ABSTRACT

### ВОПРОСЫ РАДИОЭЛЕКТРОНИКИ

### серия

### ТЕХНИКА ТЕЛЕВИДЕНИЯ

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*Popov V. V, Umbitaliev A. A., Tsytsulin A. A.* **Modern trends in designing special television systems. PP. 3−13.** The main trends in the design of special television systems, determined by the need to implement the industry development strategy, which requires an increase in the quality and complexity of systems, are considered. It is shown, that the development of systems engineering and new technologies of microelectronics and photoelectronics is based on the principles of iteration and adaptation, including the use of artificial intelligence methods based on the technology of neural networks. **Keywords**: synthesis, design, iterations, adaptation, video analytics.

*Demin A. V.,* *Zimin V. A., Popov V. V., Storosсhuk O. B., Tsytsulin A. K.* **Space laser duplex communication system. PP. 14–21.** The design of the on-board terminal of a space laser duplex communication system for information exchange in a multi-satellite constellation is considered and relationships are given for assessing the requirements for the system. A scheme for constructing a space laser duplex communication system with optical communication between modules with parallel beam paths is proposed. The possibility of realizing high transmission speeds using compact terminals over long distances is shown. K**eywords:** laser, space, duplex, terminal, information, satellite.

*Lysenko N. V., Motyko A. A., Malinovsky A. S.***The domination criterion as a tool for studying the efficiency of information systems. PP. 22–28.** On the basis of graph theory, a criterion for evaluating the efficiency of complex heterogeneous information systems is formulated, which allows analyzing the influence of certain factors on the functioning of the system and will be useful in the synthesis of telecommunication systems and devices. An example of applying the criterion in practice is given. **Keywords**: D-criterion, study of the effectiveness of information systems, heterogeneous television systems

*Krupsky K. A., Kolpin M. A., Shavin A. S., Isupov A. A*. **Methodical approach to modeling and substantiation of optical-electronic means operation regional modes for monitoring** technogenic **space conditions. PP. 29–37.** The methodical approach to modeling and substantiation of optical-electronic means operation regional modes for monitoring technogenic space conditions is presented. The technogenic space objects optical images formations model has been developed, which is a basic of the methodical approach and allows one to evaluate coordinate and non-coordinate information about objects, taking into account distortions. **Keywords**: images, technogenic space objects, optical-electronic means, trajectory measurements, exposure.

*Kapustin V. V.* **Influence of dynamic range of brightness of video frames of active-pulse television measuring systems on the accuracy of range maps formation. PP. 38–44.** The paper presents the results of modeling of multi-area methods of range map formation using active-pulse television measuring systems (AP TMS). The influence of the dynamic range of brightness of the video frames of AP TMS on the potential accuracy of multi-area methods of range map formation is estimated. **Keywords:** active-pulse television measuring system, range map, range measurement, active vision area, multi-area distance measurement methods, dynamic brightness range

*Grigoryev L. V., Kraychko A. A., Sandulenko A. V.* **Laser vision system operating in the eye-safe spectral range. РР. 45–53.** Creation of a prototype of an adaptive laser-strobe vision system capable of operating in a complex optical interference environment. Development of new laser *DPSS* emitters in a spectral range that is safe for the eyes. Verification of the operation of a vision system model in a full-scale experiment. The results of an experiment to determine the maximum detection range of a small target are presented. **Keywords**: adaptive optics, laser dynamic vision system, *DPSS* laser on stimulated Raman scattering with self-transformation

Grishchenko K. A. **A way to build a digital twin of a communication network. PP. 54–61.** The article discusses software and hardware modeling tools that provide the possibility of building a digital twin of a communication network. A comparative analysis of modeling tools is carried out. The calculations have confirmed the adequacy of the distributed control point model implemented with the help of virtualization software images of telecommunication equipment. **Keywords**: digital twins, communication network, aggregative approach, virtualization.

*Vasilyeva D. V., Dvornikov S. S. Tolstukha Yu. E., Obrezkov P. S., Dvornikov S. V.* **Formation of feature vectors for video surveillance systems** **PP. 62-68.** The results of the substantiation of proposals for the formation of feature vectors of video images, formed on the basis of discrete series of continuous time wavelets, are presented. The features of the formation of feature spaces in solving the problem of pattern recognition are considered. An algorithm for synthesizing a multiple-scale representation of signals in wavelet bases is presented. A correlation assessment of the contrast of feature vectors depending on their dimension is given. **Keywords:** formation of feature vectors, signal recognition, multi-scale representation of signals, contrast of feature spaces.

*Shariaty F.,* *Caiqin H., Pavlov V. A.,* *Lingfeng D., Zavjalov S. V.,* *Tatyana M. P.,* *Ying W., Fyodorov S. A.,* **Enhancing Classification Accuracy in Lung Cancer Analysis: Investigating the Relationship between Texture, Radiomics and Deep Features. PP. 69–75**. In this article, we propose a feature-based classification approach that integrates different features in CT imaging, with the aim of developing an automatic system for classifying lung CT scans into seven categories based on the presence of a nodule and the T-stage of that nodule. By improving the accuracy of lung cancer classification, this approach may enable more precise diagnosis and treatment planning, particularly in the early determination of T-stage. **Keywords:** ung cancer, radiomic signs, deep learning

*Zavjalov S. V., Pavlov V. A., Fyodorov S. A., Shariaty М., Pervunina T. M.* **Auto­matic segmentation and classification of COVID-19 on CT images. PP. 76–83***.* The problem of image segmentation of COVID-19 lung infection for automatic detection of infected areas on chest CT images using deep learning methods is considered. It is shown that pre-processing of CT images of the chest using the extraction of textural features can improve the efficiency of segmentation. A method for automatic segmentation and classification of COVID-19 on CT images has been proposed. The test results showed high accuracy and efficiency of the proposed method for segmenting infected areas in comparison with other approaches and with manual segmentation performed by experienced doctors. **Keywords:** convolutional neural network, COVID-19, computed tomography of the lungs, segmentation

*Sevidov V. V., Sinitsyn P. S., Tikhonov S. S., Ostrovsky Y. N.* **Calculation of the parameters of simulating radio interference to a space radar. РР. 84–90.** An algorithm is considered, as well as analytical relations for calculating the parameters of simulating radio interference. The results of simulation modeling are shown, confirming the viability of the proposed technical solution. Prospects for the use of the presented method, as well as directions for further research are proposed. **Keywords:** space radar, radio suppression station simulating radio interference, remote sensing of the Earth, synthetic aperture radar, radar surveillance, ground mobile object.

*Bystrushkin K. N., Gubko V.D., Kochkin E.A., Lyubimov A.O.* **LED monitor for collective use**. **РР. 91–96.** The article describes the results of the development of CJSC «MNITI» LED monitor for collective use (SMCP), intended for use in situation centers, offices, conference halls, public places and other places of collective use. **Keywords**: video wall controller, collective monitor, application of LED modules

*Vasilieva D. V., Dvornikov S. S., Dvornikov S. V.* **Justification of technical requirements for small object detection radar**. **PP. 97-104**. An analysis of the problems of detecting small targets is presented. The main reasons affecting the detection range of objects are revealed. The main directions that make it possible to increase the efficiency of radars are considered. Generalized data on the effective scattering surface of typical underlying surfaces in various radio bands are given. Prospective directions of development of radar detection of small targets are substantiated. **Keywords:** small targets, radar detection, passive interference, effective scattering surface

*Dvornikov S. S., Ayukov B. A., Kryachko A. F., Dvornikov S. V.* **Numerical method for calculation of atamar functions for synthesis of radio signals. PP. 105–110.** The article presents general information about the analytical synthesis of atomic functions used to generate spectrally efficient radio signals with a compact spectrum. The main analytical expressions are given in recurrent form. The conditions for obtaining their decision are substantiated. It is proved expedient in numerical calculations to limit ourselves to choosing no more than six terms of the asymptotic series, which provide an out-of-band attenuation level of about 50 dB. **Keywords:** numerical methods, atomic functions, recurrent formula, spectrally effective signals

*Gnatiuk A. I., Shavin A. S., Lizan V. M.* **Methodical approach to the synthesis of design parameters of spacecraft hulls with specified reflective characteristics**. **PP. 111–118**. The developed methodological approach makes it possible to determine the configuration of the gyroid structure with a given reflectivity. Also, using computer simulation tools, to obtain estimates of the radar cross section of the spacecraft when using this configuration. **Keywords:** gyroid structure, triply periodic minimal surfaces, radar cross section, radar absorbing materials and coatings.

*Pyatkov V. V., Ashunin S. U., Meleshko A. V.* **Method for calculating the failure rate of a LSI CMOS matrix photo detector. PP. 119–123.** An analysis of the state of requirements for the reliability of LSIs during development and operation was carried out. A method for calculating failure rates of a LSI CMOS matrix photodetector based on a priori data on the structure of products and their operating parameters is presented. **Keywords**: reliability, failure rate, degradation of LSI parameters, reliability standards, accelerated testing

*Zatsarinny A. A.* **Memories About Nikolai Leontievich Teplov (on the 100th anniversary of his birth). PP. 124–128.** The article is dedicated to the 100th anniversary of the birth of the outstanding military communications scientist Professor N. L. Teplov. The author of the article, a student of N. L. Teplov, showed his contribution to the development of the theoretical foundations of the noise immunity of discrete communication systems, as well as merits in the formation of the Department of Theory of Signal Transmission at the Kiev Higher Military Engineering School of Communications in the late 1960s - early 1970s. A number of interesting facts of personal communication with N. L. Teplov.