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Dr. Arje Nachman

22b. TELEPHONE (Include Area Code)
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RESEARCH PROGRESS AND FORECAST REPORT
GRANT AFSOR-88-0175

Period: 1 May 1988 - 29 July 1988

Principal Investigators:
Moshe Goldberg and Marvin Marcus

Center for Computational Sciences and Engineering
University of California
Santa Barbara, CA 93106

REPORT OF MOSHE GOLDBERG

During the period May 1- July 29, 1988, progress was made under Grant AFOSR-88-0175 in the following two areas:

1) E. Tadmor and Goldberg managed to unify the two main stability criteria in a previous paper, "Convenient stability criteria for difference approximations of hyperbolic initial-boundary value problems. II "(*Math. Comp.,* 1987 , 361-377). This is the content of a forthcoming paper, "Simple stability criteria for difference approximations of hyperbolic initial-boundary value problems", which is expected to appear in the Proceedings of the Second International Conference on Hyperbolic Problems.

2) Richard Arens of UCLA and M. Goldberg have made significant progress in characterizing multiplicativity factors and other multiplicativity properties of seminorms on operator algebras. This is done mainly by studying the kernels of the seminorms. It is anticipated that a preliminary manuscript will be ready by the end of the summer, 1988.

REPORT OF MARVIN MARCUS

In this reporting period M. Marcus completed a 23 page paper, "Symmetry properties of higher numerical ranges" (with M. Sandy). This paper is due to appear in the forthcoming issue of Linear Algebra and Its Applications. Some of the results of this work were presented by Marcus at the third SIAM Conference on Applied Linear Algebra, Madison WI, May 23-26, 1988. Related work is currently under way to determine a complete set of invariants for unitary similarity in terms of the numerical range. e.g., for n = 3 it is conjectured that: tr(A) = tr(B), W(A) = W(B), W(adj A) = W(adj B) (adj is the adjugate) iff A and B are unitarily similar. Such results are related to the classical criteria of Specht and Pearcy. M. Marcus also completed and submitted the paper, "Bessel's Inequality in Tensor Space" (Linear and Multilinear Algebra, to appear). This paper contains a significant advance on the so called "dominance conjecture" for Schur functions defined on the cone of positive semi-definite hermitian matrices. The relationships among the recent results of Bapat and Sunder, Chollet, and Gregorac and Henzel are also discussed.