Summaries

SIGNAL PROCESSING FOR IDENTIFICATION AND CONTROL SYSTEMS

Przemysław Korohoda: **Sensitivity Analysis for the Obtained after Optimisation Cellular Clearance of the Two-Compartmental Model** • Automatyka 2006, t. 10, z. 3

The paper considers the kinetic urea modelling, a tool used in the haemodialysis treatment. The efforts to introduce the two-compartmental model to the practical applications are mitigated by the lack of numerical value for the cellular clearance, *Kc*, being the crucial parameter of this model. The optimisation procedure, utilising the adjusted model technique to assess the *Kc* value, should be applied with the knowledge about relevant sensitivity of the resulting values to the changes in the input parameters. The changes that result from the inevitable measurement errors. In the paper a method of evaluating the required sensitivity values is described and a computational example based on the typical values is provided. The obtained results may be used to indicate the input parameters which must be measured with particular care. Application of the described procedure should provide arguments to recognise if the differences between the obtained *Kc* values result from inaccuracy of the input values or indicate the important phenomena.

Keywords: *hemodialysis, modeling, cellular clearance*

Przemysław Korohoda: **A Children Population Model for Verification of Bioimpedance Analysis Methods** • Automatyka 2006, t. 10, z. 3

A model for simulation of the measurement data obtained for statistical samples of healthy children population is proposed. The model in its future version should be suitable to investigate methods used in the area of the bioimpedance analysis to compute the total body water volume and the external compartment volume in the dialysed paediatric patients. The introductory version of model, which is based on combined deterministic and random formulas, has been positively verified with use of the available reference data.

Keywords: *bioimpedance, water, statistical model, population, children*

Zbigniew Mikrut, Piotr Augustyniak: **Mobile System for Remote Cardiologic Inspection: Implementational and Technological Aspects** • Automatyka 2006, t. 10, z. 3

The paper presents a concept and realization of a cardiologic monitoring system, which analyzes in real time the ECG signal

from Holter recorder and transmits the results of the analysis to the supervising center. Strips of the original ECG signal are transmitted only in cases when irregular heart action (heart malfunction) is detected. The connection layer used in the prototype is the GSM cellular network, namely the GPRS transmission, sending SMS text messages and – only in emergency cases – direct modem connection CSD. In the paper the implementation and testing results are described for both the client application (software on the patient's end) and the server software (the application responsible for setting-up the connections and transferring the acquired data to the MySQL database and Apache server).

Keywords: *cardiologic monitoring system, mobile cardiologic inspection, cardiology, ECG*

Tomasz Orzechowski, Katarzyna Chmurzyńska, Piotr Radkowski: **Automatic Classification of Voice Disorders Induced by Neurodegenerative Disease Based on Isolated Sounds Analyses** • Automatyka 2006, t. 10, z. 3

This paper presents results of preliminary research of voice pathological changes caused by dysarthria. Computer analysis of voice may lead to identification of parameters correlated with neurological diseases. The selection of linguistic material was characterized according to the place and manner of articulation in the phonetic system of Polish. Results of clinical examination allowed to determine simple markers of neurodegenerative diseases, which will serve as a basis for construction of objective examination model.

Keywords: *Acoustic Signal Processing, voice analysis, speech processing, speech pathology, dysarthria, Parkinson disease*

Paweł Wołoszyn: **Multiagent Approach in Cellular Chemotaxis Modelling** • Automatyka 2006, t. 10, z. 3

Biochemical signals produced by colony of unicellular organisms can induce complex movements of cells caused by their chemotaxis. This behaviour can be modelled with the use of multiagent dynamic system. This paper describes multiagent model of a cellular colony and presents the results of performed simulations, which reveal agents' spontaneous tendency to aggregate into clusters. Analysis of model dynamics leads to conclusion that apparently intentional behaviour can emerge in population consisted of simple agents lacking ability to make strategic decisions.

Keywords: *multiagent systems, chemotaxis, cellular colony*

Marek Gorgoń: **Hardware-Software Environment for Acquisition, Processing snd Visualization of Complex Signals Based on the Modern FPGA Devices** • Automatyka 2006, t. 10, z. 3

In the present paper digital standards applied for transmission and coding of a visual signal i.e. DVI, HDMI, IEEE1394, USB, Camera Link has been indicated. An increasing of image resolution and frame rate has been discussed for HDTV and DVI-based computer displays. An increase of the computing power necessary for performing image processing in HD vision systems has been noticed. A choosing of computing environment, which can assure necessary computing power, has been considered. Architecture of a system for acquisition, processing and visualization HD images and other complex signals, based on reconfigurable computing platform, cooperating with general-purpose processor has been presented. Particular components being parts of hardware-software stand have been briefly presented.

Keywords: *Image Processing, Reconfigurable Architectures, reprogrammable devices*

Laurent Babout: **X-Ray Tomography Imaging: a Necessary Tool for Materials Science** • Automatyka 2006, t. 10, z. 3

This paper gives an overview on different examples of X-ray tomography applications in the field of materials science. It highlights the necessity of applying the technique to investigate scientific problem which cannot be solved with conventional imaging tools.

Keywords: *3D imaging, Graphite, Titanium alloys*

Krzysztof Łukasiak, Krzysztof Przybyszewski: **Analysis of the Relationship between Probability of Crystal Destruction and Its Size for the Ultrafine Grinding Processes** • Automatyka 2006, t. 10, z. 3

We can use the algorithms base on the probabilistic methods for the simulations of the ultra fine wet grinding process of the solid state particles, which are built out of the crystals, agglomerates or aggregates, which is a stochastic process that we can call collective process, as it been proved in earlier publications (Przybyszewski *et al.* 2004, Łukasiak *et al.* 2005). In those papers, we pointed out how to use algorithms for the simulations of materials with non one-size distribution. In this paper we present the results of the simulations

in which we considered relationship between a probability of the grain disintegration at its diagonal, cross section, volume and without any relationship.

Keywords: *simulation of physical chemistry processes, Monte Carlo method, size distribution of particles, grinding*

Maciej Garbacz: **Path Planning Problem for Mobile Robot Using Proximity Sensors** • Automatyka 2006, t. 10, z. 3

The path planning problem for mobile robots is presented in this paper. There are some kinds of proximity sensors described. The paper presents some path planning and avoiding obstacles algorithms using proximity sensors.

Keywords: *path planning, mobile robots, obstacle avoidance, proximity sensors*

Marcin Krupski, Agnieszka Siwocha, Andrzej Cader: **Abstract Fractal Interpolation in Computer Graphics – Utilization of a New Method** • Automatyka 2006, t. 10, z. 3

In this paper there is proposed an alternative method to use fractal curves for approximation of complex curves, which is more appropriate then the FIF method for interpolation of multifractal structures. The method generalizes a conventional concepts of an interpellation node and introduces non local quantities to its description, such as a fractal dimension. Due to the fractal dimension, the method proposes a continuous family of fractal curves as a set of base elements of approximation – a base splines equivalent.

Keywords: *computer graphic, fractal analysis, fractal interpolation methods*

Agnieszka Siwocha, Marcin Krupski, Andrzej Cader: **The Concept of a Fractal Compression of Image** • Automatyka 2006, t. 10, z. 3

The advanced methods of picture compression treat the natural pictures as multifractal objects. In this paper there is proposed a distinct conception of fractal picture compression, which uses a new method of fractal interpolation. This method is based on a conception of fractal base splines and it is a modification of conventional method of base splines.

Keywords: *picture compression, multifractal analysis, fractal interpolation methods, fractal picture compression*

Witold Byrski, Jędrzej Byrski: **Finite Memory Algorithms for Exact State Reconstruction** • Automatyka 2006, t. 10, z. 3

Classical state observers given by differential equation (Kalman Filter, Luenberger observer) based on current measurements of system input and output, estimate the state of linear system in asymptotic way. For observable system there exists another methodology of designing state observers which gives however exact reconstruction of state and is based on integral equation. Such type of observer represents finite moving measurement window. Because of possible huge amount of computation within the window not for all on-line application this algorithm is suitable. Hence the new method for exact observation algorithm in the form of differential equation is presented. This algorithm is equivalent to integral observer. The use of finite memory and equation with delay enables solution of differential equation on-line, and decreases significantly the need of computation power under fulfillment of exactness of state reconstruction.

Keywords: *state observers, state filtration, exact observation*

Leszek Rutkowski: **Making Decision Using Fuzzy Sets of Type 2** • Automatyka 2006, t. 10, z. 3

In the paper type 2 fuzzy sets are presented. The intersection operation and type reduction operation are explained. An application of type 2 fuzzy sets to decision making systems is given.

Keywords: *fuzzy sets, type reduction, making decision*

PROCESS TOMOGRAPHY

Sławomir Lewandowski, Jarosław Włodarczyk: **Weight Matrix Generation for Image Reconstruction in Industrial Gamma--Ray Tomography** • Automatyka 2006, t. 10, z. 3

Weight matrix is indispensable element in algebraic image reconstruction techniques (ART, SIRT etc.) in computed tomography. Classical approaches to weight matrix generation are well-known. In this paper a new approach to weight matrix generation for gamma-ray tomography is given.

Keywords: *image reconstruction, gamma-ray tomography, weight matrix*

Volodymyr Mosorov, Dominik Sankowski, Rasif Mohd Zain: **A Dual Modality Reconstruction Algorithm for Optical and Electrical Capacitance Tomography** • Automatyka 2006, t. 10, z. 3

The paper presents a novel concept combining electrical capacitance and optical tomography for monitoring and investigating of solid/gas flows. The main idea is to gain a high quality image in full-scale concentration distribution of solid/gas flow. The new image reconstruction algorithm is developed.

Keywords: *optical tomography, dual mode tomography, image reconstruction algorithm*

Jarosław Włodarczyk, Sławomir Lewandowski: **Analysis of the Noise Influence on the Quality of the Image Reconstruction in the Dual Modality Tomography** • Automatyka 2006, t. 10, z. 3

The article presents the analysis of the noise influence existing in measuring raw data on the quality of the reconstruction images in Dual Modality Tomography DMT (Dual Modality Tomography) which consists of the gamma tomograph and the electrical capacitance tomograph. During an experiments all combinations of the noise-free and noise-data were analyzed by introducing to raw data 10 percent white noise, then examined his influence on the quality of the reconstruction and the ability of the reconstruction algorithm DMR to correct the data.

Keywords: *image reconstruction, dual sodality tomography, gamma tomography, electric capacitance tomography*

Paweł Sztuka, Krzysztof Grudzień, Andrzej Romanowski: **Software Package Dedicated to Tomographic Image Processing and Analysis** • Automatyka 2006, t. 10, z. 3

The process tomography is a measurement technique, which allows to visualise material distribution inside sensor space in form of 2D or 3D images. The visualization information obtained with aid of tomography system, particularly the analysis and processing of images, enables investigation of spatial-temporal physical phenomena during complex and dynamic industrial processes as well as their monitoring and eventually control. In most cases the first step of information gathering about process is image reconstruction. However the application of process tomography is even more valuable and clearly visible when image analysis is conducted afterwards. This paper presents original software developed for tomo-

graphic image analysis. There are new algorithms dedicated for pneumatic conveying process study implemented in this application.

Keywords: *tomographic software, image processing, flow analysis*

Robert Banasiak, Radosław Wajman, Łukasz Mazurkiewicz: **Sensor Evaluation for Three-Dimensional Capacitance Tomography** • Automatyka 2006, t. 10, z. 3

The three-dimensional capacitance tomography system is presented. Some new ideas of the 3D ECT sensors are given and tested in term of its usefulness for different processes visualisa-tion. The sensor construction technique is described. In the paper the reconstructed images using dif-ferent strategies of the 3D ECT sensors are presented. The result discussion is performed.

Keywords: *three-dimensional Electrical Capacitance Tomography, image reconstruction, sensor design*

Mariusz R. Rząsa, Radosław Wajman: **The New Concept of Capacitance Tomography Sensor Design for Gas-Liquid Counterflow Investigation** • Automatyka 2006, t. 10, z. 3

A measurement system for gas-liquid counterflow investigation is presented. On account of the structure exceptionality of the process a new capacitance tomography sensor was designed. The border area of the sensor is characterized by the higher level of sensitivity as in classical solutions. A new capacitance transducer to frequency was also designed. In the paper the preliminary results obtained with the new measurement system are presented and discussed.

Keywords: *Electrical Capacitance Tomography, image reconstruction, sensitivity matrix, ECT sensor*

Andrzej Romanowski, Krzysztof Grudzień: **Probabilistic Algorithms for Process Parameters Estimation** • Automatyka 2006, t. 10, z. 3

This paper reports the implementation of probabilistic algorithms based on statistical manipulations which are novel to process tomography. The idea is to compensate the lack of sufficient measurement data with additional calculations with the aid of Markov chain Monte Carlo methods. Work presented here concerns application of Electrical Capacitance Tomography to forced and gravitatio-

nally driven flows of solid materials. Implemented algorithms aim to estimate the set of parameters derived form geometrical models of these industrial processes.

Keywords: *ECT data processing, Monte Carlo Algorithms, flow models*

IMAGE PROCESSING FOR MEDICAL AND INDUSTRIAL APPLICATIONS

Zbigniew Rudnicki: **Image Sequence Analysis of Sliding Friction Traces of PTFE Composites** • Automatyka 2006, t. 10, z. 3

In the paper methods of analysis of microscopic image sequences of steel countersample disk are presented. These images were recorded during sliding of the samples of PTFE composites in pin-on-disk tribotester. The sequences show variations of thin layer of transferred composite material – so called "transfer film" – important in sliding friction process. The applied methods of noise evaluation and filtration and the method of binarization threshold calculation – based on image percentiles are described. Binary image features – showing transfer film changes – are defined and extracted. The function aproximation of experimental data are made. Conclusions and postulations of further research are formulated.

Keywords: *image sequences, image analysis, sliding friction, noise filtration, binarization threshold*

Adam Sędziwy: **Procedure of 2D Lattice Orientation** • Automatyka 2006, t. 10, z. 3

In the article we focus on the procedure of a two dimensional lattice orientation (according to a chosen direction). Such kind of image transformation can be used in image preprocessing in automated vision systems or everywhere one deals with maps, satellite images etc.

Keywords: *image processing, 2D lattice, maps*

Roman Vorobel, Magdalena Stobińska: **Using Relative Contrast for Unsharp Masking** • Automatyka 2006, t. 10, z. 3

The paper presents analysis of methods for image quality enhancement for increasing distinguish ability of the details. Methods for unsharp masking are emphasized. It is shown, that the relative local contrast can be the base for construction of unsharp masking methods. Optimization of low frequency image component trans-

formation is proposed and discussed. Advisability of proposed solutions in the examples is verified.

Keywords: *unsharp masking, image contrast, image enhancement, image transformation*

Krzysztof Strzecha, Anna Fabijańska, Dominik Sankowski: **Segmentation Algorithms for Industrial High-Temperature Image Analysis System** • Automatyka 2006, t. 10, z. 3

In this paper segmentation algorithms for industrial images have been discussed. Particular attention has been paid to image quantitative analysis systems. Images acquired from computerized system for high-temperature measurements of surface properties (wetting angle and surface tension) of liquid and solid in contact have been considered. The importance of image segmentation quality in the measurement process has been explained. Moreover, the analysis of main groups of known methods of image segmentation has been carried out in order to choose methods potentially useful in the measurement system vision unit. Authors' modifications of chosen algorithms have been presented. The modifications have improved precision of specimen shape projection. Finally, attempt to choose the best segmentation technique for analyzed class of images has been made.

Keywords: *image segmentation, thresholding, edges detection, industrial image analysis system*

Jarosław Gocławski, Patryk Anioł: **The Segmentation Method of Plant Cells Nuclei Images in the Cytometry of DNA with Heterogenous Distribution Inside of a Nucleus** • Automatyka 2006, t. 10, z. 3

The paper presents an algorithm of plant nuclei image segmentation preceding the procedure of DNA contents measurement. It is based on iterative multilevel thresholding of grey-level differential image, obtained by preliminary subtraction of components in RGB color space. The subtraction reduces non-stained background artifacts. Splitting of merged cell nuclei has been provided using shape-based watershed method referred to the distance transform of the objects. It has been shown, that multilevel thresholding plays a key role in the proper discrimination of nuclei profiles with highly nonuniform DNA distribution.

Keywords: *image cytometry, DNA distribution, image segmentation, Region of Interest (ROI), multilevel thresholding, iterative thresholding, erosion, dilation, reconstruction, distance transform, watershed segmentation*

Marcin Kuzański, Dominik Sankowski: **The Algorithm of the Edge Detection in the Computer Application of the Assessment of Yarn Quality** • Automatyka 2006, t. 10, z. 3

The article describes the algorithm of the edge detection in the computer application of the assessment of yarn quality. The proposed algorithm and the measurement method allows the real setting of the length and number of the protruding fibres. That solution introduces a new quality to the measurement of yarn hairiness.

Keywords: *yarn hairiness, edge detection, measurement method*

Zbigniew Bubliński, Mirosław Jabłoński, Zbigniew Mikrut: **Analysis of Video Sequences in the VirtualDub Environment Based On FPGA Platform** • Automatyka 2006, t. 10, z. 3

This paper describes the method of linear components labelling. Real and artificially generated sequences of frames were used as source of input images, and labelling was conducted in VirtualDub environment as processing of movie with VirtualDub filters. One filter is a pure software implementation of labelling algorithm, and the other is hardware implementation based on FPGA circuit. The detailed comparison of results obtained during analysis of selected video sequences is presented.

Keywords: *analysis of video sequences, object labelling, image processing on FPGA circuits*

Zbigniew Bubliński, Zbigniew Mikrut: **Efficiency of Selected Object Labelling Methods** • Automatyka 2006, t. 10, z. 3

This paper describes the comparison of two object labelling methods: linear component labelling and labelling based on recurrency ("floodfill algorithm"). Real-life and artificially generated sequences of frames stored as AVI files were used as source of test input images. Labelling algorithms were implemented as a video filter (with method select switch) running in VirtualDub environment. The detailed comparison of results obtained during analysis of selected video sequences is presented.

Keywords: *object labeling, analysis of video sequences, VirtualDub*

Agnieszka Dąbrowska, Kazimierz Wiatr: **Modification of Motion Estimation Algorithm *E3SS* for Implementation in FPGA Chips** • Automatyka 2006, t. 10, z. 3

Motion estimation is a process calculating the Shift between the macroblock of the current picture and the most similar macro-

blocks from the corresponding pictures. Motion estimation is an important element of those compression algorithms that deal with sequences of pictures. Examples of such algorithms are H.26x and MPEG. In the article basic issues and the main algorithms of motion estimation have been discussed. Additionally paper presents modification of Efficient Three-Step Search algorithm.

Keywords: *motion estimation algorithms, hardware implementation, E3SS*

Marek Gorgoń, Piotr Pawlik, Jaromir Przybyło, Mirosław Jabłoński: **Modelling and Implementation of Videodetecting Algorithms on the FPGA Platform** • Automatyka 2006, t. 10, z. 3

In the present paper the background generation and motion detection algorithms, which are of key importance for the implementation of videodetection, has been presented. A modification of the background generation algorithm, allowing for a proper algorithm functioning at medium and high traffic conditions, has been proposed. An adaptation of the algorithm for implementation in the reprogrammable device has been presented. A modification of the SAD algorithm, used for motion detection has been introduced. The modification allows for unrestricted defining of 32 Regions of Interest of irregular shape and structure in the analyzed image. It gives a capability to conduct the calculation in independent and parallel manner for particular, user-defined, active videodetection regions.

Keywords: *Videodetectors, Image Processing, Motion Detection, Reconfigurable Architectures, reprogrammable devices, High Level Languages*

Józef Jachimski, Sławomir Mikrut: **The Influence of JPEG Compression on Feature Extraction on Digital Images** • Automatyka 2006, t. 10, z. 3

In the paper some methods of image analysis of the influences of the JPEG compression on feature extraction on digital images are presented. The problem of compression of digital images has an important meaning in case of work on images consisting a cartometric material. It happens in digital photogrammetry, where geometric accuracy is the ground of the measurements. The measures of the quality losses proposed in this paper allow to estimate an influence of various compressions on cartometry. This are: mean error of point position on digital image after compression, in comparison with uncompressed image, and the second measure – correlation coefficient of images. The experiments were performed on satellite

images QuicBird, which record images in four spectral bands with resolution 2,4 m.

Keywords: *digital images, JPEG compression, correlation ratio*

Ernest Jamro, Kazimierz Wiatr: **Pipline Image Processing Employing Embedded Development Kit and On-Chip Peripheral Bus** • Automatyka 2006, t. 10, z. 3

This paper introduces a novel architecture denoted as On-chip Pipeline Architecture (OpiAr). The OPiAr is used for pipeline low-level image processing in Field Programmable Gate Arrays (FPGAs). The architecture OPiAr employs On-chip Peripheral Bus (OPB) developed by IBM and Xilinx Embedded Development Kit (EDK) and it is a modification of Dedicated Pipeline Architecture (DePiAr). Pipeline Image processing, as it was shown for the DePiAr, reduces external memory access and facilitates low-level image processing.

Keywords: *image processing, Field Programmable Gate Arrays, System on Chip (SoC)*

Marek Kwiatkowski, Mariusz Kołton, Paweł Russek, Kazimierz Wiatr: **Image Softprocessor with Reconfigurable Instruction Set** • Automatyka 2006, t. 10, z. 3

The Authors present hardware solution implemented in FPGA reconfigurable logic which is a proposal of a universal platform for the image processing. Dedicated hardware is a traditional solution in image processing area as an alternative to the software methods because it offers high processing power/hardware resources ratio. The common disadvantages of that approach is time consuming implementation time. Presented processor with reconfigurable instruction set is a compromise between software and hardware. It offers easier design flow. In the paper discrete cosine transform implementation is presented as an example.

Keywords: *computational architectures, reconfigurable systems, image processing*

Jacek Nowakowski, Daniel Kaczorowski, Łukasz Tomczak: **Image Processing Algorithms Application for 3D Multi Phase Flow Model Reconstruction** • Automatyka 2006, t. 10, z. 3

This article presents the problem of creation of three dimensional model which can visualize results of the flow measurement in 3D graphics. Firstly the algorithm prepares the data for proposed

module. This preparation consists of sequences of processing images algorithms. The tests were conducted for series of USG images. These images represent the multi-phase flow of water and oil in the pipe.

Keywords: *stereovision, image processing algorithms, disparity*

IMAGE ANALYSIS AND RECOGNITION

Piotr Pawlik, Daniel Iwaniec, Michał Iwaniec: **Disabled Person-Computer Interface Based on Camera Image Analysis** • Automatyka 2006, t. 10, z. 3

The article contains a proposition of interface disabled person-computer based on recognition of patterns (images of facial grimace). Simple camera observes the computer user and recognized patterns are converted to cursor movement and "mouse clicks". Proposed method allows using computer by persons with severe movement disabilities.

Keywords: *the disabled, human-computer interface , image processing, local descriptors*

Piotr Pawlik, Sławomir Mikrut: **Keypoints Searching for Matching Aerial Pictures** • Automatyka 2006, t. 10, z. 3

This paper presents an attempt of application of SIFT (Scale Invariant Feature Transform) method for matching aerial pictures. SIFT method allows to find the pairs of corresponding points (keypoints) on followed pictures. A statistic method of erroneous pairs detection is proposed and an analysis of accuracy of keypoints coordinates based on correlation is presented.

Keywords: *aerial pictures matching, interest points*

Jaromir Przybyło, Mirosław Jabłoński, Paweł Wołoszyn: **Marker Detection for Automatic Anotation of Facial Expression** • Automatyka 2006, t. 10, z. 3

In this paper we present an approach to automatic annotation of face image features utilizing markers. Markers are located on adequate facial regions and are acquired using color camera. Location and topology of markers has been determined utilizing knowledge of facial morphology and facial action units. We design algorithm of marker detection, as well as method of results verification.

Also, analysis of detection and verification algorithms results has been performed. The goal of our work is to use proposed approach to create facial database for evaluation facial expression recognition, without need of manual annotation of image features.

Keywords: *facial expression recognition, human-computer interfaces, marker detection*

Marek Zachara: **Fast Real Time Image Edges Vectorisation** • Automatyka 2006, t. 10, z. 3

The following article presents an algorithm for image vectorisation. The method presented below relays on an output from edge-detection algorithm (e.g. Canny) and in turn produces a list of vectors that are representation of all straight lines on the image. The algorithm proven itself to be fast and prevents redundant output. Experiments show that the method can be used for real-time processing.

Keywords: *image processing, edge detection, vectorisation*

Krzysztof Chrzanowski, Tomasz Raźniewski: **Automatic Evaluation Process of Image Intensifier Tubes Quality** • Automatyka 2006, t. 10, z. 3

A computer program SPOT that enables automatic evaluation of blemishes of image intensifier tubes is presented in this paper. The program carries analysis of images generated by image intensifier tubes, finds blemishes (dark spots) and finally determines number and size of spots present in different sectors of the tested image intensifier tube. The analysis results are presented in form recommended by military standards MIL or manufacturers' standards. Use of the developed computer program enables to increase evaluation speed of image intensifier tubes and eliminates subjectivity of classical evaluation method using a microscope and human eye as the evaluation tool.

Keywords: *image processing, image intensifier tubes, target recognition*

Artur Sierszeń, Łukasz Sturgulewski: **Reference Set Condensation with Controlling the Compromise between the Speed and the Quality of Classification** • Automatyka 2006, t. 10, z. 3

Many pattern recognition systems can have limited time for classification, mainly in applications concerned the quality control in industry. One of the simplest classifiers, known as a nearest neighbor rule, can be used for approximation of any other kind of

classifiers, for instance the more sophisticated k nearest neighbor classifier. The k nearest neighbor classifier (*k*–NN) offers very good classification quality and converges to the theoretically best possible classification rule called the Bays classifier. The classification speed depends linearly on the reference set size, so classification can be accelerated by the decreasing the size of the reference set. The easiest way to control a compromise between the speed of classification and its quality consists in division of the training set into some subsets. The gravity centers of these subsets form a condensed reference set for the nearest neighbor rule. Division of the original reference set, i.e. the whole training set, starts with one set, then this set is divided into two subsets, next one of this two subsets is divided and so on, until each subset will contain only one object, that is a point in the feature space.

Keywords: *object classification, reference set, set condensation, classification speed, classification quality*

Marcin Raniszewski: **The Lossy Image Compression with the Use of Linear Approximation** • Automatyka 2006, t. 10, z. 3

In this paper lossy image compression algorithm has been presented. The algorithm uses linear approximation. The article discusses the compression result of example bitmaps. The conclusions of the usefulness of the algorithm for some kind of pictures has been discussed.

Keywords: *lossy image compression, linear approximation, jpeg, gif, png, zip*

Łukasz Tomczak, Volodymyr Mosorov, Daniel Kaczorowski: **New Method of Texture Defect Detection in Automatic Visual Inspection** • Automatyka 2006, t. 10, z. 3

In this paper we propose an algorithm for texture defects detection, which doesn't use supervised classification. The algorithm can be simply applied in an automatic visual inspection system. For localization of texture defects we calculate features of each non-overlapping region of an image via the Singular Value Decomposition (SVD) and image processing techniques. In next step the algorithm uses the fuzzy c-means clustering (FCM) to classify each region into two clusters. Finally we define a distance between centres of defective and non-defective clusters using some threshold value chosen empirically.

Keywords: *automatic visual inspection, texture defect detection, singular value decomposition, fuzzy c-means clustering*

Jerzy Zalewicz: **Specification Technological Properties in Computer-Aided Measurement and Control** • Automatyka 2006, t. 10, z. 3

For basic of experimental investigation energetic sets, power 215 MW, describe properties technological and computer-aided measurement and control. In particular to pay attention for assemble observation parameters in monitor. It was proven, that reliability of sensors and converters is important for measurement and control.

Keywords: *measurement and control, computer- aided, energetic sets*

Marcin Bąkała, Tomasz Koszmider: **Camera's Resolution Influence on Surface Tension Measurements Accuracy** • Automatyka 2006, t. 10, z. 3

In this paper, a case-study of the Thermo-Wet surface tension measurement is conducted and diferent resolutions cameras influence on result precision are described.

Keywords: *surface tension, measurement method, cameras resolution*

Jacek Nowakowski: **Detection of Obstacles Motion in a Mobile Robot Environment** • Automatyka 2006, t. 10, z. 3

This article presents results of investigation of robot motion planner in which obstacles motion detector was implemented. Images from stereo vision system are used to compute disparity distribution and robot environment map. The results of obstacle motion detection are presented. Optical motion approach for obstacle movements detection was also presented.

Keywords: *disparity, mobile robot, stereovision, detection of obstacles*

NEURAL NETWORKS

Marcin Kolibabka, Andrzej Cader: **The Method of Extorting Internal Patterns in the One-Way Classyfing Neural Network** • Automatyka 2006, t. 10, z. 3

Creating and later learning of one-way neural networks depends from many factors. Selection of many them has estimated and experimental character. The proposed in the article method allows to the weakness of the influence of the not optimal choice of

the net structure, also speed and momentum values are less influential then in classic Back Propagation Method.

Keywords: *Neural networks, artificial inteligence, backpropagation, classification*

Joanna Grabska-Chrząstowska, Marian Fiedor, Kinga Tucholska: **Assessment of Kohonen's Networks' Performance on the Basis of an Opinion Survey among Students of the Academy of Physical Education in Cracow** • Automatyka 2006, t. 10, z. 3

On the basis of opinion survey data the paper shows the usefulness of Kohonen's networks for multidimensional data analysis. Due to a reduction to three dimensions on the one hand and the analysis of the data by an expert on the other, the usefulness of unsupervised learning networks for dividing a set of data into se-parate groups was verified. The final verification of the thesis that there is no correlation between students' opinions and their choices of preferred lecturers' features was car-ried out using an LVQ network.

Keywords: *Kohonen neural networks, LVQ neural networks, data clustering, types of personality, temporal competencies*

BUSINESS INFORMATION SYSTEMS

Ryszard Tadeusiewicz: **E-Administration as a Source of New Scientific Challenges and Practical Applications for Automatic Control and Computer Science** • Automatyka 2006, t. 10, z. 3

Traditional sources of new tasks for automatics and informatics, like industry and home applications of technology, analyzed from the point of view of scientific challenges, are near to saturation. Almost all fundamental problems connected with automatic control of big factories are solved and development goes now almost only in the area of smart and economical applications as well as technological perfection in realization of known methods and elements of control systems. The similar situation can be found in the area of applications of automatic and robotic system in homes. Therefore scientists dealing with automatic control and with applied computer science are searching for the new sources of nontrivial problems for solving and new fields off applications. One of most important and most interesting sources of such tasks can be found in the area of e-Administration (or e-Government). Development of e-Administration in Poland is now very urgent political and

practical need, taking directly from the participation in European Community. All EU member countries ought to build structures of Information Society. Development of such Society is also one of the most important goals for Polish Government. Obviously e-Administration is one of the most important elements of Information Society when Polish applications of e-Administration utilities as well as technological and organizational elements are one of the worst in Europe. It means, that fast development of e-Administration in Poland is the task, which must be performed by the government. Therefore needs connected with realization of such goals will be treated as a priority in nearest future. Yes, but first many scientific and technological problems connected with practical application of e-Administration must be solved. In paper some examples of such problems, connected with the area of Automatics and Informatics were listed and discussed. The general outlines of scientific and technological demands of e-Administration are also presented and discussed as a source of inspiration for future scientist and inventors.

Keywords: *Informatics for e-Administration, Automatic devices for e-Administration, Information Society, e-Government*

Edyta Kucharska, Lidia Dutkiewicz: **Class of Heuristic Algorithms for Scheduling Problem on Machines with Retooling** • Automatyka 2006, t. 10, z. 3

The article presents a class of heuristic algorithms, designed for scheduling problems on multiple machines with retooling depending on process state. The class is based on the solution search method with information gathering for a control purpose. An algorithm based on this method, applied for drift driving problem, is also presented. Some results of experiments are described.

Keywords: *local optimization, algebraic-logical model, task scheduling with changeover times*

Adam Niewiadomski: **Fuzzy Methods of Data Intelligent Interpretation** • Automatyka 2006, t. 10, z. 3

Interpretation of large amounts of data is, undoubtedly, the task which should be supported by information technologies. In particular, if the results of interpretation are to be presented in natural and commonly understood forms, e.g. linguistic, the use of artificial intelligence and soft-computing methods is worth considering. The methods presented in the paper are based on fuzzy sets and on their extension – interval-valued fuzzy sets. The process of data interpretation is not seen as a homogeneous one. It is divided

into to subprocesses retranslation and summarization. Both are connected with sets of procedures which are to provide the user with linguistically formulated knowledge that comes from interpreted numerical information. The task of the retranslation is to describe proper-ties of single objects in particular. Summarization lets us to generate compact textual messages that explain general properties of large sets of data. The original author's contribution is the application of interval-valued fuzzy sets in the processes described. The paper is a one of the very first Polish-language-publication in the domain.

Keywords: *interval-valued fuzzy sets, interval-valued linguistic variables and their modifiers, interval-valued fuzzy quantifiers, interval-valued linguistic, summaries of databases*

Paweł Skrzyński: **UML 2.0 in Modelling Relational Databases** • Automatyka 2006, t. 10, z. 3

UML has been accepted as the standard modelling language for specifying software and system architectures. Second version of language, known as UML version 2.0, addressed most of the problems that architects faced while modelling software with previous version of this language and confirmed its position as the most popular modelling language used in object-oriented approaches to software development. On the other hand relational model of storing data today is the most popular model and the most common methodology of modelling data in relational systems is classic Entity-Relationship model and its extensions. Although UML was strongly influenced by these mechanisms, in author's opinion, it provides much more expressive modelling power. From the static point of view of the system transformation between ERD diagrams and relational tables is relatively ease, so trans-formation rules between class diagrams and relational tables have been widely discussed in literature [5, 3]. In this paper some additional transformations which are possible from class diagrams and ac-tivity diagrams to relational tables, stored procedures and functions are discussed.

Keywords: *database modelling, UML, activity diagrams, relational model, SQL*

Michał Turek: **Rule-Based Knowledge Approach For Polygon Mesh Siplification** • Automatyka 2006, t. 10, z. 3

The article will discuss how to alternatively represent reduced information about 3D polygon meshes. It will propose a transformation able to convert provided 3D mesh into especially designed

knowledge format. That format could be described as similar to a rule-based data. Each knowledge base will concentrate knowledge rules – with terms and conclusion specified. Each term will correspond to a point inside 3D mesh – considered by the transformation as important one. As the knowledge base is established a further part of analysis could be made. That part will just use achieved knowledge base as the only data source – providing information about mesh object dimen-sions, fragmentation or mesh simplification (alternate to mesh polygon reduction technique). The knowledge base can be easily stored, processed quickly, merged or manually edited – mostly because it is much smaller and perspicuous than a corresponding 3D mesh object.

Keywords: *3D transformation, knowledge processing, rule-based knowledge, mesh simplification, mesh polygon reduction, 3D polygon mesh processing, shape analysis, shape grammars*

Kamil Kuliberda, Jacek Wiślicki, Tomasz Kowalski, Piotr Błaszczyk, Grzegorz Balcerzak, Radosław Adamus: **Implemental Aspects of the Open Transport Platform Based on a Peer-to-Peer Architecture** • Automatyka 2006, t. 10, z. 3

The paper presents the results of investigations concerning an open transport platform that can be used to build grid applications based on object-oriented databases. The described research has been focused on implementation of previously published project assumptions. The presented cases comprise: centralized architecture of a network for a transport platform, utilization of the JXTA technology for building a virtual network, foundations of a communication protocol for the network and an example of its application. An example of a transport platform integrated with an external user application is presented. All the described features are operating within the prototype.

Keywords: *SBA, SBQL, JXTA, Virtual Repository, Data Grid, Peer-to-peer, Distributed Processing*

Tomasz Serafiński: **Software Configuration Repository as Base for Advanced Software Development Process Solutions** • Automatyka 2006, t. 10, z. 3

In his article we presented software configuration repository which can be used as storage of data about software development process. With this data we can feed analytical tools which will estimate contamination of change in software project. Presented solution is taking in account not only configuration items, as in other

solutions in this class, but also complex dependencies between configuration items and resources. Additionally in repository we include all steps needed to be done while working on particular configuration items. This approach allows us to use described solution as a software quality management tool.

Keywords: *Software Engineering, Software Configuration Management, Software Configuration Repository*

Kamil Kuliberda, Jacek Wiślicki, Tomasz Kowalski, Piotr Błaszczyk, Grzegorz Balcerzak, Radosław Adamus: **Application of an Open Tranport Platform Based on Peer-to-Peer Technology for Communication and Integration of Object-Oriented Databases in the DataGrid Architecture** • Automatyka 2006, t. 10, z. 3

The paper presents the first stage of accomplishing a DataGrid concept by utilizing an open transport platform based on the peer--to-peer architecture. Implementation details concerning integration of object-oriented databases with the prototype of a transport platform are described. The prototype solution enables one to accomplish a grid network integrating distributed object-oriented data-bases.

Keywords: *SBA, SBQL, JXTA, Virtual Repository, DataGrid, Peer-to-peer, Distributed Processing*

Bogusław Filipowicz, Joanna Kwiecień: **The Use of Queueing Network for the Performance Evaluation of Organizational Units** • Automatyka 2006, t. 10, z. 3

Queueing networks are commonly used for the performance evaluation of computer, communication and manufacturing systems. This article presents the use of open and closed queueing networks with multiple job classes for performance evaluation of chemotherapy and bank units. The queueing models of these units have been proposed. Performance measures that describe the queueing network operation have been presented.

Keywords: *queueing networks, models of organizational units*

Grzegorz Sowa, Zbigniew Filutowicz: **Evolutional Content, Architecture and Form of Individual User Knowledge Presentation** • Automatyka 2006, t. 10, z. 3

Personalization of computer knowledge representation may be accomplished in both ways, individually by a user or automatically, and may be related to content, architecture or knowledge presentation form. The important issue of such an individual representation

is updating of its current content by using information which is available on the internet. Authors analyze user's needs on the basis of knowledge resources evolution, identify research issues, analyze track record on this field of science and propose a utilization of different methods to create an integrated, open and personalized knowledge model.

Keywords: *knowledge presentation, knowledge model*

OTHERS

Krzysztof Przybyszewski: **Application of the Fuzzy Sets in Tests (Closed Problems) Evaluation** • Automatyka 2006, t. 10, z. 3

The paper describes a conception of application of the fuzzy numbers for assessing students' progress in learning, knowledge assimilation and abilities. The method of judge is based on operations performed on the fuzzy numbers and fuzzy sets. It has been used for assessing different forms of tests (one-choice, multiple-choice, complementary or replaced one) and the results have been compared with teachers' marks.

Keywords: *artificial intelligence in education, fuzzy numbers, expert system, validation, evaluation*

Michał Krupski, Andrzej Cader: **Influence of Distance Learning in Information Society Development** • Automatyka 2006, t. 10, z. 3

Foundation and development of the Internet generated changes unexpected even by its creators. Progress in information and communication technologies resulted in new quality in data and knowledge exchange. This influenced people to the point when a new term was needed to describe world's population – "Information society". It also became challenge to the educational system, as future shape of civilization depends on ways new technologies, along with new knowledge and skills acquisition methods, are put into use. Latest teaching techniques provide new tools, such as e-learning, which strongly accelerates social and economic development. It is vital to take advantage of the new possibilities to support both stationary and continual education. This paper presents quick outlook on formation and development of e-learning tools. It also shows examples of distance learning applied academic centers in Poland.

Keywords: *information society, distance learning, e-learning*