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NPIC/D-98/70

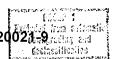
APR 1970

	MEMORANDUM FOR: Assistant Deputy Director for Intelligence
25X1	SUBJECT: Proposal for Testing of Digital Signal-to-Noise Optimization Techniques at a Cost of
	1. This memorandum requests approval for the commitment of funds for a contract. The specific request is stated in Paragraph 9.
	2. The size and distribution of the silver particles that comprise a photographic image limit the fine detail that can be recorded on any photographic emulsion. Images examined under high magnification have a granular structure which gives rise to the term "graininess." When the examination is performed by an instrument which scans in a raster mode, like a TV, the grains cause random fluctuations in the output trace or image which are not related to the object originally recorded; i.e., they produce an error signal. The more grain, the greater the random signal fluctuations and the greater the loss in fine detail. The situation is analogous to the white noise or specks seen on a TV receiver with a poor antenna. Such a scanning operation is employed in microdensitometry and in digital image manipulation in order to transfer the image on the film into a useable input to the computer. In both cases the transfer must occur with minimum error; in one situation, the structure of the image is being investigated, while in the other, the input image is already degraded and an improved representation is being sought.
25X1 25X1	2. Currently, we attempt to minimize errors due to grain noise by a mathematical averaging of the data in the computer after scanning. Although some improvement is achieved, it is not adequate for NPIC operational applications. Better techniques are necessary and information theory says they are possible. Historically, new methods for noise reduction have required more data points (over-sampling) to achieve limited success, thereby increasing processing time and computer storage requirements. What is needed is a technique that will simultaneously reduce the effects of noise, decrease the number of data points required, and improve the system accuracy. Addressing this problem, the

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Approved For Release 2004/02/11 : CIA-RDP78B05703A008200020021-9 Proposal for Testing of Digital Signal-to-Noise Optimization 25X1 Techniques at a Cost of 25X1 data, only 25 data points were necessary, and the accuracy of the trace improved. Similar application of the Criterion to NPTC microdensitometer traces would improve the quantification of the parameters used 25X1 in photo-optical image evaluation -- the only advance of this magnitude developed in the last five years. 4. The project proposed is concerned with improving the accuracy of information extracted from photographic images during the scanning and digitizing operations employed in microdensitometry and digital image manipulation (DIM). Extending the ____ Criterion concept to the ___ 25X1 software would visibly improve the quality of the image manipulated and, at the same time, reduce by 50 to 60 percent the computer core storage required, with a corresponding reduction in computer processing time. An improvement in computer processing efficiency is especially important. One square inch of operational NPIC imagery digitized to only two gray levels contains enough data points to fill the core storage of over sixteen Univac 494 (32K core) computers. 5. This project is designed to be executed in four phases over four months. Preliminary experiments would apply the _____ Criterion to 25X1 one-dimensional data, such as edge traces of "CORN" resolution targets. Success in this application would lead to extension of the algorithm to the two-dimensional case suitable for use with the _____ DIM software. 25X1 Because the first DIM experiments on operational material will be conducted in NPIC during this period, operational tests of the ____ Criterion 25X1 would be integrated with that effort. Computer time required to compile and test the algorithm would be provided by Software will be written 25X1 in Fortran IV suitable for use on the Scripps 360-44 computer. 25X1 25X1 train NPIC personnel in the detailed use of the algorithm. The Criterion would also be tested with DTM programs previously written by and preliminary, unclassified tests would be conducted to evaluate 25X1 their potential to NPIC applications. will deliver a comprehensive 25X1 technical final report detailing both practical aspects and the theoretical basis of the ____Criterion. In addition, a one-day tutorial session by ____will be given early in the project to impart essential expertise to NPIC personnel. 6. The theoretical foundation of the _____ Criterion is sound, and 25X1 the initial results are positive. The value of extending the technique to NPIC imagery cannot be estimated quantitatively, though the potential is very high. In addition, it can be applied to other community digital enhancement efforts as well as to color imagery, to electronic signals from MTF analyzers currently under development, and to the generation and fabrication of more accurate filters for optical image manipulation systems. The potential improvement is considered to be worth the low risk involved.

2

	Approved For Release 2004/02/11 : CIA-RDP78B05703A00 02 00020021-9	•
25X1	SUBJECT: Proposal for Testing of Digital Signal-to-Noise Optimization Techniques at a Cost of	25X1
25X1	The unsolicited proposal fromoffers a unique opportunity to improve the product of a variety of key projects.	
25 ×1	7. The Criterion is an proprietary technique. Accordingly, no other proposals were considered. The funds required were programmed as part of the FY-70 R&D budget. The project has been closely coordinated to insure that it will not conflict with the DTM project or the routine use of the APSD microdensitometer. Informal contacts with AFSPPF, Westover AFB, ORD/DDS&T, TSD/SSP, NRTSC, and Wright-Patterson AFB have resulted in requests to be kept informed of the work since it applies to projects in their respective areas. The project has been designed to permit application to microdensitometry, color imagery, electronic signals, etc., by anyone knowledgeable in the field. A follow-on may prove desirable, but it would not necessarily be with the same contractor.	25X1
25X1	8. The sterility code is appropriate; the Project Officer will assign security classifications to the individual reports.	
25X1	9. It is requested that the negotiation with the for a contract to conduct the program described at a cost not to exceed be approved.	25X1
	ARTHUR C. LUNDAHL Director	25X1
	. National Photographic Interpretation Center	and the control of th
	Attachments: 1. Proposal 2. Form 2420	
	APPROVED: Assistant Deputy Director for Intelligence Date	

Original - NPIC/TSSG/SC&PS (After approval)

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