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We have concentrated on proving the diffusion approximation for queueing networks via the Trotter-kato Theorem. This involves delicate calculations involving the domains of certain operators some of which have been successful and some not. We are now trying to solve the martingale problem instead of characterizing the domain and hope to use the Stroock-Varadhan approach in order to prove the corresponding limit theorem. In (3) for example, we solve the martingale problem for a class of Markov processes whose infinitesimal generators are integro-differential operators. Extensions of these results to more complicated queueing systems are currently in progress.					
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Title: Applications of Functional Analytical Methods to Problems
in Queueing Network Theory and Reliability Theory -- Final
Technical Report on Contract No: F49620-79-C-0209.

Principal Investigator: Professor Walter A. Rosenkrantz

I. Publications: Three papers were completed and two have been so far accepted for publication. Their titles are listed below:

- (1) On the Accuracy of Kingman's Heavy Traffic Approximation in the Theory of Queues, Zeit. für Wahrsch. verw. Geb., 51, 115-121.
- (2) Limit theorems for Markov processes via a variant of the Trotter-Kato theorem (with C.C.Y. Dorea), Journ. of Appl. Prob. -- to appear.
- (3) On an integro-differential equation occurring in Queueing and Storage theory -- submitted.

Note: Both the referee and the editor of the Z.W. have suggested that a substantially revised version of (3) would be acceptable for publication. I am now busy revising this paper for possible publication in the Z.W.

II. Invited Lectures: During the contract period 7/1/79-9/30/80, the principal investigator was invited to lecture at IBM's Thomas J. Watson Research Center (Jan.'80); Courant Institute of Mathematical Sciences (Feb.'80) and MIT's Laboratory for Information and Decision Systems Seminar in Mar. 1980. He also attended the annual meeting of American Mathematical Society in San Antonio (Jan.'80), and the Ninth Conference on Stochastic Processes and their applications, Evanston, Illinois August 1979.

III. Consulting: The principal investigator was a consultant to Bell Labs' operations research group during the month of June 1980. He worked with Dr. David Burman on mathematical problems occurring in the heavy traffic approximation via the diffusion approximation and benefited greatly from discussions with Dr. Ward Whitt.

IV. Research progress: We have concentrated on proving the diffusion approximation for queueing networks via the Trotter-Kato Theorem. This involves delicate calculations involving the domains of certain operators some of which have been successful and some not. We are now trying to solve the martingale problem instead of characterizing the domain and hope to use the Stroock-Varadhan approach in order to prove the corresponding limit theorem. In (3) for example, we solve the martingale problem for a class of Markov processes whose infinitesimal generators are integro-differential^{1/}or operators. Extensions of these results to more complicated queueing systems are currently in progress.

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