A Uniform Approach for Analyzing Queues with Correlated Interarrival and Service Times

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Dr. Qi-Ming He is a professor in the Department of Management Sciences at the University of Waterloo. He received a PhD from the Institute of Applied Mathematics, Chinese Academy of Sciences in 1989 and a PhD from the Department of Management Science at the University of Waterloo in 1996. His main research areas are algorithmic methods in applied probability, queueing theory, and production management. In investigating various stochastic models, his favorite methods are matrix analytic methods. Recently, he is working on queueing systems with multiple types of customers and abandonment, Markov modulated fluid flow processes, representations of phase-type distributions and their applications, and the application of neural networks (big models) in stochastic models.

Abstract： Using the Markov modulated fluid flow (MMFF) process, we introduce a framework to analyze queues with correlated interarrival and service times. An algorithm is developed for computing quantities such as the distributions, means, and variances of age, waiting time, sojourn time, and queue length. System stability conditions are found. A number of special cases are presented to demonstrate the versatility of the queueing model and the power of the solution approach. In particular, we have conducted an in-depth analysis on the M/M/1 case and the relationship between the decay rates of tail distributions of queueing quantities and the correlation coefficient of the interarrival and service times is obtained. (Joint work with Haoran Wu and Li Xia)

时间：2024年9月10日（周二） 9：30-11：00
地点：中国科学院数学与系统科学研究院思源楼625

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