. She joined the Department of Wood and Paper Science of University of Minnesota in 1998, where she is an Associate Professor. In addition to her 14-year experience working in the chemical industry, she has taught 15 different courses in Chemical Engineering, Paper Engineering, and Applied Statistics. Her research interests include applications of deterministic and stochastic systems theory in engineering practice; process monitoring and control; on-line fault detection and supervision; scheduling, planning and design of industrial processes; mathematical modeling and system identification; adaptive and statistical process control.

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