

## РЕФЕРАТИ АНГЛІЙСЬКОЮ МОВОЮ

UDC 629.7

<sup>1</sup>V. Kharchenko, <sup>2</sup>D. Prusov**BASIC PRINCIPLES FOR THE MODERN CLASSIFICATION OF UNMANNED AVIATION SYSTEMS**

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In view of the basic contemporary classification criteria attempted the classification of unmanned aircraft systems have been attempted on the basis of available scientific and technical potential, of their applications features, and prospects for development of information and the aircraft manufacturing technologies. Based on the global trends analysis of unmanned aircraft systems development in determining the prospects for development of unmanned aircraft systems as a class has been discussed the need to use a single general classification system features that reflects the level of functional independence of the aircraft belonging to the UAS and takes into account not only the level of technical excellence, but also the level of development information and logistics systems. The formation principles of unmanned aircraft systems and complexes have been considered due to the UAC development problems, including the issues of the complex architectonics, its full composition, unmanned aircraft controlling methods, and the procedures for the unmanned aviation complex use as a whole taking into account the peculiarities the different UAVs categories application.

**Keywords:** classification features, unmanned aircraft systems.

UDC 621.396

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For surveillance over air traffic the system for reception of ADS-B signals was built. For this purpose the antenna, the receiver of ADS-B signals, the decoder were made and the software for computer was installed. Airplanes on a distance up to 160 km and heights up to 12 000 m were observed. This system has small "blind funnel" and allows to trace airplanes practically "over itself". The system is used in educational process and for performance of student's scientific researches.

**Keywords:** surveillance over air traffic, system for reception of ADS-B signals.

UDC 629.735.051:681.323:629.735.067(045)

<sup>1</sup>S. Pavlova, <sup>2</sup>L. Blagaya**ANALYSIS OF THE HUMAN FACTOR AT CONTROL OF THE MODERN AIRCRAFT**

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Functional interaction features of the operator with a difficult control system have been considered at airplane control. Necessity of working out of vector model of the operator as integral part of difficult system has been revealed.

**Keywords:** aircraft, dispatcher, ergatic system, operator, pilot.

UDC 656.7.052.001.76:551.507(045)

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**INTERACTIVE GLOBAL NETWORK FOR WEATHER DATA OBTAINING,  
EXCHANGE AND DISSEMINATION**

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The possibility to enhance the weather information provision of relevant customers is considered. It is based on the use of the complex global system for weather information obtaining, exchange and dissemination. The structural diagram of the system is proposed. The structural diagram is completed with addition connections that allow to pay strong attention on the most dangerous meteorological phenomena at the critical moment of flight. The proposed approach gives possibility to aircraft crew to select and use specified operative information and increase the probability for proper decision taking. The aircraft are used as the dynamic elements for data obtaining and exchange in the frame of the global system for weather information obtaining, exchange and dissemination.

**Keywords:** ADS-B, automated surveillance systems, flight safety, human factor, meteorological information, onboard surveillance systems.

UDC 629.3.025.2(045)

**O. Sushchenko**

**STRUCTURAL SYNTHESIS OF COMBINED ROBUST CONTROL SYSTEM  
WITH EXTERNAL COORDINATE DISTURBANCES**

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The paper is devoted to actual problem of precision and disturbance resistant control systems. The basic approaches to design of the combined robust control systems are considered. The basic concepts of the structural  $H_\infty$ -synthesis of the combined system and the optimization criterion taking into consideration the sensitivity functions by the reference signal, parametrical structured and external coordinate disturbances are defined. The expression for the transfer function of the generalized system is obtained. The possibilities of its representation in the space of states are shown. The obtained results may be used in the area of the wide class control systems.

**Keywords:** combined robust systems, external coordinate disturbances.

UDC 629.735.051:681.323(045)

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**NETWORK TECHNOLOGIES OF SYSTEMS CNS/ATM**

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The architectures of modern network technologies are considered. Trends in aviation network CNS / ATM are shown. Principles of digital networks and the possibility of their use for the construction of "Aviation Internet" are analyzed.

**Keywords:** Cloud Computing, CNS/ATM, computer network, Grid, information technology, Net-centric system.

UDC 656.7.052:159.961.2(045)

**O. Grabovska****REASONS FOR SPATIAL ORIENTATION ILLUSIONS APPEARING DURING PLANE PILOTING**

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Various types of pilot's spatial disorientation are described. Complicated and critical situations during the flight are defined that contribute to development of spatial orientation illusions. Moreover, attitude indicators and their imperfections are compared. It can be concluded on the basis of the carried out research that in order to prevent from appearing of spatial orientation illusions all factors which might influence the normal state of flight should be taken into account.

**Keywords:** attitude indicator (artificial horizon), critical situations during the flight, pilot, spatial orientation illusions.

UDC 004:65.011(045)

<sup>1</sup>P. Pavlenko, <sup>2</sup>S. Doroshenko, <sup>3</sup>V. Treityak**DEVELOPMENT AND INTRODUCTION OF THE SYSTEM OF INFORMATIVE SUPPORT OF MANAGEMENT PROCESSES BY PRODUCTIVE DATA**<sup>1,3</sup>National Aviation University<sup>2</sup>Sumy Scientific and Production Association by M. Frunze<sup>1</sup>E-mail: petr pav@nau.edu.ua

The basic problems of machine-building enterprises of Ukraine, which are related to absence of single computer-integrated informative space of CASS of the production setting, are analysed. Set intercommunication of computer-integrated CASS of the production setting, which influences on an operationability and authenticity of acceptance of administrative decisions in the conditions of machine-building production. The system of informative support of processes of management of production data is offered in computer-integrated informative space of CASS of the production setting. The structural-functional chart of management of production data of machine-building production is presented. Advantages of the use of the developed system are resulted.

**Keywords:** computer-integrated CASS, computer-integrated informative space, enterprise, life cycle of good, management, system of informative support.

UDC 004.422.833

**A. Krasnopol'skiy, A. Kosyanchuk****METHOD OF FORMING OF REPORTS IN NETWORK ARCHITECTURE WITH THREE LEVELS**

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A research purpose is forming of conception of creation of reports facilities of free fyireporting Software software in network architecture with three levels of access database Microsoft SQL Server on the basis of the real informative system to "Dergatestaciya-K" which is exploited in the National Aviation University. Research object automation of orgware of state attestation of graduating students of educational-qualifying levels "Specialist", "Magistr" in form qualifying examinations. A research method is based on description of business processes on the basis of application of methodology of Aris and use of diagrams ICD (Information Carrier Diagram – charts of electrone documents) and to work of mechanism of reports in the system by the method of record select sre-after information in a rdl-file in the XML format. The got results rotined that for such class of the informative systems it is necessary to carry work on creation of windows of these documents from the level of programmer to the level of business-designer by introduction in service of the system of the module of treatment of client messages and base of the windows of information given in relation to forming for reports, which will do necessary selections and form the cuts of information.

**Keywords:** automation, educational process, language of description of reports, network architecture with three levels.

UDC 004.7:[021.61+027.7](045)

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### CREATION OF SCIENTIFIC JOURNAL REPOSITORY BASED ON OPEN JOURNAL SYSTEMS

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The main features, characteristics and advantages of the open access database "Open Journal Systems" are considered. Demonstrated role of an electronic journal in promotion of the research activity and revealed the advantages of open access, through which expands readership and increases the number of citations of scientific papers.

**Keywords:** electronic journal of open access, index, open access, open source software, science citation.

UDC 621.891:621.316

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### THE REGULARITY CHANGE OF AMPLITUDE AND ENERGY PARAMETERS OF ACOUSTIC EMISSION SIGNALS AT THE RESIZING OF COMPOSITE MATERIAL ELEMENTS

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The simulation of the fracture process of elements of the composite material under the action of shear force and the formation of acoustic emission signals, taking into account changes in the geometric size of the elements of the composite material was conducted. The results of theoretical studies shows that changes in the geometric size of CM elements affects on the development process of its destruction, and formed AE signal. An increase in the geometric size of CM elements at constant loading conditions, led to decrease in the speed of its destruction. Thus there is a decrease in the amplitude of AE signals, increasing the duration of their leading edge and duration. Was established that an increase in the geometric size of elements of the CM led to reduction of the maximum amplitude, power, energy, and area under the curve of formed AE signals by the linear laws. Such change in the maximum amplitude and duration of formed AE signals, obviously due to the fact that an increase in the geometric size of CM elements decreases the speed of their destruction. Reducing energy and power formed AE signals, probably due to a decrease in the maximum amplitude of formed AE signals by increasing the geometric size of CM elements, which is preceded by an increase in their duration.

**Keywords:** acoustic emission, amplitude, composite material, fibres, energy, parameter, regularity, shear force, stress.

UDC 517.2

Ye. Gayev

### LAMINAR FLOW THROUGH A TUBE WITH AN EASILY PENETRABLE ROUGHNESS NEAR AXIS

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Mathematical model has been suggested and investigation carried out of laminar flow through a round tube with a porous insertion (easily penetrable roughness, EPR) in its middle along the axis. Velocity and shear fields have been found analytically for stable flow region, as well as hydraulic resistance as functions of EPR density and its height.

**Keywords:** laminar flow, porous medium, roughness, round tube.

UDC 532.783

<sup>1</sup>H. Bordyuh, <sup>2</sup>A. Polishchuk**STRUCTURAL AND ELECTROOPTICAL PROPERTIES  
OF THE ELECTROCHROMIC LIQUID-CRYSTALLINE COMPOSITES**

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In this work we determine structural peculiarities and main parameters of the new composite materials based on lyotropic liquid crystals with viologen admixtures. We provided a complex investigation of the electrochromism of created materials caused by viologens, which have the ability of coloration under the action of an electric field.

**Keywords:** electrochromism, lyotropic liquid crystals, structural analysis, viologens.

UDC 66.011(045)

B. Korniienko

**MATHEMATICAL MODELING OF THE DYNAMICS OF TRANSFER  
PROCESSES DEHYDRATION AND GRANULATION IN A FLUIDIZED BED**

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An approach to the description of multivariate process of dehydration and granulation in a fluidized bed, which is accompanied by a phase transition is complicated by the formation of liquid phase on the surface of the pellet, followed by removal of the liquid phase and the formation of a mass crystallization by a layer of microcrystals. Presents a mathematical model of two-phase Euler-Euler.

**Keywords:** dehydration, fluidized bed, granulation, mathematical modeling.

UDC 519.21

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**LIMIT DISTRIBUTION OF A RANK OF RANDOM SATURATED MATRIX ABOVE A FIELD GF(2)**

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In this paper a theorem on the asymptotic ( $n \rightarrow \infty$ ) distribution of rank of random matrices in the field GF (2) of  $T$  independent random  $n$ -D lines, the absence in it of unity lines and the assumption that the difference between the number of rows  $T$  and number of columns  $n$  of the matrix is a fixed number of random characters,  $T - n = \text{const}$ .

**Keywords:** field GF (2), limit distribution of rank, random matrix, saturated matrix.

UDC 539.375

Yu. Rudyak

**DETERMINATION OF STRESS INTENSITY FACTOR FOR HETEROGENEOUS  
FOR BASIC STATE OF STRESS**

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The solution of spatial problems of fracture mechanics destruction by optical methods for low levels of optical anisotropic was examined. It is important for basic stress intensity factor. The experimentally calculation method was worked out. The formula for stress intensity factor was determined.

**Keywords:** crack, mechanical fracture, photoelasticity, stress intensity factor.

UDC 504064

<sup>1</sup>T. Konitsula, <sup>2</sup>M. Dovganyk**INTEGRATED MANAGEMENT OF SOLID HOUSEHOLD WASTES' TREATMENT**

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The influence of solid household wastes on the environment in Ternopil region was investigated. This ecological assessment of solid household wastes polygons located within the region. The analysis of the effectiveness of collection and sorting of waste as secondary raw materials was performed.

**Keywords:** environmental protection, integrated management, recycling materials, sanitary-epidemic situation, solid household wastes, systems of filtrate utilization.

UDC 550.03:002:004(045)

<sup>1</sup>N. Bakhova, <sup>2</sup>O. Chornaya**INFORMATION PROPERTIES OF THE GEOPHYSICAL ENVIRONMENT**

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The geophysical environment structure as a form of organization, regulation of deformable solid environment is considered. The regularities of hierarchical discreteness of the geophysical environment are showed. Multi-component systems of the Earth – the lithosphere, the earth's crust, rock and its separate blocks – are the open systems. Interactions of any natural system with its environment can be very small. Thanks to the presence of small perturbations– «microreasons» geophysical environment can be considered as an information open system. The information-descriptive models of the geophysical environment on the basis of mental experiments and methods of analogies are constructed. The natural means of protection of information pollution are showed.

**Keywords:** discrete hierarchy of the geophysical environment, evolution, information properties, lithosphere self-organization.

UDC 574.63(045)

<sup>1</sup>O. Matvyeyeva, <sup>2</sup>D. Demyanko, <sup>3</sup>I. Ogdanskay**DEFINITION OPTIMAL MASS SORBENT "ECOLAN" FOR CLEANING WATER FROM OIL PRODUCTS**

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The article deals with cleaning water from oil products sorbent "Ecolan". Efficiency of research cleaning oil water sorbent. Identify the optimum mass sorbent, which will be rational to use this sorbent, as well as the minimum time of interaction sorbent "Ecolan" and contaminated water. On the basis of anticipated study assessment the effect of efficiency sorbent "Ecolan" physical and chemical conditions holding the process of cleaning.

**Keywords:** cleaning efficiency, kotsentratomir, petroleum products, sorbent.

UDC 544.431.122(045)

<sup>1</sup>E. Bovsunovsky, <sup>2</sup>O. Ryabchevsky, <sup>3</sup>Y. Godovska, <sup>4</sup>O. Lychmanenko**THE IMPACT OF ACID ACTIVATION PARAMETERS OF DARK BROWN LOAM ON ITS SORPTION PROPERTIES TO CHROMIUM (III) IONS**

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Today the purification of waste water from heavy metals is an actual environmental problem, which is due to the existence of these different forms of pollution (in the form of salts, oxides etc.). The using of environmentally safe materials can be the direction of solution of this problem. One of them is a common natural sorbent - dark brown loam.

Large reserves of this material, cheapness, very high adsorption, ion exchange and filtration properties provide the practical and economic feasibility of its use in the process of purification of waste water from chromium (III) ions. The experimental results on improving of sorption properties of dark brown loam by acid activation of sewage treatment from chromium (III) ions have been presented. The optimal conditions for acid activation of the sorbent, at which provides the maximum degree of purification of water from pollution have been defined. Analysis of researches has confirmed the effectiveness of using dark brown loam, modified by sulfuric acid activation, as the sorbent of chromium (III) ions from waste waters.

**Keywords:** activating, chrome, cleaning, loam, sorbent.

UDC 504.055(045)

**Y. Shevchenko**

### **METHOD OF NOISE MAPPING OF TRAFFIC FLOWS IN MODERN CITY**

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The issue of noise maps creation is studied on the example of small town Burshtyn. On the base of up-to-date existing and previously created by author mathematical models equivalent noise levels from traffic flows modeling have been carried out. To verify proposed models for calculation of noise from particular cars and from traffic flows and the effects of sound propagation from noise source to receiver experimental researches have been done. On the base of collected data empirical coefficients for each category of transport means have been defined. Horizontal noise map of Burshtyn has been created. The analysis of soundscape state has been done and recommendations for decreasing of noise levels from two main roads have been proposed. Further researches aim to create not only horizontal, but also vertical noise maps for small districts, as well as their cross and longitudinal sections. Creation of such maps is up-to-date question for analysis of soundscape state on the territory of multistory buildings that is a characteristic feature of modern cities.

**Keywords:** noise pollution, traffic flows, urban noise mapping.

UDC 667.63(045)

**F. Fabulyak, <sup>1</sup>D. Uliankina, <sup>2</sup>T. Taran**

### **MODIFICATION OF ACRYLIC LACQUER BY DOUBLE-DUTY LYOPHILIC EMULSION**

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General useful properties of acrylic lacquers have been studied. References to methods to modify them are given. It has been shown possibility modifying acrylic lacquers with the help of ethylene glycol is a prospective way of improving their properties.

**Keywords:** acrylic emulsion MBM-3, acrylic lacquer, inductive capacity, paint and varnish materials, polyacrylates.

UDC 667.612(045)

**F. Fabulyak, <sup>1</sup>T. Taran, <sup>2</sup>D. Uliankina**

### **INFLUENCE OF BIFUNCTIONAL LYOPHILIC MODIFIER ON DIELECTRIC PROPERTIES OF POLYURETHANE LACQUER WATERBORNE EMULSION**

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The main positive properties of polyurethane have been studied. References to methods to modify them are given. Shown the possibility of regulating the properties of polyurethane water dispersions by modifying polymer by ethylene glycol.

**Keywords:** ethylene glycol, lyophilic properties, modification, paints and coatings, polyurethane, tangent of the dielectric loss angle, water dispersions.

UDC 665.2:665.7.038(045)

<sup>1</sup>O. Matvyeyeva, <sup>2</sup>T. Marynych**INVESTIGATION OF SLIME FORMATION PROCESSES IN TURBINE AND INDUSTRIAL OILS**

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The problem of operating turbine and industrial oils is to ensure the preservation of physical and chemical properties of oils for a long period of time. It is established that at all stages of operation the oil exposed to various contaminants of dispersed phase, the nature and origin. Chemical analysis of oil contamination shows that up to 70% by weight of contaminants is silicon dioxide and the rest are air, water, "wear and corrosion products" and slime. These contaminants are the main reasons that cause slime formation. Slime is a resinous hydrocarbon residue, in most cases, brown in colour. As a result, slime formation lead to a change the physical and chemical properties of oils, active process of aging, the oil becomes a wastes.

**Keywords:** aging, heat and mechanic equipment, operation, oxidation, slime formation, termal and nuclear power plants, turbine and industrial oils.

UDC 544.723:661.874(045)

I. Voytko, N. Manchuk, <sup>1</sup>E. Bahlyey, <sup>2</sup>K. Lashchenko, <sup>3</sup>V. Babanov**SORPTION OF NICKEL FROM HYDROCARBON SOLUTIONS ON CLAY MINERALS**

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In order to develop methods of extraction from petroleum and petroleum products explored sorption of nickel from its heptan solutions on domestic deposits kaolin and bentonite. Experimentally obtained sorption isotherms. The values of sorption capacity of these minerals are equal respectively for nickel 0.35 and 0.39 mmol/g. It is concluded that after the tests on samples of oil and oil products these natural sorbents can be recommended for use in practice.

**Keywords:** adsorption, bentonite, kaolin, nickel, sorption isotherms.

UDC 378.016:54(045)

<sup>1</sup>V. Kirichenko, <sup>2</sup>S. Boichenko**IMPACT OF EDUCATIONAL CONCEPT ON INFORMATION AND DIDACTIC SUPPORT OF ACADEMIC DISCIPLINES HIGH SCHOOL**<sup>1</sup>Khmelnysky National University<sup>2</sup>National Aviation University<sup>1</sup>E-mail: victor@beta.tup.km.ua<sup>2</sup>E-mail: chemmotology@ukr.net

The problems associated with the development of innovative educational concept of higher technical education and its impact on the level of perfection the information and didactic ensure the educational process in the basic disciplines, and hence on the efficiency and quality of education, the formation of systems thinking and the student's creative personality traits

**Keywords:** conception, didactics, education, technics.