Abstracts of Papers From Other Journals

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The subject areas are grouped below:
Cinematography
Laboratory Practice
Photographic Theory and Materials
Sound
Television

CINEMATOGRAPHY

The use of the K24m-5 frame-by-frame motor for time-lapse cinematography (in Russian), Yu. P. Pokhitonov, *Tekh. Kino i Televideniya, 19:* 68-9, July 1975.

The conversion of certain Soviet motion-picture cameras for time-lapse cinematography by providing them with the K24m-5 electric motor is discussed. — S.C.G.

The standardization of picture instability in cinematography (in German), K.-O. Frieling-haus and Nguyen-An-Vinh, *Wiss. Z. Hochsch. Ilmenau, 20:* 159-66, No. 45, 1974.

A survey is presented of the requirements specified in standards on the relative permissible values of instability of motion-picture images. On projection, image instability on the screen is the result of errors in the camera and projector and also of the errors in position of the perforations of the negative and positive film stocks. — S.C.G. (Translated from *Ref. Zh. Fotokinotekhnika.*)

LABORATORY PRACTICE

Apparatus for the continuous measurement of the moisture of a moving motion-picture film (in Russian), F. A. Rozental', N. A. Vinogradova, A. F. Skripilin, Yu. P. Darakhvelidze and M. V. Pavlovich *Tekh. Kino i Televideniya, 19:* 31-34, July 1975.

A description is given of an instrument by which the moisture content of a processed film is continuously measured while the film is in motion as it passes into the drying unit. The capacity of the film is measured with an electrode not in contact with the film, together with an electronic circuit, the signal from which controls the parameters of the drying unit. — S.C.G.

The influence of the size of the nuclei of AgI crystals on the dispersity of AgBr crystals in the ammoniacal method of photographic emulsion making (in Russian) V. G. Loginov, Yu. D. Sidorov, and P. V. Meĭklyar, *Zh. Nauch. Prikl. Fotogr. Kinematogr., 20:* 293-295, No. 4, 1975.

Experiments have been carried out on the precipitation of silver-bromide emulsions onto silver-iodide nuclei, the sizes and numbers of the nuclei being varied, while the total quantity of AgI was kept constant. From electron micrographs of the emulsions, it was found that the mean projected area of the grains was related linearly to the average diameter of the nuclei. The number of emulsion grains varied as the square root of the number of nuclei. The part played by re-solution and the formation of supplementary AgBr nuclei is discussed. — S.C.G.

The copying of motion-picture films obtained with high-speed cameras (in Russian) *Trudy Leningr. Inst. Tochnoĭ Mekh. Opt.*, 44-50, No. 78, 1974.

A printer is described for the optical and contact copying of films from high-speed cameras. It will deal with both 16mm and 35mm films. — S.C.G. (Translated from *Ref. Zh., Fotokinotekhnika.*)

Monitoring system for high-speed duplication of sound tapes, P. M. Johnson and L. Richardson, *BBC Eng. 100:* 57-63, June 1975.

The BBC External Broadcasting Dept. supplies some 1200 tape recorded programs each week to relay bases and other users. These recordings are made on high-speed duplicating tape machines and the article describes the monitoring system which has been developed for the checking of the quality of the copy tapes.

Automatic exposure control for duplicate film processing, Ruth Lyon and Robert Wakeman, *Photogramm. Eng. and Remote Sensing, 41:* 1385 1390, Nov. 1975.

Present procedures used in determining exposure levels for obtaining quality duplicate imagery involve empirical evaluations of the original negative and various duplicate prints. An improved technique which offers automatic determination of this optimum exposure level should provide significant savings in materials, equipment, time and personnel. Fairchild Camera and Instrument Corp. has developed an Automatic Exposure Control System for airborne cameras in which the optimum exposure is determined not by the average scene brightness alone, but by this mean value modified by the variance of the brightness of a large number of small samples. This technique has proven highly successful in discriminating against clouds in field tests. When the same technique was applied to the determination of optimum exposure for use with the duplicate film process, it again proved quite successful. An analysis of those cases where less than optimum results were realized led to the concept that, through the use of the asymmetrical characteristics of scene brightness, the percentage of satisfactory duplicates could be still further increased. Using frequency distributions of sample readings versus diffuse density values, an algorithm was developed involving the mean, variance, and asymmetry statistics of the density distribution. The use of the proposed algorithm has significantly improved the determination of the optimum exposure point.

Digital Image Processing, Ralph Bernstein, Dallam G. Ferneyhough, Jr. *Photogramm. Eng. and Remote Sensing, 41:* 1465-1476, Dec. 1973.

The use of digital sensors in earth resources applications appears to be well-established. The signals sent to the ground from the LANDSAT (previously known as the Earth Resources Technology Satellite, ERTS) Multispectral Scanner (MSS) are digitized prior to transmission. For future earth-observation programs, both the sensor outputs and the ground processing will be digital. If such sensors are to serve a useful role in the surveying and management of the earth's resources, efficient methods for correcting and extracting information from the sensor outputs must be developed. The Federal Systems Division of IBM has developed an image processing facility to experimentally process, view and record digital image data. This facility has been used to support LANDSAT digital image processing investigations and advanced image processing research and development. A brief description of the facility is presented, some techniques that have been developed to correct the image data are discussed, and some results obtained by users of the facility are described.

Sensitivity improvement by step-biasing in holographic interferometry, Mauro H. Zambuto, *Opt. Eng. 14:* 372-374, July-Aug. 1975.

A technique of holographic interferometry yielding a one-order-of-magnitude increase in sensitivity over conventional techniques is described. The method, based on the superposition of a calibrated quarter-wavestep motion on the motion to be detected, is designated as step-biasing. The sensitivity improvements are due to a reversal of the brightness distribution, so that vibrating points appear lighter, nodal points darker. A theoretical discussion of the technique, as applied to the detection of vibration by time-average holographic interferometry, is offered and experimental verification with a 30 Å peak amplitude of vibration is presented, together with comparison with conventional techniques. The method was originally devised for application to real-time holographic interferometry. This is done easily, yielding the same sensitivity improvement.

Rapid processes of photographic image production by diffusion transfer method, Yu. I. Zhurba and V. A. Cherkasov, *Tekh. Kino i Televideniya, 19:* 29-33, Dec. 1975.

This paper provides a review of research and development in the field of rapid processes for photographic image production by diffusion transfer method.

Diffusion in motion picture film emulsion, F. S. Bolotnikov, *Tekh. Kino i Televideniya, 19:* 26-29, Dec. 1975.

Equations for calculating the changing in time of diffusing component concentrations field in motion-picture film emulsion layer and also average concentrations across the layer thickness have been proposed. The results of testing the proposed equations with experimental data on motion-picture film washing are given.

PHOTOGRAPHIC THEORY AND MATERIALS

Principles of standardization of test image films (in Russian), E. L. Nel'skiĭ and S. D. Karipidi. *Tekh. Kino i Televideniya, 19:* 63-67, July 1975.

Existing standard specifications for test image films for controlling the conditions of film projection are discussed, and a classification of the different types of test film is proposed. — S.C.G.

A new set of black-and-white negative motion-picture films (in Russian) L. I. Arkhipov, V. A. Bekunov, L. M. Bogdanov, S. A. Bongard, M. K. Grechko, V. I. Korres, E. A. Rokhlina and Z. Ya. Shevchenko, *Tekh. Kino i Televideniya, 19:* 10-13, July 1975.

A set of black-and-white negative film stocks has been designed in the Soviet Union to replace the black-and-white films now in use. Its characteristics are compared with those of the old set. — S.C.G.

Reciprocity failure in Kodak HIE film exposed to ruby-laser pulses, Rory O. Rice and James D. Macomber, *Jour. Opt. Soc. Am. 65:* 1489-1494, Dec. 1975.

Kodak High-Speed Infrared Film Type 2481 HIE 421 was found to be less sensitive to photons in ruby-laser pulses (of duration 19-75 ns) than to photons from a conventional red light source. The ratio of the sensitivities varied smoothly with the optical density of the developed frame, ranging from about $\frac{1}{3}$ at a density of 0.2 to about $\frac{1}{30}$ at an optical density of 2.2. The data indicate that the photochemical law of reciprocity is not obeyed by this film over this range of exposure times.

Effect of nonuniform irradiance and irradiance fluctuations upon the response of photographic film, C. T. Chang and J. L. Bjorkstam, *Jour. Opt. Soc. Am., 65:* 1495-1501, Dec. 1975.

A theoretical and experimental study of the exposure of photographic film demonstrates differences that depend upon spatial and temporal properties of the exposing light. These differences of developed film density are due to irradiance fluctuations and the threshold nature of the photographic detection process. The model used provides a means of explaining discrepancies found in related experiments of other investigators.

Some possibilities in the use of new audio-visual techniques for the long-term storage of color motion-picture images (in Russian), A. Marin, *Tekh. Kino i Televideniya,* 19: 21-23, June 1975.

Since the color photographic image is not sufficiently stable for the archive storage of motion-picture films, the possibilities of using other forms of storage are discussed, such as videotape, videodisc, and holographs. — S.C.G.

Some features of the technology of film production by the universal-format frame method (in Russian), N. D. Bernshteĭn, M. Z. Vŷsotskii, and B. N. Konoplev, *Tekh. Kino i Televideniya, 19:* 8-15, June 1975.

The authors previously suggested a method of motion-picture production in which the film is shot initially on 35mm film with a single frame size, irrespective of the format of the release films made from it. The system has been put into operation in several Soviet film studios, and the accumulated experience with the method is discussed. The survey covers the modifications required by the equipment, and the stages in production from shooting, through rush printing, editing, etc. to the printing of release prints in the 70mm, 35mm wide-screen, 35mm ordinary, and double-16 formats. — S.C.G.

SOUND

Noise-cheating image enhancement, Hans J. Zweig, Eamon B. Barrett and Patrick C. Hu, *Jour. Opt. Soc. Am., 65:* 1347-1353, Nov. 1975.

A new technique for noise suppression has been designed and tested that allows detection of small and extremely low-contrast images. The procedure entails a double scan. A first scan is made with an aperture that provides about ten quantized levels (±2 sigma apart). Isolated spots are removed and the scene is rescanned with an aperture half the original diameter. Another quantization is performed, with the original quantization intervals, but only for points in the vicinity of object boundaries. The density values that can be assigned for these points are further restricted to those that occur in a surrounding region of that point, as determined by the primary scan.

Perception and method for measurement of nonlinear distortion in audio transmission systems, Seiya Nikaido, Mitsuru Ichikawa and Hideo Nakamura, *NHK Technical Jour., 27:* 43-76, 1975.

This paper proposes a method for measurement of nonlinear distortion using a wideband signal and pairs of band-elimination and band-pass filters, which is named the "dynamic" method of measuring distortion. Using this method, distortion produced in the actual performance of a device or a system is obtained and distortion components appearing in various frequency bands are extracted separately. Distortion values obtained by this method agree well with the subjective sound quality as compared with those obtained by the conventional method. Several new approaches to perception of distortion have become possible through using this measurement equipment. The just perceptible level of distortion for typical program sounds was experimentally obtained as a function of the frequency of distortion components, and high frequency distortion was found to be much more noticeable. Comparison of the just perceptible levels of nonlinear distortion and noise-like components showed that the latter was lower by about 10 dB in a low or middle frequency range, and that both of them were almost the same in high frequency bands. For practical application of this method, it is desirable to use weighted noise signal for convenience. Criteria upon which to evaluate the distortion characteristics obtained by using a standard noise signal were established and problems inherent in the use of noise signals were discussed. The method was applied to loudspeakers. High frequency distortion in loudspeakers was found to have a great influence on sound quality in spite of its relatively small value. Relation between "dynamic" distortion characteristics and "harmonic" distortion characteristics are also discussed.

Design of a digital-controlled audio level indicator, Thomas M. Hay III, *Jour. Audio Eng. Soc., 23:* 726-730, Nov. 1975.

The advantages of digital techniques used to produce a VU/peak level display system for use on audio consoles are discussed. Primary con-

siderations of design were systems reliability, readability, accuracy and tracking between displays.

The statistical regulation and control of the printing of photographic soundtracks of film prints (in Russian), E. A. Kligman. *Tekh. Kino i Televideniya, 19:* 31-35, June 1975.

The methods of statistical quality control are applied to the printing of photographic soundtracks. — S.C.G.

TELEVISION

A new method for two-dimensional picture sharpness correction in a separate luminance color television camera, Hideo Kusaka and Taiji Nishizawa, *NHK Technical Jour., 27:* No. 2, 77-89, 1975.

This paper describes the spatial frequency response correction of television pictures without any delay lines. The authors have proposed a new method to obtain a spatial lowpass filter in the optical system or the photoelectric conversion system of a television camera with no delay line processing circuits. A defocused optical system or another pickup tube which has lower beam aperture response is used. In a four-tube separate luminance color camera, however, an additional luminance signal Y′ is derived from R, G and B signals (i.e. $Y' = 0.30\,R = 0.59\,G = 0.11\,B$). This is equivalent to a signal obtained by applying two-dimensional spatial frequency lowpass filtering to a separate luminance signal Y of the camera. The corrected frequency response, signal-to-noise ratio, color errors and influence of misregistration of a television camera which applies this new method are analyzed, and the system design of the method is shown. As the result of an application of this correction method to a four-tube separate luminance color telecine camera, the corrected frequency response and signal-to-noise ratio agree with theoretical calculations. The subjective assessment of picture sharpness results in an improvement of 1.5 ranks for 35mm slide film and 1 rank for 16mm cine films, in seven grade comparison scales, and the effectiveness of this new correction method is confirmed.

Color adaptation in picture-viewing situations, R. W. G. Hunt and L. M. Winter, *Jour. Phot. Sci. 23:* 112-115, May/June 1975.

The chromaticities that appeared neutral were determined for observers adapted to viewing conditions typical for projected transparencies. Neutrality was determined by a naming technique. Adaptation to the picture area was found to be incomplete, except for color temperatures in the range 5500 to 6500 K. Neutral points were also determined for a typical television picture with various amounts of ambient tungsten light.

From camera tubes to solid-state sensors, Paul K. Weimer, *RCA Review, 36:* 385-424, Sept. 1975.

Electronic television has from its beginning depended on electron beams for picking up and reproducing the image. It now appears that self-scanned semiconductive devices will be able to carry out many of the functions of camera and storage tubes. Research at RCA has played a significant role in the development of a large family of imaging tubes and their more recent solid-state counterparts. The present paper reviews the basic problems of image scanning and compares the solutions obtained by means of tubes and semiconductors.

Semiconductor heterojunction vidicons, C. R. Wronski, *RCA Review, 36:* 425-443, Sept. 1975.

The introduction of the silicon vidicon demonstrated that a good-quality semiconductor can be used as a vidicon target. However, the fabrication of a structured target that consists of a large array of electrically isolated n-p homojunctions is difficult. The use of an appropriate insulator or granular metal (cermet) heterojunction offers the possible elimination of such a structure, but stringent constraints are imposed on such junctions by the camera-tube requirements. Various silicon heterojunctions have been investigated and their junction properties as well as vidicon characteristics studied. By extending some of this work to wider-bandgap semiconductors, the dark current, resolution, and sensitivity could be directly correlated with the semiconductor, the insulating film, and their interface.

Basic concepts of charge-coupled devices, W. F. Kosonocky and J. E. Carnes, *RCA Review, 36:* 566-593, Sept. 1975.

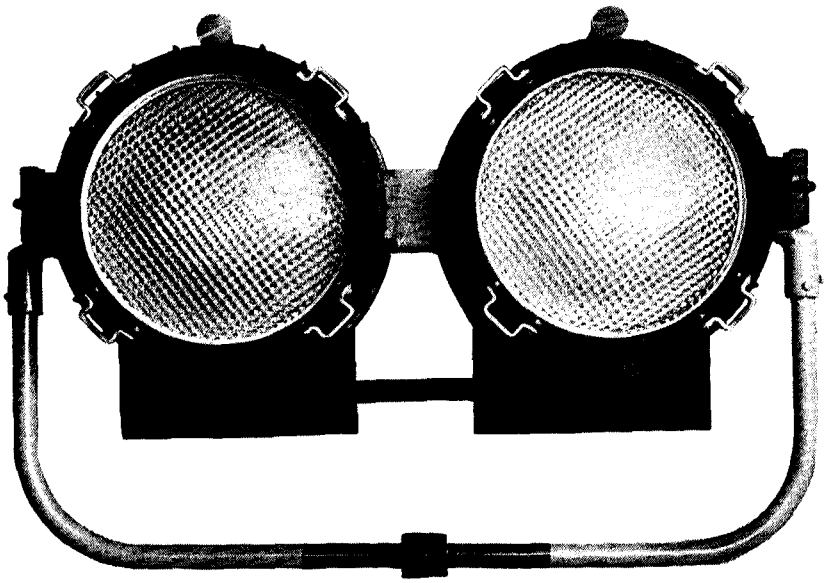
Key concepts involved in the operation and design of charge-coupled devices (CCDs) are discussed and described in simply physical terms. These include the relationship between speed and device dimensions, the key concept of complete charge transfer versus the bucket-brigade mode of transfer, a simplified discussion of buried-channel operation, and a qualitative explanation of the available techniques for the introduction of the charge signal into CCDs and output detection methods.

Liquid crystal matrix display using cholesteric-nematic phase transition, Tetsuro Ohtsuka, Masahide Tsukamoto and Mitsuharu Tsuchiya, *J. Inst. TV Engrs. of Japan, 29:* No. 6, 491-497, 1975.

A liquid crystal matrix display device using a 160 × 56 element matrix panel of nematic/cholesteric liquid crystal mixture having positive dielectric anisotropy has been developed experimentally. The matrix panel is scanned by a line-at-a-time addressing method using one-half or one-third voltage discrimination. It is found by the experiment that the crosstalk is practically suppressed by the abrupt increase in the light transmission characteristic against the ac bias voltage change, and that no flicker is observed in spite of low frame frequency because of the long relaxation time also controlled by the selection of the ac bias voltage. Contrast ratios of 15:1 to 30:1 were obtained for the alphanumeric characters displayed.

Tri-electrode vidicon for single pickup tube color TV camera, Akira Sasano, Toshio Nakano, Haruo Matsumura, Ken Tsutsui, Takeo Nishimura and Shusaku Nagahara, *J. Inst. TV Engrs. of Japan, 29:* No. 6, 485-490, 1975.

A three-color vidicon having a three-electrode target has been developed. The target consists of a three-color stripe filter, three sets of 216 striped electrodes, each aligned to red, green or blue stripes of the filter, to produce primary color video outputs separately, and a layer of photoconductive film. The striped electrodes of SnO_2 are precisely delineated by sputter-etching through a chromium mask and connected by a multilayered interconnection method. The pitch



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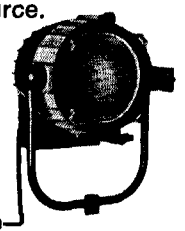

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and the width are 20 μm and 12 μm, respectively. The photoconductive film of Sb_2S_3 is deposited on the striped electrodes. This paper describes the target structure, fabrication technology and characteristics of the three-electrode vidicon.

A color camera with a tri-electrode vidicon, Yoshizumi Eto, Kazuhiro Sato, Kenji Takahasi, Shusaku Nagahara, Takeo Nishimura and Shizuka Ishibashi, *J. Inst. TV Engrs. of Japan, 29:* No. 6, 480-484, 1975.

A single-pickup-tube color TV camera using a three-electrode vidicon has been developed. The design of a three-electrode vidicon camera differs from that of a conventional single pickup tube camera in that the crosstalk among the primary color signals and the increased noise power, both due to the electrostatic capacitance between the signal electrodes, are to be taken into consideration. In order to determine the optimum design parameters, the authors analyze the above-mentioned effects and obtain the allowable limit of crosstalk by the assessment of picture quality degradation. It is shown that considerable improvements in color uniformity, dynamic range and stability over the conventional single pickup tube color camera can be achieved by using a three-electrode vidicon.

Automatic measuring and monitoring system for color television line using VIT signals, Hiroshi Naitoh and Seiichi Saitoh, *J. Inst. TV Engrs. of Japan, 29:* No. 6, 402-409, 1975.

This paper deals with an automatic measuring and monitoring system for color television transmission line characteristics by using a mini-computer and VIT signals. Based on the preliminary analysis concerning the measurement items and the method of digital computation of distortions, a new combination of VIT signals is proposed and implemented in the measuring equipments which are also applied for monitoring transmitter performances. The following are some of the new approaches introduced in the system: (1) Amplitude or phase of sine waves such as multiburst is obtained by using a simplified method of calculation, (2) *K*-rating is deduced from Echo-rating, (3) Noise power (SNR) is calculated by the summation of the absolute values of sampled data.

A method of automatic scanning beam control of television camera tube, Kazuhiro Sato, Yoshizumi Eto, Shusaku Nagahara, and Shizuka Ishibasi, *J. Inst. TV Engrs. of Japan 29:* No. 8, 642-647, 1975.

A system of automatic control of the scanning beam current of a television camera pickup tube is utilized to extend the dynamic range of the pickup tube. While the conventional method to achieve this effect is to feed back the signal current to the beam control electrode of the tube, this method is often associated with an unwanted oscillation phenomenon. This paper discusses the cause of this oscillation, and seeks the criteria for the stable operation of the beam control loop. Then, the authors propose a new method in which the return beam current from the target is utilized to control the scanning beam. It is shown that, in the latter method, a negative feedback loop is constituted resulting in the stable control of the beam current.

Telecine operating practice, J. R. Errey, *Proc. IREE, 36:* 293-296, Sept. 1975.

The quality of color television images derived from motion-picture and slide film is dependent not only on the quality of the original film, but also on the alignment and operation of the associated television equipment. A committee of the Standards Association of Autralia has concerned itself with identifying the various stages of the film/television interface and has prepared Draft Standards for consideration by the Australian television and film industry. These draft standards are summarized in this paper and the philosophy that led to the adopted format of the standards is presented.

Photoelectric autocollimator for calibrating and testing the distance scale of motion-picture camera lenses, A. L. Yarinovskaya, *Tekh. Kino i Televideniya, 10:* 14-19, Oct. 1975.

Presently available autocollimators used for calibrating the distance scale of motion-picture camera lenses depend on the subjective judgment of an operator to determine when the instrument is properly focused. In a newly developed model, the operator has been replaced by a cadmium sulfide photoelectric cell whose output current reaches a minimum when the lens under test is properly focussed at certain prescribed distances. This is done by superimposing the image of a test pattern in the optical system of the lens under test with a negative of the same test pattern. When the two test patterns are accurately superimposed, the current through the photoelectric cell is a minimum. A filter in the optical path corrects the response of the photoelectric cell to that of the normal eye. The model has been compared with the earlier visual type instrument by calibrating the same group of lenses on both instruments using a number of different operators, each taking only one reading. In each case, the spread of the readings with the new model has been considerably less than that from the visual model.

Since the setting of the photoelectric autocollimator for optimum focus is more sharply defined for a good lens than it is for a mediocre lens, the new instrument can also be used to test the optical quality of lenses on the basis of the change in current resulting from a given longitudinal displacement of the lens under test.

Pulse-code modulation: principles, transmission methods and applications, Ernst Belger and Norbert Mayer, *Rundfunktech. Mitteilungen, 19:* No. 5, 1975.

The paper explains the principles of pulse-code modulation and also draws attention to the relationship between bit-rate and the bandwidth of the signal, as well as to the formation of quantization noise. Examples of the application of PCM are taken from the field of sound transmission and also from that of television transmission.

Pulse regeneration and work-recognition with a sequential PCM video signal, Karl-Heinz Trissl, *Rundfunctechn. Mitteilungen, 19:* No. 5 1975.

Whereas the question of source coding in digital signal transmission is today the subject of intensive discussion, the problems involved in sequential transmission have so far been somewhat neglected. The article reports on equipment for sequential PCM transmission, which is capable of handling a maximum signal flow rate of 200 Mbits/s. The article gives further details of the methods used in this equipment for pulse regeneration, word-recognition and -correction.

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In conclusion, the utilization of PCM is considered from the point of view of resistance to disturbance.

Wideband signal recording on film using (AlGa) as CW injection lasers, J. E. Roddy, *RCA Review, 36:* 744–758, Dec. 1975.

CW injection lasers have demonstrated excellent performance when used in a wideband film recorder to replace a gas laser and its external light modulator. The injection lasers have been internally modulated from 1 to 200 MHz (±2 dB) and film recordings of signal frequencies up to 100 MHz (160 cycles/mm) have been made. The lasers are double-heterojunction, (AlGa) as devices emitting up to 10 mW at 710 nm when operated at 77 K. Comparisons are made between injection laser performance and data taken previously on an argon laser recorder.

TESTS, MEASUREMENTS AND ANALYSES

Special color analysis techniques, Paul G. Smith, Kenneth R. Piech and J. E. Walker, *Photogramm. Eng., 40:* 1315–1322, Nov. 1974.

A new interpretation technique and the associated equipment for extracting additional intelligence from reconnaissance sensor records is introduced. Reconnaissance sensor imagery is a film record of images having spatial and photometric properties. Image spatial properties such as size, shape and pattern can be enhanced through the use of aids such as magnification, mensuration and stereo equipment. On the other hand, equipment to enhance image photometric properties such as tone, color, contrast and density (which are a function of ground object reflectance and contain valuable intelligence information) is not available to the operational interpreter. This new interpretation technique enhances photometric properties by generating and displaying ratios of target reflectance obtained from the spectral data presented on color and color-infrared films. The photometric properties are presented in new spatial patterns for interpretation by the interpreter. An example applies the ratio technique to evaluate surface texture. An experimental image interpretation console has been fabricated to allow rapid and accurate enhancement of photometric properties. The console permits an image interpreter to perform all necessary spatial and photometric analyses at one station.

Extreme errors of numerical integrations in colorimetric calculations, Noboru Ohta and Gunter Wyszecki, *J. Opt. Soc. Am. 65:* 834–838, July 1975.

The tristimulus values of object-color stimuli are commonly calculated by means of the weighted-ordinate method at constant wavelength intervals. By assuming that the tristimulus values are calculated accurately when the wavelength interval is $\Delta\lambda = 5$ nm, we have estimated the extreme errors that can occur when $\Delta\lambda$ is increased to 10 and 20 nm. We have also estimated the extreme errors that can occur when other approximate numerical integrations are used, such as Simpson's rule or Durand's rule of integration. The extreme errors, are always very large and are caused by jagged spectral distributions of the object-color stimuli included in this study.