

JOURNAL OF TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY

Preface

This issue contains many interesting papers. The starting one, *Decision Support under Risk by Optimization of Scenario Importance: Weighted OWA Aggregations*, by Włodzimierz Ogryczak and Tomasz Śliwiński, addresses an important problem of evaluation of decision outcomes under several scenarios to form an overall objective functions; this is a basic problem in decision support under uncertainty. The proposed approach is to use a fuzzy operator defined as the so-called weighted OWA (WOWA) aggregation. The WOWA aggregation, similar to the classical ordered weighted averaging (OWA), uses the preferential weights assigned to the ordered values (i.e., to the worst value, the second worst and so on) rather than to the specific criteria. This makes it possible to model diverse preferences with respect to the risk. Simultaneously, importance weighting of scenarios can be introduced. In this paper, solution procedures are analyzed for optimization problems with the WOWA objective functions related to decisions under risk. Linear programming formulations are introduced for optimization of the WOWA objective representing risk averse preferences. Their computational efficiency is demonstrated.

The next paper, *Path Diversity Protection in Two-Layer Networks*, by Mateusz Dzida, Tomasz Śliwiński, Michał Zagożdżon, Włodzimierz Ogryczak, and Michał Pióro, addresses an optimization problem related to issues of future network architecture, namely, dimensioning links in a resilient two-layer network. A particular version of the problem which assumes that links of the upper layer are supported by unique paths in the lower layer is considered. Two mixed-integer programming formulations of this problem are presented and discussed. Direct resolving of these formulations requires pre-selection of “good” candidate paths in the upper layer of the network. Thus, the paper presents an alternative approach which is based on decomposing the resolution process into two phases, resolved iteratively. The first phase subproblem is related to designing lower layer path flows that provide the capacities for the logical links of the upper layer. The second phase is related to designing the flow patterns in the upper layer with protection assured through diversity of paths. In this phase we take into account the failures of the logical links that result from the failures of the lower layer links (so called *shared risk link groups*).

The third paper, *Hierarchical Multiobjective Routing in MPLS Networks with Two Service Classes – A Meta-Heuristic Solution*, by Rita Girão-Silva, José Craveirinha, and João Clímaco, begins by reviewing a two-level hierarchical multicriteria routing model for MPLS networks with two service classes (QoS and best effort services) and alternative routing, as well as the foundations of a heuristic resolution approach, previously proposed by the authors.

Afterwards a new approach is described, of metaheuristic nature, based on the introduction of simulated annealing and tabu search techniques in the structure of the dedicated heuristic. The application of the developed procedures to a benchmarking case study shows that, in certain initial conditions, this approach provides improvements in the final results, especially in more “difficult” situations detected through sensitivity analysis.

The fourth paper, *Propagation Path Loss Modeling in Container Terminal Environment*, by Ryszard J. Katulski, Jacek Stefański, and Jarosław Sadowski, describes a novel method of path loss modeling for radio communication channels in container port area. Multivariate empirical model is presented, based on multidimensional regression analysis of real path loss measurements from container terminal environment. The measurement instruments used in propagation studies in port area are also described.

The fifth paper, *Model for Balancing Aggregated Communication Bandwidth Resources*, by Piotr Pałka, Kamil Kołtyś, Eugeniusz Toczyłowski, and Izabela Żółtowska, presents a multicommodity bandwidth exchange model BACBR (balancing aggregated communication bandwidth resources) for the purpose of aggregating similar offers in bandwidth market auctions and market clearing. In this model offers submitted to sell (or buy) the same, similar, or equivalent network resources (or demands for end-to-end connections) are aggregated into single commodities. BACBR model is based on an earlier balancing communication bandwidth trade (BCBT) model. It requires much less variables and constraints than original BCBT, however, the outcomes need to be disaggregated. The general model for disaggregation is also given in the paper.

The sixth paper, *Incorporating Customer Preference Information into the Forecasting of Service Sales*, by Piotr Rzepakowski, describes the phenomenon of customers preference change when they are getting more familiar with services or being motivated to change their buying habits. Different sources of motivation induce customers to change their behavior: an advertisement, a leader in a reference group, satisfaction from services usage and other experiences, but usually those reasons are unknown. Nevertheless, people vary in susceptibility to suggestions and innovations, and also in preference structure change dynamics. Historical information about the preference structure gives additional information about uncertainty in forecasting activity. In this work the conjoint analysis method was used to find customer preference structure and to improve a prediction accuracy of telecommunication services usage. The results have shown that prediction accuracy increases about by one percent point, what results in a 20 percent increase after using proposed algorithm modification.

The seventh paper, *Multiobjective Approach to Localization in Wireless Sensor Networks*, by Michał Marks and Ewa Niewiadomska-Szynkiewicz, describes a complex problem of wireless sensor network localization that can be solved using diverse types of methods and algorithms. There are several criteria which are essential when we consider wireless sensor networks. The objective is to determine accurate estimates of nodes location under the constraints for hardware cost, energy consumption and computation capabilities. In this paper the application of stochastic optimization for performing localization of nodes is discussed. Two phase scheme is described that uses a combination of the trilateration method, along with the simulated annealing optimization algorithm. Two variants of proposed technique are discussed, i.e., centralized and distributed. The attention is paid to the convergence of proposed algorithm for different network topologies and trade-off between its efficiency and localization accuracy.

The eighth paper, *Comparative Study of Wireless Sensor Networks Energy-Efficient Topologies and Power Save Protocols*, by Ewa Niewiadomska-Szynkiewicz, Piotr Kwaśniewski, and Izabela Windyga, describes ad hoc networks that are the ultimate technology in wireless communication that allow network nodes to communicate without the need for a fixed infrastructure. The paper addresses issues associated with control of data transmission in wireless sensor networks (WSN) – a popular type of ad hoc networks with stationary nodes. Since the WSN nodes are typically battery equipped, the primary design goal is to optimize the amount of energy used for transmission. The energy conservation techniques and algorithms for computing the optimal transmitting ranges in order to generate a network with desired properties while reducing sensors energy consumption are discussed and compared through simulations. A new clustering based approach is described that utilizes the periodical coordination to reduce the overall energy usage by the network.

The ninth paper, *Parallel and Distributed Simulation of Ad Hoc Networks*, by Andrzej Sikora and Ewa Niewiadomska-Szynkiewicz, describes advances in modeling and simulation as traditional methods used to evaluate wireless network design. This paper addresses issues associated with the application of parallel discrete event simulation to mobile ad hoc networks design and analysis. The basic characteristics and major issues pertaining to ad hoc networks modeling and simulation are introduced. The focus is on wireless transmission and

mobility models. Particular attention is paid to the MobASim system, a Java-based software environment for parallel and distributed simulation of mobile ad hoc networks. The design, performance and possible applications of presented simulation software are described.

The tenth paper, *The Non-Didactic Aspects of e-Learning Quality*, by Ewa Stemposz, Andrzej Jodłowski, and Alina Stasiecka, presents results of research on the quality of e-learning transcending the classical didactic point of view. It illustrates a discussion of criteria, measures or metrics developed on the basis of statistical analysis of data gathered from e-learners that evaluated the quality exploited e-learning applications and systems. The main contribution of the paper is the proposal for the quality metrics with the features concerning e-learning platforms in the technological and human aspects.

The eleventh paper, *Heuristic Analysis of Transport System Efficiency Based on Movement of Mobile Network Users*, by Grzegorz Sabak, describes results of introductory research focused on possibility to use location data available in a mobile network for the analysis of transport system status and efficiency. The details of a system capable of detecting abnormal traffic situation (accidents, heavy congestion) are described. This system (called VASTAR) uses a neural network to learn and store certain characteristic of the analyzed part of a road system. Based on a measured divergence from normal characteristic, a notification about non-typical situation is triggered. The results of a computational experiment using real-world location data and simulation of abnormal situation are provided. The proposed system can be a relatively low cost way to improve competitiveness of a mobile network operator by allowing him to offer new type of informational service. It could also aid municipal authorities by providing support for decisions regarding road traffic control and management and be used by emergency services as a monitoring an alarming tool for detecting abnormal road traffic situations when other means of observation are unavailable.

The twelfth paper, *Analytical Modeling of the WCDMA Interface with Packet Scheduling*, by Maciej Stasiak, Piotr Zwierzykowski, and Janusz Wiewióra, presents the application of a new analytical model of the full-availability group carrying a mixture of different multi-rate traffic classes with compression property for modeling the WCDMA radio interface with packet scheduling. The proposed model can be directly used for modeling of the WCDMA interface in the UMTS network servicing different traffic classes. The described model can be applied for a validation of the efficiency of the WCDMA interface measured by the blocking probability and the average carried traffic for particular traffic classes.

The thirteenth paper, *Perspective for Using the Optical Frequency Standards in Realization of the Second*, by Karol Radecki, concerns an alternative definition of the second. The second is currently defined by the microwave transition in cesium atoms. Optical clocks offer the prospects of stabilities and reproducibilities that exceed those of cesium. This paper reviews the progress in frequency standards based on optical transitions, recommended by International Committee for Weights and Measures, as a secondary representation of the second. The operation of these standards is briefly described and factors affecting stability and accuracy of these and some new optical clocks are discussed.

The fourteenth paper, *PHY Abstraction Methods for OFDM and NOFDM Systems*, by Adrian Kliks, Andreas Zalonis, Ioannis Dages, Andreas Polydoros, and Hanna Bogucka, presents diverse PHY abstraction methods for both orthogonal and non-orthogonal systems are presented, which allow to predict the coded block error rate (BLER) across the subcarriers transmitting this FEC-coded block for any given channel realization. First the efficiency of the selected methods is investigated and proved by the means of computer simulations carried out in orthogonal multicarrier scenario. Presented results are followed by the generalization and theoretical extension of these methods for non-orthogonal systems.

The fifteenth paper, *Technical and Regulatory Issues of Emergency Call Handling*, by Wojciech Michalski, presents selected technical and regulatory aspects of emergency call handling in communication between citizens and authorities in case of distress. Among the most important technical aspects of emergency call handling are recognition and treatment of emergency call by originating network, routing of such call to the appropriate public safety answering point (PSAP), delivering call-related information to the PSAP as well as architecture and organization of PSAPs. From the legal point of view, of importance are the obligations for the Member States and stakeholders involved in E112 project included in the EU directives, actions of European Commission related to providing access to the location information as well as obligations concerning emergency call handling included in Polish national law.

We wish the Readers interesting reading.

Andrzej P. Wierzbicki
Guest Editor

