ABSTRACT&REFERENCES

APPLIED INFORMATION TECHNOLOGY

METHOD FOR IDENTIFYING NAVIGATIONAL SPACECRAFTS WITH INCOMPLETE INFORMATION OF RANGING CODE (p. 4-8)

Dmytro Grosheliev, Anatoliy Kulabukhov

For solving the target tasks spacecrafts require information about their mass centers position and angular positions in a particular terrestrial reference system. Today, satellite navigational equipment is actively used for solving such problems. Existing solution methods are applicable when there is information about the ranging code structure, pseudo-random sequence of each navigation unit. Meanwhile, if the carrier frequency in a wide frequency range is quite difficult to change, the principle of ranging code formation can be changed programmatically (e.g., by changing the order of generator polynomial of a pseudo-random sequence). Taking into account that the GPS and GLONASS navigation groupings are managed by the ministries of Defense of the USA and Russia, such situation may occur. Meanwhile, assuming that the navigation signals transmission will not be terminated, determination of the target device coordinates is possible in case of identification of navigational transmitting spacecraft. The work deals with the problem of navigational unit identification under the changing structure of pseudo-random sequence

Keywords: spacecraft, identification of beacons, navigation, angular orientation, pseudo-random sequence.

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FRAMEWORK FOR GRID APPLICATION DEVELOPMENT WITH SUPPORT OF DIFFERENT TYPES OF LARGE-SCALE COMPUTING TASKS (p. 8-14)

Olga Prila

Despite active development and use of grid-technologies for solving computing large-scale tasks of different scientific fields, the issue of complexity and efficiency of using the grid-environment by its ultimate users is of current importance, as well as ensuring the required quality of service. This is caused by complexity of low-level and lack of full-featured high-level grid-tools. The features of using the grid-environment for various types of computing tasks was considered. The requirements for developing high-level grid-applications and results of existing studies were presented. The paper provides an extension of the gUSE / WS-PGRADE open framework architecture by optimization of planning and execution of different tasks in the grid-environment by analyzing the structural features of the task, state and quality of service of the grid-network resources. The framework will reduce costs for development cross-platform grid-applications and improve the efficiency of grid-environment used for solving the application tasks of various scientific fields

Keywords: grid, framework, workflow, optimization, QoS

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DECOMPOSITION OF COLOR IMAGES INTO SINGULAR COMPONENTS (p. 15-19)

Victor Zagrebnyuk, Fuad Nasirov

Image segmentation is widely used in the systems of context region-based image retrieval (RBIR). For the RBIR system implementation first of all it is necessary to develop an image automatic annotation subsystem, namely to represent an image as a set of semantically separate regions. For solving this problem the method of image decomposition into singular components corresponding to three largest eigenvalues, which contain information about large-scale regions, is proposed. The method, based on the analysis of eigenvectors, was proposed for automatic determining the number of regions or large-scale color clusters. It is shown, that the number of clusters is equal to the number of sign inversions of the component of eigenvector, corresponding to the third eigenvalue, in the order of descending sequence of singular values

Keywords: image segmentation, context image retrieval, singular image decomposition, context region-based retrieval

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PALETTE METHOD OF EFFICIENT DIGITAL VIDEO CODING (p. 19-22)

Vladyslav Kumysh

In information and communication networks an essential part of rapidly growing traffic is occupied by streaming video and specialized video data designed for comprehensive analysis by the methods of computer vision. In information and communication networks video compression methods are subject to strict requirements of coding/decoding speed for ensuring the qualitative operation in real-time mode. The paper offers the palette method for effective digital video coding, which uses adaptive quantization of video frames in the color space and their representation in the single byte palette graphical format. The compression level of the proposed method constitutes, on average, 2.98 times. The developed method for video coding ensures the preservation of good quality of visual perception with a PSNR value of 46.1 dB. The encoded video can be displayed using existing software, i.e. there is no need to change the decoder

Keywords: effective video coding, adaptive quantization, compression, palette graphical format

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WS-BPEL-MODIFICATION OF TLC-VERIFICATION METHOD (p. 23-28)

Vadym Shkarupylo

To increase the confidence that Composite Web Service functional properties will correspond to our expectations the Formal Verification procedure can be conducted. In order to do that the appropriate specification formalism has to be chosen first. Temporal Logic of Actions TLA+ language usage represents the way to get compact and easily reconfigurable formal models. Broadly adopted WS-BPEL 2.0 OASIS standard can provide us with building blocks for such models retrieving. The aforementioned re-configurability is achievable by models stratification.

As for transition system model the Kripke structure completely fits the domain. TLA Checker (TLC) as TLA Toolbox framework built-in component is a convenient way to get the job done. Despite that, comparing to UPPAAL tool performance for instance, the minor TLC tweaking has yet to be applied.

To this end the modification of TLC-verification method has been proposed. Modification is based on TLA-models stratification coupled with the sequence of Breadth-first- (BFS) and Depth-first-searches (DFS)

Keywords: Composite Web Service, WS-BPEL, Specification, Kripke structure, TLC, Verification, Stratification

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ADAPTIVE DECIMATION OF ACHROMATIC COMPONENTS IN cBX2X3 SPACE FOR IMAGE COMPRESSION (p. 29-32)

Ilia Rublev

Recent trends of image and video sequences compression efficiency improvement lie in applying adaptive methods, which in different ways process and compress homogeneous and textured areas and contours of objects.

The aim of the research is investigating the possibility of an adaptive sub-sampling of image achromatic components, its impact on the level of compression performed by the PPMd method, as well as the quality of the reconstructed image.

The paper first described a method of adaptive sub-sampling of achromatic components of the image based on evaluation of the mean square error (MSE) during the interpolation within the blocks of 4x4 pixels and performing the sub-sampling only in those blocks where the MSE is below the threshold value.

The paper gives the results of the study of dependence of compression level of achromatic components and images in the cBX2X3 environment on the sub-sampling scheme, and renders the increase of compression in 1.5-2.8 times, with maintaining the visual quality of images.

This allows the adaptive sub-sampling of achromatic components at the stages of image pre-processing in formats with sub-sampling

Keywords: sub-sampling of brightness components, adaptive sub-sampling, image compression, PPMd algorithms

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IMPROVING THE METHODS FOR PROVIDING THE ACCURACY OF AUTOMATIC CONTROL SYSTEMS OF AIR SUPPLY TO A BLAST FURNACE (p. 33-41)

Gennady Kanjuk, Max Popov, Elena Bliznichenko, Alexander Andreev

The paper deals with solving important scientific and technological issues of improving the methods and ways of providing the accuracy of automatic control systems of air supply to the blast furnaces based on scientifically valid and identified by experimental results mathematical model of turbo compressor unit.

The main research result of ACS of turbo compressor units of air supply to the blast furnace lies in developing an integrated systemic approach and corresponding normative and methodological providing for developing the precision ACS of air supply.

Classification of precision automatic control systems of air supply based on their systematization according to the control principles and algorithms was first performed.

Mathematical models of turbo compressor units and electrohydraulic control systems, as well as methods of synthesis of precision controls for electro-hydraulic systems, received further development.

The practical significance of results is as follows:

- new module block diagrams and ratio for determining the optimum parameters of precision air supply controls were proposed;

- specific technical solutions for improving the metrological providing of ACS of air supply were proposed;

- the proposed technical solutions allow significant (2-3 times) increasing the accuracy of control of air supply to the blast furnaces. The efficiency and practical utility of the proposed solutions is confirmed by the acts of their introducing at PJCS "Alchevsk Iron and Steel Works", Alchevsk and research and production enterprise LLC "Energetic", Kharkov

Keywords: turbo compressor unit, automatic control system, air supply, metrological providing

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SYSTEM OF TEMPERATURE MODE CONTROL OF BLOCK DEMINERALIZING PLANT AT NPP (p. 42-46)

Romuald Medvedev, Svitlana Merdukh

As a result of a detailed review of the literary sources it was revealed that the effect of temperature on the ion exchange process is paid little attention nowadays.

Therefore, in the paper the authors first of all aimed to study thermal stability of ionites and to prove the importance of maintenance of temperature mode of the turbine condensate demineralization process at nuclear power plants.

Since the operator-technologist is responsible for prompt decisions regarding the period of ionite filters blocking at the power generating unit, his actions can not be considered as optimal.

Failure to maintain the process temperature conditions leads to ionite matrix destruction and loss of the ion exchange resin ability to ion exchange with other minerals of the NPP secondary circuit.

The authors developed an automatic system of temperature control of the block demineralization plant for filters operation control of the turbine condensate demineralization system. This system is implemented based on the Honeywell microprocessor technology using the Experion PKS software package. The system will help to avoid the ionite destruction, extend the operation term of ion exchange resins, reduce filter operation on the worn resins and avoid emission of mineral ions into the workspace of the second circuit.

Verification of the system was carried out using the information on the Khmelnitsky NPP current operation. The results do not exceed the standards and are acceptable for use

Keywords: ion exchange, block demineralization plant, temperature mode, control system

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SYNERGETIC SYNTHESIS OF HIERARCHICAL CONTROL SYSTEM OF SUGAR FACTORY TECHNOLOGICAL COMPLEX (p. 46-51)

Volodymyr Zayika, Vasyl Kyshenko

Technological defecosaturation complex consists of processes of physical and chemical treatment of diffuse juice with active substances, and physical purification of compounds. Determination of rational liming and diffuse juice saturation control modes is the primary task for modern management systems.

The paper considers the application of method for analytical design of aggregated regulators for control over the diffuse juice defecator.

The developed hierarchical control structure enables to divide technological process into separate operations and identify control channels.

The synthesis of control laws was carried out. The effect of driving and controlling parameters was defined.

The results of research, with some modifications, can be applied for the synthesis of control laws of sugar production technological operations.

The suggested solution of the problems of multi-criteria vector control will promote higher indexes of stability and efficiency of technological processes control systems

Keywords: mathematical model, aggregate regulator, ADAR method, hierarchical system, sugar production

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CONTROL SYSTEM OF EXTRUSION OF POLYMER PRODUCTS (p. 51-56)

Lyudmila Yaroshuk, Oleksii Zhuchenko

The polymer extrusion control system is presented, which minimizes power consumption under specified quality parameters of polymer products. The main difficulty in construction of this system is that the quality parameters of finished products can not be measured in real time mode because of the lack of appropriate technical means.

These parameters can be measured only in a laboratory environment that does not allow using the classic feedback control systems.

The proposed control system is a cascade system with two control loops. The inner loop consists of two PID-controllers, regulating temperature and polymer pressure in the forming die at a predetermined level.

The outer loop is a controller-optimizer, which forms a master control for the inner loop for achieving the desired product quality and minimizing energy consumption. In order that the mathematical model, used in the controller-optimizer, always adequately reflected the real condition of control object, used in the controller-optimizer, the model adaptation block was introduced into the control system.

The presented results of a simulation modeling of the proposed control system have shown its high efficiency

Keywords: extruder, control system, optimizer, quality of product

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