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THE APPLICATION OF DIFFUSION APPROXIMATIONS TO THE STUDY OF TIM--ETC(U)
1976 J P LEHOCZKY AF-AFOSR-2642-74
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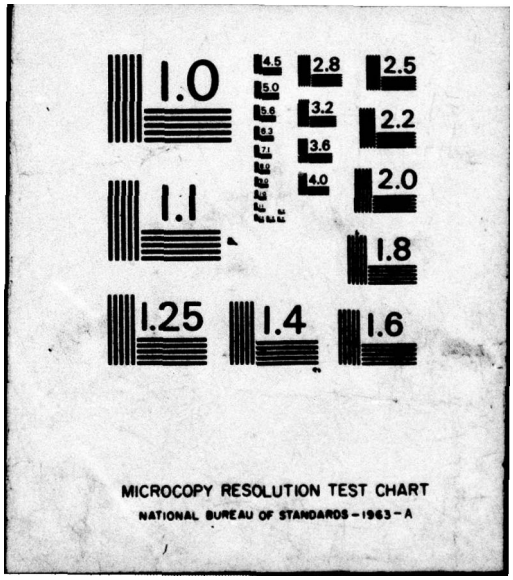
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

1. A new method for studying time sharing computers was developed. The method allows for performance evaluation and an assessment of different scheduling algorithms. Two reports are in preparation.

2. Progress was made in studying complex maintenance-repair systems. The models developed allow for aircraft to be serviced by a number of different specialized repair crews. One report was completed. (cont)

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20 Abstract

3. A new approach to linear and nonlinear compartment models was developed using diffusion approximations. These models can be used to study Air Force problems including personnel models and queueing networks. One report was completed, one is in preparation.

4. A model of communication systems with message interruption was developed and analyzed. The model applies to communication systems where messages may transmit on the same channel and thus collide, in satellite systems for example. One report is in preparation.

5. One report is in preparation which discusses the numerical solution of the steady state equations of large Markov systems. These numerical methods are used extensively in studying the behavior of many of the models mentioned in 1-4.

AFOSR - TR - 76 - 1407

The Application of Diffusion Approximations to the Study of Time-Sharing Computer Systems and Transitory Queueing Systems

Progress Report AFOSR 74-2642B

Jan. 1, 1976 - Dec. 1, 1976

This report outlines progress in substantial progress was made in the research supported by Grant AFOSR 74-2642B both in developing diffusion approximations as a general tool for studying stochastic systems and in analyzing a number of complex systems of particular Air Force interest.

Important progress was made in the analysis of time sharing computer models. A new technique has been developed which allows for performance evaluation of systems as a function of the scheduling algorithm used. The method also allows for service distributions to be of phase type rather than just exponential. This research will lead to optimal scheduling algorithms and will allow for finding the system configuration which meets a required grade of service. Two reports on this method are in preparation.

The new approximation method has been applied to complex repair-maintenance system models. Progress has been made in dealing with systems where a ground facility supports a number of aircraft. Each aircraft may require several different types of repair from specialized repair crews. One can use the approximation techniques to assess the performance of a system and to find an optimal scheduling of jobs. One report was written.

"A diffusion approximation for a repairman problem with two types of repair" (with D.P. Gaver), to appear Management Science.

Further progress was made in the study of communication queueing models. An analysis of a communication queueing system where messages can collide on a given channel and force retransmission of both was completed. A technical report presenting this analysis is in preparation.

A study of general compartment models was undertaken. A diffusion approximation analysis was given for the general linear model. Progress has been made in generalizing this analysis to non-linear model. Compartment models can be applied to a number of problems of Air Force interest including personnel flow models and queueing networks. One report was written and one is in preparation.

"A diffusion approximation analysis of a general n-compartment system" (with D.P. Gaver), Technical Report No. 110, Carnegie-Mellon University.

Finally, progress was made in the numerical solution of the steady state equations for Markov chains with large state spaces. Methods using Gauss-Seidel iteration were studied. Of particular interest is methods of finding good starting values based on an approximate analysis of the system. One technical report is in preparation.