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NPIC/TSSG/RED/ATB-127/70

29 June 1970

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MEMORANDUM FOR: [redacted] DD/S&T/Field Office

THROUGH : Executive Director, NPIC  
Chief, Advanced Technology Branch, RED/TSSG  
Chief, Research & Engineering Division, TSSG  
Chief, Technical Services & Support Group, NPIC

SUBJECT : Special Digital Image Manipulation Project

1. Under a contract which has been co-funded by the Advanced Research Projects Agency and the Central Intelligence Agency, the

[redacted]

[redacted] has developed a research facility for investigating Digital Image Manipulation (DIM) techniques. In support of a special project for [redacted] DD/S&T/Field Office, this research facility was used to demonstrate the feasibility of applying Digital Image Manipulation techniques to a certain class of operational problems. This memorandum discusses this exercise which was performed during the period 8-14 April 1970. Details of the experiments are reported as attachments.

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2. The data for this study originated from two entirely different low resolution, terrestrial collection systems. In one case (attachment #1) the data was collected through an optical system and recorded directly onto film, whereas in the other case (attachment #2) a T.V. system was used to record the data on video tape. The data supplied to NPIC for input to the DIM system, was second generation and was entirely on photographic films. In the first case the original negative (tri-x pan) was contact printed as a direct positive (4427) and in the second case, the T.V. data was imaged on a cathode ray tube and photographed (film unknown). No further information was supplied.

3. The results of the study indicate that for these collection systems, DIM may offer some assistance with mensuration and photointerpretation problems. With each image studied, edges were better defined and the overall noise level was reduced. In practice, the better definition would make it easier to determine the dimensions of the objects of interest, and in the presence of less noise, provide additional insight concerning their shape.

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4. There were significant limitations encountered in this exercise, i.e., insufficient data concerning the input, research oriented hardware and software, and an image severely degraded by photographic grain structure. As a consequence, the results reported here represent the state of the technology as applied only under poor conditions and do not represent what would be obtained with an operational system designed to satisfy operational needs. For this problem, the application of image manipulation techniques was analogous to a mathematical exercise, where one is given an approximate solution (the image), and then required to formulate the problem (diagnose the problems in the image) and calculate a new answer (manipulate the image). With calibrated input data, better results could have been obtained.

5. DIM cannot effectively function as an isolated interpretation technique, but must be treated as an integral part of the overall collection system. Therefore, the routine application of DIM techniques to any operational problem will necessitate the re-examination and calibration of the collection system and the development of modified DIM techniques and equipment. For these particular problems, this may require the modification of the collection system, the use of new recording materials and processing, and the expansion of the DIM system to analyze video as well as photographic data.

6. Despite the problems and the limitations encountered, this project has demonstrated the feasibility of applying DIM techniques to an operational problem, has permitted the translation of theoretical considerations into practical terms, and has helped identify problem areas. These results have impact on the DIM program in that they are generically related to NPIC problems, and provide significant perspective with respect to the current state of applied technology.

  
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