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MONTHLY LETTER REPORT
ON
IMAGE ANALYSIS III (U)

1 June 1968 to 30 June 1968

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IMAGE ANALYSIS III

REPORTING PERIOD 1 JUNE 1968 TO 30 JUNE 1968

I. COHERENCE

The experimental work on coherence effects has been completed, and the results are undergoing final analysis. These results are currently being applied to the problems of spatial filtering in microscopes and in scanning instruments. A summary is being prepared to pinpoint in what instruments and under what conditions coherence effects must be considered, and the possible extent of such effects.

II. SHADED APERTURE INVESTIGATION

Studies to determine the feasibility of using color filters in microscopes to enhance the viewing of high frequency detail are underway. Both the zoom 70 and High-Power Stereoviewer microscopes are being considered.

The zoom 70 is an incoherent instrument, and the filter in this case will be placed over the front element of the objective. The filter under design consists of a central circle of one color and an outer annulus of the complementary color. For these two colors, an incoherent transfer function can be found from the convolution of the aperture corresponding to each separate color. It should be possible to design the filter so that the low frequency information is imaged as a mixture of the two colors and the high frequency information is imaged in the color of the outer annulus. The filters are currently being fabricated on color reversal film.

A filter of similar configuration is being fabricated for use in the High-Power Stereoviewer. In this instrument, the filter can either go in the condenser aperture or in the back focal plane of the objective. The approach currently being tried is to have the filter in the condenser, as this is more accessible and allows the use of larger format filters. The illumination in this instrument is partially coherent and the effect of the filter cannot be calculated rigorously. If the filter is constructed so that the illumination through the central circle just fills the objective, then the low frequency information will image in the color of the central circle and the high frequency information will image in the color of the outer annulus. An achromatic condenser, which is interchangeable with the condenser in the Stereoviewer, has been obtained for use in these experiments.

Studies are underway on the feasibility of using scanning systems, such as the IQ or IDT, as coherent filtering instruments. The primary problem under consideration is to determine how to obtain a sufficiently large format in the filter plane to enable filters to be of a size convenient to fabricate and align. Since the size of the spectrum in the transform plane is proportional to the highest spatial frequency in the object, the IDT, which operates on high frequency objects, appears more suitable for this application than the IQ. It may, however, be possible to sufficiently increase the scale of the transform in the IQ by using a longer focal length objective and illuminating the sample with a diverging wave.

III. IQ AND IDT EXPERIMENTATION

[redacted] has been requested to provide us with their photography containing known object sizes. Using the IDT (with and without shaded apertures) and the Image Quantizer-Projection Printer system (using the quantizing and differentiating modes along with and without shaded apertures) the objects will be measured. The "best" operational modes relating measured object sizes to real life dimensions will be sought. 25X1

The Image Quantizer and Projection Printer were delivered as scheduled. Although basically in good working condition, the following modifications and repairs are currently being made on these instruments.

PROJECTION PRINTER

1. The sample table tends to bind at one position of its x-y motion. This condition will be corrected.
2. Installation of an air-actuated shutter to eliminate image vibration during photographic exposure.

IMAGE QUANTIZER

1. Fit housing securely so as not to bind rotating drum
2. Manufacture six scanning aperture frames for insertion into the optical axis
3. Reduce minimum contour-interval in the quantizing mode to 0.01 density units or below. The Quantizer presently goes down to 0.012 density units
4. Replace thermal relay.

IV. SUBCONTRACT WITH [redacted] 25X1

The work statement from [redacted] was received on July 3, 1968, 25X1
and work has commenced on that phase of the program.