

## Summaries

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Wojciech Bożejko, Józef Grabowski, Mieczysław Wodecki: **Blocks in the Total Tardiness Flow Shop Problem** • Automatyka 2007, t. 11, z. 1–2

Blocks are applied in the best metaheuristic algorithms of solving flow shop problem with the makespan ( $C_{\max}$ ) criterion. It makes possible to eliminate moves which generates worse elements of a neighborhood. In this paper we present generalization of the classic block formulation, which we are applying in the tabu search algorithm to solving total tardiness flow shop problem ( $F||\sum w_i T_i$ ).

**Keywords:** *scheduling, flow shop problem, earliness, tardiness, tabu search*

Wojciech Bożejko, Mieczysław Wodecki: **Parallel Scatter Search Algorithm for Flow Shop Problem with  $C_{sum}$  Criterion** • Automatyka 2007, t. 11, z. 1–2

In the paper we consider flow shop problem with the criterion of minimalization of the sum of job's finishing times ( $F||C_{sum}$ ). We present the parallel algorithm based on the scatter search method. Obtained results are compared to the best known from the literature.

**Keywords:** *scheduling, flow shop problem, scatter search, parallel algorithm*

Zbigniew Buchalski: **An Heuristic Algorithm for Tasks Scheduling on Parallel Machines System with Limited Resources** • Automatyka 2007, t. 11, z. 1–2

In the paper problem of time-optimal allocation of  $n$  independent tasks and nonrenewable resources to  $m$  parallel machines is considered. For some tasks execution time function the mathematical model of this problem is formulated and an heuristic algorithm for solution this problem is presented. Some results of executed computer research for basis of proposed heuristic algorithm are presented.

**Keywords:** *tasks scheduling, parallel machines system, heuristic algorithms*

Jacek Dajda, Grzegorz Dobrowolski: **Systems Approach towards Modern Methods of Software Development** • Automatyka 2007, t. 11, z. 1–2

Agile methodologies are the response for disappointment with traditional software methods. By applying systems approach, it was possible to solve substantial problems of software engineering discipline, however the requirement of close proximity of project

members was found a serious limitation. As a major percentage of software projects is developed by distributed teams nowadays, there is ongoing work aimed at supporting these teams in a context of agile methodologies.

**Keywords:** *systems approach, agile software development methodologies, distributed programming teams*

Dariusz Dereniowski, Marek Kubale: **A Formal Model for the Bug Localization Problem** • Automatyka 2007, t. 11, z. 1–2

There are several criteria for testing program correctness. In this paper we deal with the problem of automatic software testing under the assumption that the set of tests (assertions) is given for selected blocks of code. We simplify the analysis by assuming that the program being tested contains exactly one bug, but this does not lead to loss of generality. We consider some practical aspects of the above problem and a graph-theoretical model in general as well as some chromatic aspects of a graph searching model in particular.

**Keywords:** *graph, graph coloring, software testing*

Grzegorz Dobrowolski, Jarosław Koźlak, Edward Nawarecki: **Modelling of Anomalies and Crisis Situations in Decentralised Systems** • Automatyka 2007, t. 11, z. 1–2

In this paper examples of the application of a multi-agent approach are given for modelling and the optimising of handling anomalies and crisis situations within the scope of supply chains and city traffic. The system for modelling supply chains takes into consideration auctions led among contractors and prestige parameter which describes the relationships among the pairs of companies. The system for modelling city traffic is based on the concept of cellular automaton and an algorithm of rotating discs responsible for the traffic lights configuration.

**Keywords:** *multi-agent systems, supply chains, modelling and optimisation of city traffic, anomalies, crisis situations*

Jan Tadeusz Duda: **Statistical and Rule-Enhanced Methods of Time Series Segmentation** • Automatyka 2007, t. 11, z. 1–2

Time series segmentation techniques based on statistical tests are discussed. A generalization of Likelihood-Ratio Tests (LRT) is proposed, dedicated for detection of trend changes under auto-correlated noise. An evaluation of segmentation reliability with LRT is

presented. It is shown that high efficiency of segmentation can be reached by rule-enhanced statistical tests, with spectral properties of noise being taken into account. The presentation is completed with convincing examples of application of the modified methods.

**Keywords:** *time series segmentation, statistical tests, rule-enhanced segmentation, Likelihood-Ratio Test*

Józef Grabowski, Jarosław Pempera: **The Methods of Diversification of Local Search in Flow Shop Problem with Sum of Completion Times Criteria** • *Automatyka* 2007, t. 11, z. 1–2

In this paper we consider the flow shop problem with sum of completion times criteria. We present several methods of diversification of local search, which are applied to the construction of the tabu search algorithm. Computation experiments using benchmark problems demonstrate the high effectiveness of proposed methods.

**Keywords:** *tabu search, diversification, flow shop, sum of completion times criteria*

Waldemar Kaczmarczyk: **Distribution Planning for Variable Demand under Vendor Managed Inventory Contract** • *Automatyka* 2007, t. 11, z. 1–2

This paper addresses coordinated production and distribution planning for one producer of car parts to several clients under Vendor Managed Inventory contract. According to this contract producer is responsible for safety stocks at all locations. Paper presents mixed integer programming model for this problem and analysis of potential uncertainty sources and their modeling alternatives.

**Keywords:** *coordination of production and distribution, mixed integer programming*

Waldemar Kaczmarczyk: **Reformulations of the Proportional Lot-Sizing and Scheduling Model with Identical Parallel Machines** • *Automatyka* 2007, t. 11, z. 1–2

This paper addresses mixed integer programming models of the lot-sizing and scheduling problems for several products on identical parallel machines with limited capacity. Presented model allow processing of two products in single period and explicit model processing times before and after changeovers. In this paper are presented reformulations and valid inequalities for these models,

and also extensions for case of unrelated machines and long setup times overlapping two periods.

**Keywords:** *production, lot-sizing and scheduling, mixed integer programming*

Piotr Kadłuczka, Wojciech Chmiel: **Exploitation of Properties of QAP Problem in Evolutionary Algorithms Construction** • Automatyka 2007, t. 11, z. 1–2

The paper presents an approach to an implementation and evaluation of evolutionary algorithm using operators exploiting peculiar properties of QAP problem. They are based on expected conditional value of objective function for partially fixed solutions. The numerical experiments were performed for standard test problems of quadratic assignment problem (QAP) from QAPLIB-A library. We compare the results of algorithms using pseudo-genetic operators which exploit some QAP problem properties with results obtained from algorithms using standard pseudo-genetic operators for permutation problems.

**Keywords:** *quadratic assignment problem, QAP, approximate algorithms, evolutionary algorithms, genetic operators, conditional expected value of objective function*

Piotr Kadłuczka, Jacek Piwowarczyk, Wojciech Chmiel: **Concurrent Evolutionary Algorithm with Self-Adaptation** • Automatyka 2007, t. 11, z. 1–2

The paper presents intelligent agent approach to multipopulation evolutionary algorithm with self-adaptation. The approach is based on different areas as software engineering, parallel and distributed systems and artificial intelligence. This technology belongs to up to date researches in the construction of hybrid approximate methods.

**Keywords:** *concurrent evolutionary algorithm, intelligent agent system, parallel algorithm, multipopulation evolutionary algorithm, TSP – traveling salesman problem*

Joanna Kwiecień, Bogusław Filipowicz: **The Application of Queueing Theory in Modelling of Elementary Mental Processes** • Automatyka 2007, t. 11, z. 1–2

In this paper Authors present a queueing network architecture called QN-MHP and modeling of human performance in different situations, taking account incorrect performance of individual sys-

tems which could be reflection of incorrect operations of some brain areas. Utilization of systems in QN-MHP and optimal routing of information entities have been obtained for selected example.

**Keywords:** *queueing networks, modeling of mental processes*

Piotr Łebkowski: **Petri Nets of the Materials Flow at the Steel Plant** • Automatyka 2007, t. 11, z. 1–2

A Petri deterministic time net applied to the modelling of the material flow at the steel plant is a very effective research tool. This paper presents a Petri net expanded with the attribute vectors of places and transitions, as well as the logical rules of transition launching and the procedures that update the attribute values. Owing to such an expansion, we can observe the properties of the streams that flow through the system, e.g. the costs and the project completion time, simulate the effects of the changes introduced into the system and analyse the results of unexpected disturbances and the breaks in the supply chain.

**Keywords:** *time Petri nets, material flow, supply chain, model of steel plant*

Marek Magiera: **Comparative Analysis of the Three Production Planning Methods for Flow Shops without Stores** • Automatyka 2007, t. 11, z. 1–2

The three methods of production planning for multistage systems without intermediate buffers are presented. The two methods are hierarchical and the one is monolithic. The methods are constructed for machine loading and task scheduling. The mathematical linear models are constructed for the methods. The time criterion is used in the mixed integer programming. Results of computational experiments with the proposed approaches for production planning are presented. The maximum workloads and CPU run times are compared for all methods.

**Keywords:** *production planning, integer programming, flexible manufacturing systems, scheduling*

Wojciech Mitkowski, Krzysztof Oprzędkiewicz: **A Robust Discrete Dynamic Compensator for an Uncertain-Parameter Parabolic System** • Automatyka 2007, t. 11, z. 1–2

In the paper problems of synthesis of finite-dimensional, discrete dynamic feedback for a class of uncertain-parameter linear parabolic systems are presented. The dynamic feedback should

assure the exponential stability with fixed damping coefficient in the whole uncertain parameters area. In the paper a simple method of construction a robust compensator was proposed. A computational example was also given.

**Keywords:** *parabolic systems, uncertain parameter systems, discrete dynamic feedback*

Grzegorz J. Nalepa, Antoni Ligeza, Igor Wojnicki: **From Content to Knowledge: a Perspective on CMS** • Automatyka 2007, t. 11, z. 1–2

Building efficient tools for supporting Knowledge Management is a hot research topic and a great challenge for modern computer science. Increasing functionality of web applications and almost unlimited computational power of modern hardware seems to promise that solving this problem is a matter of time. Up to now efficient database technology has been developed and web technology has achieved relatively satisfactory level. However, the goal to build a real knowledge servers seem still far from being realistic. The paper discusses certain issues concerning the so-called Content Management Systems (CMS) which can be regarded as a partial solution with respect to knowledge storing, retrieval and presentation. Contemporary tools and techniques applied in CMS are presented in brief and future problems to be solve are identified.

**Keywords:** *knowledge management, content management, web technologies*

Krzysztof Oprzędkiewicz: **An Implementation of Special Control Algorithms at the PC-Based “soft PLC” Platform** • Automatyka 2007, t. 11, z. 1–2

In the paper problems of implementation of special control algorithms: Smith’s Predictor, cancellation controller and finite-dimensional discrete dynamic compensator at the PC-based “soft PLC” platform are discussed. The implementation was realized with SIEMENS hardware and software use. In the paper a piece of elementary information about an experimental heat control plant and tested control algorithms were remembered, an architecture of a control system and results of tests covering real-time requirements meeting are also presented.

**Keywords:** *PC-based control, special control algorithms, PLC programming, time-delay systems*

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Tadeusz Sawik: **Integrated Scheduling in a Customer Driven Supply Chain** • Automatyka 2007, t. 11, z. 1–2

A mixed integer programming approach is proposed for a long-term, integrated scheduling of material manufacturing, material supply and product assembly in a customer driven supply chain. The supply chain consists of three distinct stages: manufacturer/supplier of product-specific parts, producer where finished products are assembled according to customer orders and a set of customers which generates final demand for the products. The overall problem is how to coordinate manufacturing and supply of parts and assembly of products such that the total supply chain inventory, manufacturing start-ups and parts shipping costs are minimized. Numerical examples modeled after a real-world integrated scheduling in a customer driven supply chain of high-tech products are presented and some computational results are reported.

**Keywords:** *supply chain optimization, production planning and scheduling, multiobjective integer programming*

Piotr Sienkiewicz: **Mathematical Confrontational States Models** • Automatyka 2007, t. 11, z. 1–2

The evolution of mathematical confrontational states models such as combat and war has been described in the article. The evolution starts from linear Lanchester's models and ends at modern non linear models. Assessment of progress confrontational systems theory has been done. It means theories which work in inhospitable environment.

**Keywords:** *linear models, war, mathematical models, conflict theory*

Piotr Sienkiewicz: **Optimization at Security Systems Management** • Automatyka 2007, t. 11, z. 1–2

The model of security systems management has been described in the article. Two levels control are considered in this model. The first level called local level consists of threat objects which have specific security potential. The second level called higher command (regional or central) includes objects with potential, which can be used to support local system during danger. The essence of security systems management is risk management.

**Keywords:** *security, risk management, systems*

Czesław Smutnicki, Adam Smutnicki: **New Properties of Cyclic Schedules in Flow Shop System** • Automatyka 2007, t. 11, z. 1–2

This paper deals with the deterministic variant of the problem of optimization cycle run in flow shop repetitive manufacturing system with no store constraints. Starting from earlier papers of the author on this subject, in this paper there are presented some, also new, properties with unpublished yet proofs, efficient algorithms of finding schedule for fixed order of processing tasks in the cycle as well as some experimental results.

**Keywords:** *scheduling, cyclic manufacturing, algorithm*

Wojciech Szmuc: **Coloured Petri Nets in UML Object Concept Modelling** • Automatyka 2007, t. 11, z. 1–2

The paper describes a use of coloured Petri nets in UML object concept modelling. The proposed solution provides a construction of net representing structural view of system. Dynamic entity creation is also supported. Coloured, hierarchical Petri net is an outcome of the algorithm. Size of the net is constant and independent with regard to object creation/destruction. This benefits in applicability of existing tools for building and systematic properties analysis of created model.

**Keywords:** *Petri net, UML, class diagram*

Adam Tyński: **Application of the New Crossover Operator for Solving the Job-Shop Scheduling Problem with Transportation** • Automatyka 2007, t. 11, z. 1–2

In the paper the new crossover quasi-operator *MX* utilizing path-relinking idea is presented. The operator has been embedded in the genetic algorithm used for heuristic solve the job-shop scheduling problem with transportation. In the mathematical model of the problem it is assumed, the assignment of transport activities to AGV vehicles is not given and constitutes an additional decision variable. As the optimization criterion the completion time of all jobs is assumed.

**Keywords:** *optimization, scheduling, genetic algorithms, AGV*

Konrad Wala: **Tabu Algorithm for Optimization of the Generalized Assignment Problem** • Automatyka 2007, t. 11, z. 1–2

In the paper the discrete model of generalized assignment problem is presented. For investigated NP-hard discrete optimization



problem we give detailed description of six constructive algorithms and as improving algorithm the tabu one with short and long term memory. Numerical results of improving processes for instances from the OR\_library are included.

**Keywords:** *generalized assignment problem, tabu algorithm, neighbourhood*

Małgorzata Żabińska: **Agent System for Realization of Operations** • Automatyka 2007, t. 11, z. 1–2

In the paper, a concept of agent system for performing services, meant as tasks comprising sequences of operations, eg such as in production systems has been shown. Assumptions for realization, and roles of agents in the system, system's functions and architecture based on agent platform Jade have been presented. Implementation elements of multiagent system prototype have been described, as well as the way of using the realized prototype.

**Keywords:** *agent, sequence of operations, multiagent system*