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STATISTICAL TECHNIQUES FOR SIGNAL PROCESSING(U)  
PENNSYLVANIA UNIV PHILADELPHIA S A KASSAM 30 MAY 85  
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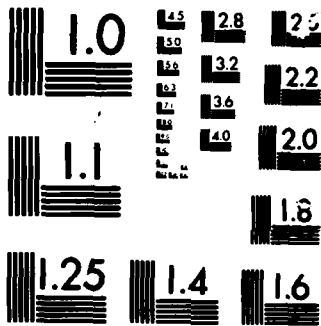
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**AFOSR-TR. 86-0172**

**STATISTICAL TECHNIQUES FOR SIGNAL PROCESSING**

**Research Progress and Forecast Report**

**AFOSR Grant AFOSR 82-0022**

**Principal Investigator: S.A. Kassam**

**Grant Year: November 1, 1984 - October 31, 1985**

**Report Date: May 28, 1985**

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This report summarizes the progress we have made since November 1, 1984 under AFOSR Grant 82-0022 for continuing research on "Statistical Techniques for Signal Processing". It also summarizes our objectives and anticipated results for the second year of the above grant.

The progress made so far can be inferred from the list of publications and of items in preparation for publication since November 1, 1984, [1]-[10] on page 3. The invited paper [1] is a comprehensive survey of robust signal processing schemes. In [2] a new coding scheme for binary images has been described. In the main area of our research, that of nonlinear smoothers and filters based on generalizations of medians and other robust estimators, references [3]-[6] contain our recent results and interpretations. References [7] and [8] are on the subject of optimum quantization of data and coefficients in estimation and detection problems. Finally, [9] and [10] contain recent results on nonparametric and robust detection and filtering. Those of the listed papers which have not yet been sent to AFOSR will be mailed in a package within the next three months.

In the second year of the current grant we will continue to focus on the important area of nonlinear filters and smoothers based on robust estimators. We plan to study in particular the class of moving-window (non-recursive) filters which utilize in a general way both temporally-ordered and rank-ordered data weighted by appropriately designed weighting matrices. In addition, we will continue our statistical characterizations of the edge-preservation and noise-rejection properties of such filters, and consider also recursive versions. The primary application area to which we will attempt to apply promising results will be that of image

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MATTHEW J. KAUFMAN

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restoration and also that of constant-false-alarm-rate radar processing.

As a secondary activity we expect to be able to continue our research on new methods for nonparametric detection and robust signal processing.

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### LIST OF PUBLICATIONS

1. S.A. Kassam and H.V. Poor, "Robust Techniques for Signal Processing: A Survey", Proc. IEEE (Invited Paper), Vol. 73, pp. 433-481, March 1985.
2. I.H. Song and S.A. Kassam, "A Method for Binary Image Data Compression and Coordinate Representation", Proc. 1985 Conf. Information Sciences and Systems, (Johns Hopkins), pp. - , March 1985. (Being prepared for submission to IEEE Trans. Pattern Analysis and Machine Intelligence).
3. S.R. Peterson and S.A. Kassam, "Edge Preserving Signal Enhancement Using Generalizations of Order Statistic Filtering", Proc. 1985 IEEE Conf. Acoustics, Speech and Signal Processing, pp. - , April 1985.
4. S.A. Kassam, "A Class of Nonlinear Filters for Edge-Preserving Smoothing", 1985 IEEE International Symposium on Information Theory Abstracts, p. , June 1985.
5. Y.H. Lee and S.A. Kassam, "Generalized Median Filtering and Related Nonlinear Filtering Techniques", IEEE Trans. Acoustics, Speech and Signal Processing, Vol. ASSP-33, pp. - , June 1985.
6. S.R. Peterson, Y.H. Lee and S.A. Kassam, "Spectral Performance Characterizations of Some Generalized Median Filters", IEEE Trans. Communications, (submitted for Publication).
7. C.T. Chen and S.A. Kassam, "Generalized Quantization of Coefficients for FIR Wiener and Matched Filters", IEEE Trans. Communications (Being revised for Publication).
8. S.A. Kassam, "Optimum Data Quantization in Signal Detection". Chapter in Advances in Communications and Networks (Blake and Poor, Eds) Springer-Verlag, 1985 (In Press).
9. S.A. Kassam, "Hard-Limiting and Nonparametric Detection of Narrowband Signals", IEEE Trans. Information Theory (Submitted for Publication).
10. S.A. Kassam, "Bounded p-Point Classes of Densities in Robust Hypothesis Testing and Filtering", IEEE Trans. Information Theory (Submitted for Publication).

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