PHYSICAL AND TECHNOLOGICAL PROBLEMS OF RADIO ENGINEERING DEVICES,
TELECOMMUNICATION, NANO-AND MICROELECTRONICS. PART 2

CHOICE OF CRITERIA FOR SETTING CORRESPONDENCE BETWEEN TERMS IN KNOWLEDGE BASES (p. 65-67)

Vasyl Lyashkevych, OksanaOlar

In constructing bases or warehouses of knowledge, ontology of the arbitrary thematic branch, the issue of choosing the method of setting correspondence between terms (concepts) is always topical.

Among the many approaches to setting the correspondence between the terms in bases or warehouses of the knowledge domain "Intelligence diagnostics of computer means" the most common is the use of tables with diagnostic information such as "object - property", which can be described by Cartesian product. But using a binary relation, we can answer the question: "Is there the relation?"

Today it would be expedient to get the answer to the question: "Which of diagnostic means are more effective?" The answer to this question can be obtained from the diagnostics results.

The normalized value of diagnostics software efficiency can be used for setting correspondence between terms (concepts) such as "Object - Property" for example, in the table of knowledge "Models of computer means - Diagnostics means" and others

Keywords: computer means, intelligence diagnostics, ontology, knowledge base, knowledge table

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MEASUREMENT OF CHARACTERISTICS OF ORGANIC TRANSISTOR STRUCTURES (p. 68-72)

Zenon Gotra, Natalia Kus, Vladislav Cherpak, Pavlo Stakhira, Gregory Barylo

The system for measuring parameters of organic transistor structures was proposed and developed in the paper. Circuit diagram was simulated in the software environment Proteus.

Output and transfer current-voltage characteristics of organic transistor structures were studied.

To develop a measuring system, modern elements of electronic equipment were used. Current-voltage characteristics, which show the work of organic transistor structures were shown, such as output and transfer characteristics, that is the dependence of the drain-source current (I_{ds}) on the drain-source voltage (V_{ds}) and gate voltage (V_g). The studies at different gate voltages $V_g = 0 \div 100V$ with the interval 10V were conducted. It is shown that at the increase in the gate voltage, the drain-source current (I_{ds}) increased within about 0.2 mA÷0.1 mA.

This allows to use organic FETs both in display panels and in the smart cards since in the display panels transistors are used for color control and in smart cards - for improving information transfer. (This should remain so)

Keywords: semiconductor layer, the organic transistor structures, measuring system

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PECULIARITY OF SEED-LAYER SYNTHESIS AND MORPHOMETRIC CHARACTERISTICS OF ZnO NANORODS (p. 72-75)

Veronika Ulianova, Anatolii Orlov, Genadzi Pashkevich, Oleksandr Bogdan

The obtained new results of ZnO hexagonal nanorods synthesis by hydrothermal method on the lithium niobate substrate with synthesized seed-layer from sol-gel were presented. Optical microscopy, scanning electron microscopy and X-ray diffractometry were used to examine the morphometric and structural characteristics of the formed structures. The "oriented channels" for deposited by sol-gel method ZnO seed-layers was detected after annealing for the first time. It could be evidence of crystalline structure formation of the layer and wasn't caused by the process on the interface between the layer and the substrate. It was established that the roughness of the ZnO seed-layer had significant influence on ZnO nanorods structure and caused its tilting. The diameter of single seeds had defined the diameter of nanorods obtained by hydrothermal method and was about 50 nm, the length of nanorods was about 0,5 μm. Average aspect ratio was equal to 9.3. The ZnO rod structures were regularly situated all over the substrate surface and had single-crystal structure. It is expected that vertically oriented ZnO structures can be obtained on smooth seed-layer, formed at adjusted process parameters such as sol-gel concentration and annealing temperature. The synthesized nanostructures could be applied as single functional material of nanoscale devices, such as sensing element of surface acoustic wave sensors and energy storage cells for energy harvesting due to having unique properties

Keywords: seed-layer, ZnO nanorods, sol-gel, hydrothermal method, tilting

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TRASFIELDERS OF FLUXES OF INDUCTION VECTORS OF ELECTROMAGNETIC FIELD OF REACTIVE COMPONENTS (p. (75-78)

Vladimir Kudrya

The study of the ways and methods of implementation of passive reactive components of electrical circuits was conducted in the paper. In particular, it is the question about inductance coils, capacitors, transformers and other reactive components. The generalized block diagrams of functional transformations of physical quantities such as descriptors, which form their mathematical model, are given. It was proved that irrespective of the type of reactive component, all of them are characterized by the transformation of fluxes of electric induction vectors into fluxes of magnetic induction and vice versa in local volumes, which are set in a particular design. Thus, it was proved that any reactive component can be characterized as the flux transformer – transfielder.

It was shown that in isotropic media, according to the Maxwell equations, the transformation of fluxes of electric induction vectors into magnetic induction vectors and vice versa occurs in orthogonal planes. This fact allowed to set the criteria assessment of the transfielder designs optimality.

One of the main results of the study was the illustration of using not only the conduction current but also the displacement current as the derivative of the flux of electric induction vector. On this basis, the block diagram of transfielder, which uses the displacement current and serves as the transformer with capacitance input, was developed.

Thus, the proposed study is the generalized analysis of the whole class of reactive components that allowed to point out the ways of improving the existing and developing new reactive components with better performance characteristics such as reliability, frequency ranges, coordination ways and temperature modes

Keywords: reactive components, capacitor, inductance coil, flux of induction vector, capacitor transformer

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ZigBee WIRELESS COMMUNICATION SYSTEM FOR TELEMEDICINE (p. 79-82)

Grygoriy Barylo, Galyna Kuchmiy, Iryna Kremer

The authors of the paper presented the circuit design of electronic circuit of transmitting and receiving information for solving the problems of telemedicine. For simulation and configuration, Smart RF software environment was used. The simulation was carried out, and 3D visualization of system elements in the PROTEUS software was developed. The features of using telecommunication technologies of the IEE 802.15.4 standard in telemedicine infrastructure were considered. The basic requirements to the data transmission system for medical information accounting were given, and technical means for their implementation were defined. The method for constructing a wireless network of telemedicine within the locally-distributed objects was proposed. The simulation of the host device operation was carried out using modern software, which allow minimizing costs of design works and provide configuration flexibility in combination with high performance and network efficiency

Keywords: telemedicine, electronics, circuitry, wireless communication systems, ZigBee, Bluetooth, Wi-Fi

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METHOD OF SECURED INFORMATION ASSESSMENT BASED ON MULTISTAGE DECISION-MAKING PROCESSES (p. 82-85)

Anton Storchak

One of the components of information security control is to assess the information systems security levels that are designed to determine the effectiveness of the security means.

The aim of this work is to develop a method for assessing the security of information processed in the information system based on controlled multistage decision-making processes that enhance the efficiency of information security, taking into account the characteristics of the process of protection. To achieve this goal it is necessary to determine the value of risk at each stage of the protection process and generally determine the choice of security means that minimize the importance of risk at all stages.

Evaluation process of information systems protection and the process of security means implementation in phases. At each phase a set of data on the security system state is obtained. It depends on the implemented security services that characterize the security system state and influence the choice of protective mechanisms used.

The paper defines the vectors of the evaluation process of security and protection application process to ensure risk values minimization at all stages of the system protection.

Value (8) and (9) along with the rule of protective measures usage (7) determine the procedure for selecting the optimal measures to protect the full statistical description of the system. These expressions are the basis for finding optimal or similar to these algorithms of the security means usage in case of apriority uncertainty. They allow to determine the degree of information systems protection based on the study of changes in its characteristics

Keywords: information system, security assessment, multistage processes

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MULTI-STEP MODE SIGNAL CONVERSION ALGORITHMS IN HALL SENSOR DEVICES (p. 86-91)

Zenon Hotra, Roman Holyaka, Victoriya Ilkanych, Tatyana Marusenkova, Valentin Lesynsky, Ivan Godyniuk

This paper presents a numerical and experimental based data analysis of electromagnetic noise immunity in magnetic field measurement devices on Hall sensor transducers. Relevance of this problem takes place in sensor networks with autonomous low-powered sources, magnetic field mapping devices for charged particle accelerators fusion reactors, etc.

The proposed algorithm is based on averaging of several step by step signals, especially, acquired by three consecutive measurements in time interval: $(t + dt)$, (t), $(t - dt)$. In $(t + dt)$ and $(t - dt)$ time intervals a Hall sensor current pulse magnitude and directions are the same. Contrary to these, in (t) time interval the Hall sensor current has the opposite direction.

It is shown that the efficiency of triple step measurements is three times higher than in double step measurement. The integral performance criterion concept of the signal converter effectiveness is introduced.

The performance criterion factor is defined as a ratio of signal converter electromagnetic noise immunity to its energy consumption. A signal transducer optimized to noise immunity study, its operating modes and Hall sensor parameters are described. Both calculation and experiment results show that the performance criterion factor in triple step measurements is twice higher than in double step measurements

Keywords: Hall sensor, signal transducer, noise-immunity

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INVESTIGATION OF THE CERTAIN INTERNET DOMAIN STATISTICAL CHARACTERISTICS (p. 91-96)

Oksana Kyrychenko, Sergey Ostapov, Igor Kanovsky

The review of works, in which statistical characteristics of complex networks were studied on the example of WWW-space, was conducted in the paper. For collecting and processing statistical information of web-pages, the software (crawler), which allowed to conduct network sounding from many entry points was designed and written. Segments net.ua, edu.ua of Ukrainian web-space and segment ac.il of Israeli web-space were investigated. Clusterness coefficients for these segments were calculated. It is shown that increasing the depth of sounding leads only to quantitative changes and qualitative network indicators remain almost unchanged. Probability plots of nodes in degrees on output and input connections and for undirected graphs of the studied segments of web-space are given. It was found that the subnets of input connections (in degree) demonstrate the power-series probability distribution of nodes with the initial section exponent (-2.2), indicating the scaleless nature of the graph.

For the subnet of output connections (out degree) exponential probability distribution of the studied nodes, for which the average degree of nodes was calculated, was obtained. The considered zones do not contain significant features and their level fully corresponds to current trends of the Internet development.

The comparison of the obtained results with literary data was conducted

Keywords: statistical characteristics, degree of node, clusterness coefficient, input connections, output connections

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PREDICTING RELIABILITY OF STRUCTURES GaP-SnO$_2$ BASED ON 3D MODELS OF THEIR SURFACE (p. 96-98)

Svetlana Voropaieva

The application software of Math Lab package for 3D modeling of morphological characteristics of UV radiation sensor surface based on GaP was used. It was shown that using 3D modeling is a software tool, which allows to visualize heterogeneities of contacts both during their production and selective current control during their operation, analyze the design and technological features of their formation and generate recommendations on their structure improvement. Along with the studies of photoelectric and electro-physical characteristics of semiconductor sensors, 3D modeling of surface morphology of the photosensitive layer of sensors allows to determine the reasons of their degradation parameters and predict the reliability of further operation of the information-measuring system.

The revealed morphological surface heterogeneities of the studied UV sensors can be caused by local etching of layer after etching of, or formation of islet oxidizing forms on the surface before applying

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DEVELOPMENT OF SCHEMATIC SOLUTIONS FOR AUTOMATIC OLEDs GLOW BRIGHTNESS CONTROL (p. 99-102)

Zenon Gotra, Pavlo Stakhira, Vladislav Cherpak, Gregory Barylo, Christine Ivanyuk, Igor Helzhynskyy

An overview of existing energy-saving lighting sources for premises was conducted in the paper. The method of measuring the brightness of organic light-emitting structure, which consists of a measuring part, which is carried out on the developed measuring device and a mathematical part of direct calculation of the OLEDs glow brightness was proposed. The measuring was carried out on the basis of the developed structure and proposed method for brightness measurement.

Current-voltage and voltage-brightness characteristics of organic light-emitting diode were shown.

A circuit solution to the OLEDs glow brightness automatic control, depending on the room lightning was de-

veloped. The electrical schematic diagram in the program environment Proteus was modeled and optimized.

The proposed diagram allows optimizing the performance of light-emitting device using the OLEDs and their control system, reducing power consumption. During the optimization, the optimum values for parameters of electrical diagram and microcontroller code table were selected

Keywords: OLED, light-emitting layer, optical power, radiation spectrum, microcontroller

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EPITAXIAL STRUCTURES ON THE BASE OF Cd$_{1-x}$Zn$_x$Sb AND LASER OPTIMIZATION OF THEIR PROPERTIES (p. 103-106)

Yuriy Obedzynskyi, Andriy Savchuk, Viktor Strebegev, Ivan Yuriychuk

Photosensitive elements on the basis of CdSb and Cd$_{1-x}$Zn$_x$Sb single crystals, doped with Te, In, Ga, are obtained by liquid-phase epitaxy. CdSb and Cd$_{1-x}$Zn$_x$Sb epitaxial layers are exposed to pulsed laser radiation with energy density 2-10 J/cm^2. CdSb layers surface acquires a more ordered planar morphology, density of structural defects in the heterojunction and width of the transition region are reduced at optimal mode of laser processing speed. Laser beam stimulates transformation of metastable cadmium antimonide phase inclusions into CdSb equilibrium phase. Photosensitivity of Cd$_{1-x}$Zn$_x$Sb based heterojunction cells is increased. The optimal level of photosensitivity is achieved by doping basic single crystals by Te. Interference bandpass filters in the form of SiO, Ge, BaF$_2$, ZnS thin films on ZnSb single crystal are designed. Selection of incident IR radiation on the photosensitive element by such filter makes it possible to block solar and other noises in the wavelength range λ<2 micron

Keywords: semiconductor, photosensitivity, epitaxial structure, laser, crystal, CdSb, Cd$_{1-x}$Zn$_x$Sb, heterojunction, impurity

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FABRICATION AND PROPERTIES OF p-n-JUNCTIONS BASED ON Cd$_{1-x}$Zn$_x$Te (p.107-109)

Viktor Brus, Mariya Ilashchuk, Bohdan Griytsyk, Orest Parfenyuk, Pavlo Maryanchuk

Electrical properties of semiconductor p-n-junctions, fabricated by the illumination of Cd$_{1-x}$Zn$_x$Te crystals by powerful laser pulses, were investigated.

The fabrication of barrier structures was carried out on the base of Cd$_{1-x}$Zn$_x$Te single crystals with n-type of conductivity, grown by the Bridgman method at controllable cadmium vapor pressure. The region with p-type of conductivity was created by means of a powerful ruby laser (λ=0.694 μm, absorption coefficient in CdTe α= 6·104 cm^{-1}).

The prepared structures were established to be abrupt p-n-junctions. Their I-V characteristics are determined by the generation-recombination processes within the space charge region as well as by the recombination at the interface between recrystallized layer and bulk semiconductor.

The C-V characteristics, measured at different frequencies of small amplitude (10 mV) AC signal, provide evidence on the presence of the series resistance and surface states at the interface between recrystallized layer and bulk semiconductor that is in good correlation with the results obtained from the I-V characteristics

Keywords: CdTe, p-n-junctions, laser, illumination, evaporation, diffusion, recombination, vacancies, current, signal

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FEATURES OF DIAGNOSTIC INFORMATION SEARCH FOR SOLVING TASKS OF INTELLIGENCE DIAGNOSTICS (p. 109-112)

Vasyl Lyashkevych, Roman Makarchuk

Ensuring reliable operation of computer means (CM) for companies and enterprises, where information technologies are closely integrated into the production process is an actual and important task, which prevents the technological process stoppage or loss of important data. Today, the problem of formalization of engineers-diagnosticians' experience and processing of diagnostic information (DI) provided by them, which is the main component of improving the efficiency of CM diagnostic tools during the operation is partially solved. However, the problem of developing DI search tools as constituent means of ID remains topical. Taking into account the trends of intensive development of CM, the features of CM as diagnostics objects (DO) were given in the paper, and the analysis of the interaction process of an engineer-diagnostician with retrieval systems during solving the ID problems was carried out.

At each stage of solving ID problems, diagnostician, if necessary, searches needed DI.

The problem is that within the one query to the IRS (information retrieval system), he cannot cover the actual situation that leads to the stepwise search of DI. Each step is accompanied by its features. On the basis of the conducted studies and analysis it can be stated about the feasibility of using search services as constituent methods and tools of CM intelligence diagnostics

Keywords: computer means, intelligence diagnostics, diagnostic information, search services

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PROPERTIES OF Optical and photovoltaic cells ON THE BASE OF In_4Se_3, $In_4(Se_3)_{1-x}Te_{3x}$ CRYSTALS (p. 113-116)

Volodymyr Strebegev, Viktor Strebegev, Sergiy Nichyi, Ivan Yuriychuk

Theoretical calculations of thin-film interference systems for design of IR-filters on the base of $In_4(Se_3)_{1-x}Te_{3x}$ solid solution crystals are carried out. Interference-absorptive band-pass filters on $In_4(Se_3)_{1-x}Te_{3x}$ crystal with different cutting wavelength position depending on the composition x of the solid solution are produced by vacuum evaporation. Spectral transmission characteristics of the filters and dependence of their parameters on structural perfection of substrates and filter films are studied. Photosensitive elements on the base of $In_4(Se_3)_{1-x}Te_{3x}$ homo-epitaxial heterojunctions are designed and laser correction of their photosensitivity spectral characteristics is carried out.

Surface morphology of epitaxial layers is studied by electron raster microscopy. Temperature dependence of $In_4(Se_3)_{1-x}Te_{3x}$ based photosensitive elements is measured. Mechanical strength and stability of filters and photosensitive elements spectral characteristics under cooling are studied. Laser treatment of photosensitive elements significantly increases photo-response signal of epitaxial structures at optimal operating temperatures

Keywords: interference filter, band-pass filter, transmittance, crystals, $In_4(Se_3)_{1-x}Te_{3x}$, In_4Se_3, heterostructure, heterojunction, solid solution, photosensitivity

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RESEARCH OF THE INTERMITTENT FAILURES PREDICTING METHOD BASED ON THE THEORY OF RUNS (p. 116-119)

Leonid Nedostup, Myroslav Kiselychnyk, Pavlo Zayarnyuk

Intermittent failures of REE (radio electronic equipment) are hard to predict, while they may lead to critical consequences. We propose the method, based on the theory of runs of random processes for predicting the parametric reliability of REE.

This method allows predicting the duration of runs, their number and average duration of one run in the interval from 0 to T, on condition of the known three-dimensional random variable distribution law. The analytical and graphic dependencies for determining the parameters of the random process of change of REE defining parameter are given in the paper. The proposed method allows taking into account intermittent failures and predicting reliability for stationary and non-stationary processes. In addition, as a result of some simplifications, predicting is carried out with the known regression of expected value and variance, as well as the known random process distribution law.

The main advantage of the developed method is that it allows predicting the reliability of radio electronic equipment both in the case of the stationary process, and in the cases of the process with periodic component and quasideterministic random process

Keywords: runs, intermittent failures, reliability, reliability predicting, theory of runs

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