October 1969

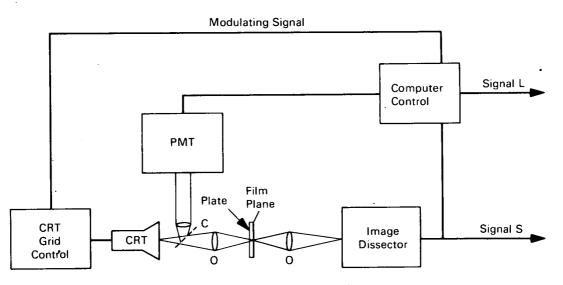
Brief 69-10568

# NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

# **Electrooptical Scanning of Film**



An Implemental Configuration of the Scan-In/Scan-Out System

### The problem:

To devise a method of obtaining a tolerable signalto-noise ratio from the camera of a flying-spot scanning system when there is a wide range of transmissivities within a given frame of film. In areas of low transmissivity more light is required in order to effect a camera-tube output of sufficiently high signal-tonoise ratio. Illumination of the whole frame with a light of higher intensity could cause a "flare" effect, especially from the areas of high transmissivity.

#### The solution:

A novel concept of operation of a scan-in/scanout flying-spot scanning system that recognizes three different levels of transmissivity within a frame; selectively it acts on these levels either to intensify the illumination or to extend the duration of the illuminating spot at any picture element. Thus it improves the ratio of signal to tube noise in the camera's output.

#### How it's done:

The increase in illumination at a picture element, necessary to raise the camera-tube output signal to a usable level, is effected by means of a closed-loop modulated-illumination system that senses the level of the tube's output signal. If the level is low, the system increases the intensity of spot illumination; if it is very low, the spot is caused to dwell on the picture element sufficiently long for the output to be integrated to a usable level. Confinement of the illumination to a spot decreases the system aperture and so greatly reduces the flare effect.

By separation of required illumination and by definition of the system apertures the technique provides for production and control of extreme brightness of

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States

Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights.

light, but renders inconsequential phosphor decay, halo, astigmatism, scanning-spot size, etc. With use of a controlled brightness of light, a high signal-to-noise ratio can be achieved for each scanned element of the image.

The illuminator (scan-in component) is not limited to any particular source of light; sources may include cathode-ray tubes, incandescent lamps, arc lamps, and lasers. For scanning of an extended dynamic range, the scan-out component may be a nonstorage type of camera tube such as a scanned photomultiplier tube or an image-dissector tube. Storage types of camera tubes, such as vidicons, image orthicons, isocons, or emitrons, may be used within their respective dynamicrange capabilities.

# Notes:

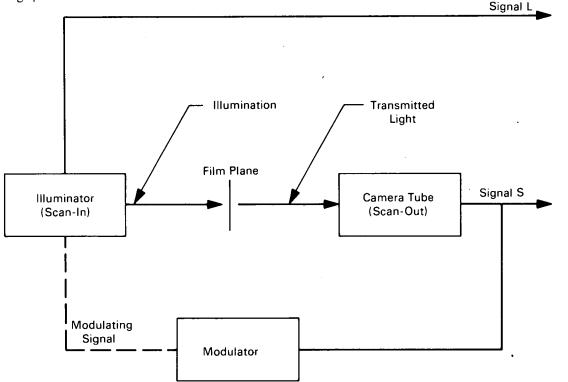
1. This invention may interest those concerned with storage, or correction by computer, of photographic images.

## Documentation is available from: Clearinghouse for Federal Scientific and Technical Information Springfield, Virginia 22151 Price \$3.00 Reference: TSP69-10568

#### Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

> Source: F.C. Billingsley and J. J. Volkoff of Caltech/JPL under-contract to NASA Pasadena Office (NPO-11106)



#### Block Diagram of One Scan-In/Scan-Out Technique