ABSTRACTS

**ВОПРОСЫ РАДИОЭЛЕКТРОНИКИ**

### серия

**ТЕХНИКА ТЕЛЕВИДЕНИЯ**

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*Bachevsky S. V., Zarubin A. A.***Digital transformation of education in the field of info telecommunication. PP. 3–9**. The article analyzes the issues of digital transformation of educational organizations in the field of information and telecommunications, discusses the history of digital transformation, its role and goals, platforms and tools, provides examples of digitalization of certain areas of activity of educational organizations. **Keywords:** digital transformation of education, digitalization of education.

*Popov V*. *V*. **Issues of digital transformation in television. PP. 10–16**.The possibilities of implementing digital transformation in the field of television are considered. It is shown that its application should be aimed at developing new functional capabilities of television systems.

*Ivanov S. A.* **The role transformation of Russian Federation Unified telecommunication network in the system of military control as a result of realization the processes of digital transformation and globalization. PP. 17–23**. The article presents the main factors accompanying the role transformation of the Unified Telecommunication Network of Russia in the military command system, which took place in the context of digitalization and globalization of society, technology and technology. Shows the author's vision of the transformation results and related problems. **Key words:** Unified telecommunication network, infocommunication system, globalization, digitalization, transformation, memory.

Sagdullaev T. Yu., Sagdullaev Yu. S. **Options for constructing the input link of multispectral systems technical vision.** **PP. 24–30**. The variants of constructing the input link of various spectral systems of technical vision that provide the formation of binocular and monocular images by registering and converting the radiant flux in different spectral regions (zones) of the optical spectrum are considered.

*Sagdullaev T. Yu., Sagdullaev Yu. S.* **The influence of the parameters of the input link of technical vision systems on the recognition ability of objects***.* **PP. 31–40**.The features of detection, discrimination and classification of objects in television images are considered depending on their linear dimensions and detection range, characteristics of the input link of the optoelectronic path of various spectral vision systems. **Keywords:**detection, discrimination and classification, size of objects, range, input link, lens, vision systems

*Kuzichkin A. V., Baburova O. A., Volkova O. I., Gromov P. P., Gulya-Yankovsky D. V., Zumberov S. B., Markin S. K., Medvedev I. V., Patrikeev A. A., Popov V. V., Reshetnikov A. Yu, Taranov A. A., Shamraeva Ya. V.* **Iinterface of the television infrastructure of the launch complex «Angara-А5» with the digital complex of switching and distribution of television information of the cosmodrome «Vostochny». PP. 41–46**. The hardware and software implementation of the interface of the television infrastructure of the launch complex of the Angara-A5 space rocket with the digital complex of switching and distribution of television information of the cosmodrome «Vostochny» is considered. The developed equipment for interfacing with television information sources uses the principle of intellectualization peripheral equipment proposed by the authors. **Keywords**: cosmodrome «Vostochny», digital complex of switching and distribution of television information, equipment for interfacing with television information sources

*Shavin A. S., Krupsky K. A., Kudinov M. G., Isupov A. A*. **Methodical approach to estimation of opportunities of a land-based optical-electronic search station for detection of space objects PP. 47–54**. In the article is presented the methodical approach to estimation of opportunities of a land-based optical-electronic search station for detection of space objects based on imitating modeling. The offered approach can be used for estimation and forecasting of opportunities of an optical-electronic search station of quick search and detection of space objects with due regard for tactical technical characteristics of station, conditions of supervision and optical-geometrical characteristics of space objects. Keywords: search station, space object, quick search, imitating modeling, estimates of opportunities, probability of detection.

*Gudaev R. A., Rogov D. A., Smirnov M. S., Tsaptsov A. V.* **Modeling the process of detecting, tracking and recognizing an object against a complex background by an optical information tool.** **PP. 55–65**. The article presents the results of experiments to confirm the capabilities os the software complex for solving problems of detection, recognition and tracking in the interests of researching algorithms for the functioning of optical information tools. The hardware and software complex is implemented in a programming enviroment Labview using a webcam to simulate the area of responsibility of an optical tool. Shows the possibility of using the hardware and software complex for mathematical and seminatural moderation of algoritns for detection, recognition and tracking. **Keywords:** detection, object recognition, tracking, optical information tool

*Pavlov V. A., Popov V. V., Korchagina A. V., Taranov A. A.* **Application of machine learning methods for detecting and segmentation of fire and smoke on aerial photos. PP. 66–73**. The application of statistical features of images and machine learning methods for the detection and segmentation of fire and smoke on aerial photographs is considered, allowing to increase the efficiency of the problem being solved. **Keywords:** wildfires, optimal algorithms, classification, features, machine learning

*Ivanov V. G., Kamenev A. A*. **Influence of a dual-range matrix photodetector thermal camera sensitivity regions overlapping on the accuracy of determining the object temperature PP. 74–79**. The influence of the degree of the spectral sensitivity regions overlapping of a dual-range IR array photodetector (FPA) on the accuracy of determining the temperature of the observed object using a thermal imaging camera has been investigated. It is shown that the determination of the object temperature using the ratio of signal voltages in closely spaced spectral regions corresponding to the ascending or descending branches of the Planck law of radiation can be carried out without using narrow-band optical filters. A significant overlap of the FPA’s sensitivity regions leads to an error in estimating the temperature of objects on the ground scene up to 3...5 degrees. Ways to reduce this error have been considered. Keywords: dual-range matrix photodetector, identification, object temperature, thermal imaging camera, detection

*Ubozhenko D. Y., Zakutaev A. A., Pozdnyakov A. Y.* **Proposals for guise unified radio-optical calibration satellite.** A review of the existing experience in creating unified calibration tools for ground-based radar and quantum-optical means. A variant of the design of a unified radio-optical calibration spacecraft is proposed. Justified the choice of the material of the body of the specified spacecraft. The possibilities of launching it with existing domestic launch vehicles are considered. The modeling of the reflective characteristics of the spacecraft of the proposed design in the optical and radar wavelength ranges has been carried out. **Keywords:** unification, calibration support, spacecraft

*Dvornikov S. V., Pshenichnikov A. V., Rusin A. A., Manaenko S. S., Vlasenko V. I., Sema A. V.* **Analysis of change in mutual information in channels of continuous systems under interference. PP. 80–85**.The article presents analytical studies of the dependence of the value of the total average mutual information on the level of dispersion of channel noise. Analytical expressions are obtained that characterize the value of mutual information from the ratio of the variances of the useful signal and the additive set of noises. The results of numerical calculations are presented. Directions for further research have been identified. **Keywords:** mutual information, continuous information transmission systems, probability density of an ensemble of input messages.

Markov E. V., Skuratov V. V., Fedosov A. Y., Manoshi E. A., Dvornikov S. V., Kryachko A. F. **Immunity of radio communication channels under interference conditions. PP. 86–94**. Proposals are presented to improve the noise immunity of radio communication channels in conditions of fading through the use of broadband signals. The use of Barker sequences for the expansion of modulating information pulses has been substantiated. The results of evaluating the noise immunity of channels with Rice fading at various ratios of the effective voltages of the regular and diffuse signal components are presented. The possibilities of error-correcting coding methods to reduce the probability of a bit error in channels with fading, in comparison with the use of wideband signals, are investigated. Proposals for the practical application of the results obtained are formulated. **Keywords:** reception noise immunity, Rice fading channels, spread spectrum based on Barker sequences, bit error probability

Tolstukha Y. E., Dvornikov A. S., Golik А. М., Ustinov A. A., Dvornikov S. V., Torgaev О. А., Smirnov О. Y. **Justification of requirements for radars from the position of estimating the differences coefficient. PP. 95–101**. In the article, based on the analysis of the implementation of the statistical approach applied to the detection of signals in radar problems, for the Neumann – Pearson criterion, an approach to substantiating the technical requirements for radar stations is substantiated. The graphs are presented, characterizing the coefficient of difference, through the probabilities of false alarm and correct detection. Analytical calculations are presented. The results of analytical modeling are presented. Proposals for the practical use of the results obtained are formulated. **Keywords:** probability of detection, probability of false alarm, Neumann-Pearson criterion, statistical decision criteria

*Kanaev A. K., Oparin E. V., Oparina E. V.* **Methodology for monitoring network technical state of clock network synchronization based on entropy analysis of diagnostic parameters of its elements. PP. 102–111**. This article provides an overview of the main classes of equipment in the network clock network synchronization and their diagnostic parameters, and also indicates the significant influence of the process of functioning of the clock network synchronization network on the process of functioning of the entire telecommunication system. To assess the technical state of the clock network synchro­nization network, an approach is proposed using the entropy analysis of the diagnostic parameters of its elements. An entropy model of the dynamics of the clock network synchronization network has been obtained, which later serves as the basis for the development of a methodology for monitoring the technical state of the clock network synchronization network. The advantage of the method obtained is that it takes into account the full range of elements and diagnostic parameters of the clock network synchronization network, as well as the ability to continuously monitor the state of the entire network and develop solutions for its control. **Keywords**: telecommunication system, network clock network synchronization, diagnostic parameter, differential entropy, control system.

*Dobriakov B. N., Mihaylovskiy A. I.* **Design of variofocal radiation resistant lens with focal distance 6-18 mm. PP. 112–116**. The article says about the lens design. It starts with the description of problems of such calculation. Also gives information about results of calculation of aberration. At the end there are OTF (optical transmittance function) of optical system given. **Keywords**: optical system, variofocal lens, radiation resistant

*Mihaylovskiy A. I., Kozhina A. D., Shemigon T. N.* **Optical design of radiation-resistant compact lens. PP. 117–123**.The article says about lenses for television cameras, that function in radiation. Also gives information about calculation of two lenses: high-aperture and wide-field lenses. At the end there are OTF (optical transmittance function) of optical system given. **Keywords**: optical system, radiation resistant, high-aperture lens, wide-field lens, television camera