

Jacek Augustyn, Maciej Klemiato, Jan T. Duda: **Reconfigurable Integrated Production Control System of Industrial Processes on QNX Neutrino Platform** • *Automatyka/ Automatics* 2013, Vol. 17, No. 2

This paper presents the structure and implementation of the Integrated Reconfigurable Production Control System. The solution offers monitoring, control and supervision of manufacturing systems equipped with Enterprise Resource Planning (ERP) and Supervisory Control and Data Acquisition (SCADA) systems. The article proposes the architecture and the main principles of such a system, as well as its substantive tasks. QNX Neutrino system was chosen for a development platform as it provides real-time operations for control loops. The proposed project is intended for continuous industrial production systems.

Keywords: *process control, real-time systems, QNX Neutrino, SCADA, ERP, MES*

Ewa Dudek-Dyduch, Krzysztof Rączka: **Selection of Databases for Real Estate Information Systems** • *Automatyka/ Automatics* 2013, Vol. 17, No. 2

The objective of the article is to scrutinise the types of databases and to choose the most appropriate one for property markets computing systems. The problems of the property markets analysis and valuation were characterised and the types of systems that should be created were presented as well. Two types of systems emphasized in the article should be a part of property market's computing systems. These are: a system of monitoring and analyzing the overall situation in the real estate market (M-A System), an expert system that is designed for the local market analysis and valuation of real estate in the local market (REE System – Real Estate Expert System). The problem is presented at the databases point of view. The characteristics of various types of databases were described taking into account their usefulness and it was decided which of them has the broadest range of application. Analysis has covered: relational databases, object-oriented databases, object-relational databases and a NoSQL databases. For M-A system, a NoSQL type of database was proposed, whereas for the REE system object-relational database or object database.

Keywords: *computing systems, databases, property market's analysis, property valuation, relational databases, relational-object oriented databases, object-oriented databases, NoSQL*

Grzegorz Karpel, Konrad Gac, Maciej Petko: **FPGA Based Hardware Accelerator for Parallel Robot Kinematic Calculations** • Automatyka/ Automatics 2013, Vol. 17, No. 2

This paper presents an application of FPGA to support the calculation of the inverse kinematics problem of a parallel robot. The presented robot is designed for milling by moving the spindle along a desired trajectory generated in Cartesian space. This means that for each point of the trajectory solution of the inverse kinematics problem is needed. The resulting sequence of data creates the joint space trajectory. The trajectory in joint space must be calculated in real time. Required high frequency and complex equations makes the problem of the calculation time crucial. The paper shows how to increase the computing power for inverse kinematics problem solving, preserving required calculation accuracy, by augmenting the arithmetic coprocessor with custom instructions. The paper shows hardware implementation of the accelerator and presents results of calculations performed on Altera FPGA chip.

Keywords: parallel robots, inverse kinematics problem, implementation of algorithms, FPGA

Krzysztof Kołek: **Application of Android OS as Real-time Control Platform** • Automatyka/ Automatics 2013, Vol. 17, No. 2

This paper presents an application of an Android device to control a laboratory Antilock Breaking System (ABS). The controllers to avoid the locking of the wheel are considered. The architecture of Android OS is given. The discussion is focused on the features of the Android helpful to build real-time control systems. The mobile phone acts as a controller performing the control algorithm of avoiding the locks of the wheel. The controller application is implemented in Java which is the basic Android development language. The controller uses only standard system functions without the use of real-time extensions. The results of the experiments show punctuality of control task running on Android. Also, the braking experiments are given. The conclusions include comments on the applicability of Android devices as a platform for real-time control.

Keywords: real-time control, Android, Java, Antilock Breaking System

Sławomir Nasiadka, Henryk Krawczyk: **An Architecture of Execution Environment for Context-aware Applications Running in Intelligent Space** • Automatyka/ Automatics 2013, Vol. 17, No. 2

Context-aware applications running in intelligent spaces are one of the most dynamically developed group of applications. Their model called CAA (context-aware applications) on the one hand allows to express their interactivity with regard to cooperation with an intelligent space and their users. On the other hand it shows their iterative nature that allows to analyze context-aware part of the application according to iterative algorithms. Applications defined in that way can be executed directly by the intelligent space. However, to do that the space needs to be enhanced with a special engine delivering particular mechanisms. The article describes such engine called Parallel CAA, its architecture and implementation. The implementation creates a CAA execution environment.

Keywords: context-aware application, application model, environment architecture, intelligent space

Paweł Skrobanek: **Minimal Cut Sets with Time Dependencies Analysis** • Automatyka/ Automatics 2013, Vol. 17, No. 2

Fault tree analysis (FTA) is one of the most frequently used techniques for safety analysis. The result of such an analysis are minimal cut sets (MCSs). Occurrence of all the events from MCS is a necessary and sufficient condition to cause a fault (hazard, dangerous situation). Thus, both the design and implementation of the system should prevent or minimize the probability of such a situation inter alia using the knowledge of the MCSs. Standard FT cannot express time dependencies between events. This possibility gives us FT with time dependencies (FTTD). The analysis of the FTTD gives us also MCSs, but extended to the time dependencies as well. This paper proposes a way to create such sets and partial automatization of analysis for specific cases provided.

Keywords: fault trees with time dependencies, minimal cut sets, system safety

Piotr Szwed: **Application of Fuzzy Cognitive Maps to Analysis of Development Scenarios for Academic Units** • Automatyka/ Automatics 2013, Vol. 17, No. 2

For many classes of problems it is difficult to make decisions, assessments or develop plans based on precise quantitative models.

Fuzzy Cognitive Maps (FCM) are a well-known tool for qualitative analysis of systems that uses a simple representation of knowledge in the form of a graph of concepts linked by causal relationships. Advantages of FCMs are the ease of gathering and representing knowledge and the simplicity of reasoning techniques, very close to neural networks. The paper gives results of experiments aiming at application of FCMs to analysis of development scenarios for research and teaching units. The analyzes were conducted for four representative classes of academic units: strong, medium, weak with a development potential and weak; their results are discussed and several observations related to reasoning with FCMs are made.

Keywords: *fuzzy cognitive maps, fuzzy logic, artificial intelligence, qualitative models*

Piotr Szwed, Mariusz Duplaga: **An Approach to Guidelines Implementation in E-health System Supporting Chronic Care** • Automatyka/ Automatics 2013, Vol. 17, No. 2

Guidelines developed in line with Evidence-Based Medicine paradigm usually take form of narrative recommendations formulated on the basis of available evidence resulting from clinical trials and other types of studies. For past ten years there were developed several Formal Guidelines Representation languages that attempted to express them in form of algorithms or processes. Analysis of specific requirements related to e-health and in particular telemonitoring systems indicated, that a process oriented formalization of guidelines is in this case inappropriate, as such systems should be reactive, event driven and enable adaptation to cope with the quality of entered data. In this paper we describe an approach to guidelines implementation in the e-health system. Contrary to various FGR languages developed earlier the decision support will be based on the set of fuzzy rules that on the technical level will be implemented as XQuery transformations of XML data. We discuss this approach on an example related to the management of bronchial asthma, as customization of the system to this disease was selected as one of the proof-of-concept exemplifications of the system.

Keywords: *e-health system, medical guidelines, fuzzy rules*

Grzegorz Śmigielski, Damian Lewandowski, Roman Dygdała: **Control of Delivery of Water Capsule for the Explosive Generation of Water Spray** • Automatyka/ Automatics 2013, Vol. 17, No. 2

This article presents the structure of the system which makes possible the release of a water capsule from the helicopter and the

detonation of water situated inside the capsule at the defined height over the target (the place of fire) in order to cover the land of a adequate area with the produced aerosol. The moment of the release and detonation is defined on the basis of the current velocity of a flight and the position of the capsule.

Keywords: *real-time system, firefighting, GPS*

Igor Wojnicki, Michał Rad: **Rapid Design and Development of Control Applications for Electrical Engineering** • Automatyka/ Automatics 2013, Vol. 17, No. 2

This paper presents a control application programming concept based on attributive logic and context-based reasoning. General features and benefits, compared with other contemporary approaches, are given. The proposed solution is targeted at electric machine tests and diagnostics. An illustrative example of programming an induction motor no-load test which compares the proposed solution with a Matlab-based application is also given.

Keywords: *programming, control systems, software design, electric machines*

Wojciech Zwonarz: **Time Stability of Computer Generated Control in Real-time** • Automatyka/ Automatics 2013, Vol. 17, No. 2

This paper is devoted to analyze time stability of robot arm controller. Controller is implemented on PC platform with Windows XP and Matlab/Simulink environment with additional toolbox RT-CON. Described robot is 3 DOF Stanford Arm. It is powered with high torque, gearless electrical engines. The analyze of jitter effect influence on robot period moves was made. Experiment was made with PD and PD extended by neural network controllers. During experiment the test of influence of stressed system on control generation was made.

Keywords: *real-time, control, PD, Windows, Stanford arm, jitter, neural network*