REPORT DOCUMENTATION PAGE

AFRL-SR-BL-TR-98-

0698

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	10/19/98	Final Technical Report; 6/15/95-8/31/98

4. TITLE AND SUBTITLE
Stochastic Control and Nonlinear Estimation

5. FUNDING NUMBERS
F49620-95-1-0439

6. AUTHOR(S)
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8. PERFORMING ORGANIZATION REPORT NUMBER
4

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
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10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

Four students were supported on the AASERT, and their work covered many important areas of control theory (see attached).

Two projects formulated and proved the convergence of reasonable adaptive algorithms for communication systems with many competing users. Other projects developed efficient coding methdso via dynamic programming methods, and efficient numerical methdso for optical stochastic control.

19981113 065

14. SUBJECT TERMS
AASERT, control theory

15. NUMBER OF PAGES
1

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

AFOSR/AASERT – Final Technical Report
Kushner/Fleming
F49620-95-1-0439

Robert Buche worked on adaptive problems in communications networks. In one Model, there are several alternative services (say guaranteed service and best effort services (say guaranteed service and best effort service). The arriving user must choose, based on the available data and his immediate self interest in minimizing time in the system or some other cost). It is shown that natural and flexible user strategies converge to the desired Nash equilibrium for the entire system, guaranteeing the best allocation in the long run.

John Curren worked on problems in which there are many competing users of a resource system. There is learning in the system, and each user adapts his selection of which resource to use on the basis of past experiences. Interaction occurs because the cost for the use of a given resource depends on the loading of the collection of resources by all users. Key mathematical issues involve characterization of simpler limit models obtained in the limit as the number of users tend to infinity, and key practical issues include the identification and stability analysis of equilibrium loading patterns.

Kevin Kochanek developed efficient decoding methods. The work concerns linear parametrization of communication codes, and efficient algorithms for maximum likelihood decoding via dynamic programming.

Adam Szpiro worked on numerical methods for tracking problems. He is developing higher order Markov chain approximations, and these apply as well to risk sensitive and robust nonlinear stochastic control.