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Preface

This issue contains ten papers, four of which deal with multi-objective optimization problems in contemporary telecommunications, the remaining six with diverse problems of knowledge engineering or optimization related to telecommunications or information society.

Teresa Gomes and José Craveirinha in the paper *An Algorithm for Enumerating SRLG Diverse Path Pairs* start with the premise that telecommunication networks are intrinsically multi-layered, a single failure at a lower level usually corresponds to a multi-failure scenario at an upper layer. In this context, the concept of shared risk link group (SRLG) diverse path set may be defined as a set of paths, between an origin and a destination, such that no pair of paths can be simultaneously affected by any given failure (or risk) in a single failure scenario. Firstly we present the formulation of the SRLG diverse path pair calculation problem in a directed network. An algorithm for enumerating SRLG diverse paths, by non decreasing cost of their total (additive) cost will be presented, which is based on an algorithm proposed for generating minimal cost node disjoint path pairs. The SRLG diverse path pairs may be node or arc disjoint, with or without length constraints. Computational results are presented to show the efficiency of the proposed algorithm for obtaining node or arc disjoint SRLG diverse path pairs in undirected networks.

Carlos Simões, Teresa Gomes, José Craveirinha, and João Clímaco in their paper *Performance Analysis of a Bi-Objective Model for Routing and Wavelength Assignment in WDM Networks* recall that establishing end-to-end connections on wavelength division multiplexing (WDM) networks requires setting up lightpaths, defining the sequence of optical fibres and the wavelength in each fibre (the routing and wavelength assignment problem) for traffic flow. This paper reviews a bicriteria model for obtaining a topological path (unidirectional or symmetric bidirectional) for each lightpath request in a WDM network, developed by the authors, and presents a performance analysis of the model by considering important network performance measures. A performance analysis of the two bicriteria model is presented, comparing the performance metrics obtained with the monocriterion models using the same objective functions, in five different standard reference networks.

The same authors in the paper *Performance Analysis of a Bi-Objective Model for Routing with Protection in WDM Networks* add the issue of a fault management scheme in WDM's in order to avoid the huge loss of data that can result from a single link failure. Dedicated path protection, which establishes two end-to-end disjoint routes between the source-destination

node pair, is an effective scheme to preserve customers' connections. This paper reviews a bicriteria model for dedicated path protection, that obtains a topological path pair of node-disjoint routes for each lightpath request in a WDM network, developed by the authors. A performance analysis of the bicriteria model is then presented, comparing the performance metrics in a similar setting as in the previous paper.

Michał Marks in the paper *A Survey of Multi-Objective Deployment in Wireless Sensor Networks* addresses the problem in designing wireless sensor networks (WSNs) that relates to finding a tradeoff between the desired requirements for the lifetime, coverage or cost of such a network while coping with the computation, energy and communication constraints. The paper examines the optimal placement of nodes for a WSN in a multi-objective formulation. It is impossible to consider the deployment of the nodes separately from WSNs applications. The properties of WSNs applications that determine the placement problem are highlighted. Diverse objectives that should be considered are defined and enumerated. The paper provides an overview and concentrates on multi-objective strategies, their assumptions, optimization problem formulations and results.

Cezary Chudzian and Jarosław Sobieszek in the paper *Personal Ontologies for Knowledge Acquisition and Sharing in Collaborative PrOnto Framework* summarize preliminary experiences with a prototype framework for collaborative knowledge acquisition and sharing, called PrOnto. At the moment the artifacts that are organized and shared are typical sources of scientific knowledge, namely journal papers and web pages. In PrOnto two interrelated explicit levels of knowledge representation are introduced: keywords and ontological concepts. Each user of the framework maintains his own ontological profile, consisting of concepts and each concept is, in turn, by subjective user's decision, related to a set of weighted keywords that define its meaning. Furthermore, dedicated indexing engine is responsible for objectively establishing correspondence between documents and keywords, or in other words, the measure of representativeness of the keyword to document's content. Developing an appropriate knowledge model is a preliminary step to share it efficiently. The higher level representation facilitates exploration of other people's areas of interest. PrOnto gives an opportunity to browse knowledge artifacts from the conceptual point of view of any user registered in the system. The paper presents the ideas behind the PrOnto framework, gives an outline of its components and finalizes with a number of conclusions and proposals for future enhancements.

Ewa Niewiadomska-Szynkiewicz and Michał Marks in the paper *A Software Platform for Global Optimization* address issues associated with the global optimization algorithms, which are methods of finding optimal solutions for complex (non-convex, discrete, etc.) problems. The paper focuses on an integrated software environment – global optimization object-oriented library (GOOL), which provides the graphical user interface together with the library of solvers for convex and nonconvex, unconstrained and constrained, although mostly non-discrete problems. The design, performance and possible applications of the GOOL system are described. A practical example – price management problem – is provided to illustrate the effectiveness and range of applications of the software tool.

Agnieszka Gosk in the paper *Query Optimization in Teradata Warehouse* presents a definition of the active data warehousing (ADW) paradigm. One sort of data warehouses which is consistent with this paradigm is teradata warehouse. Therefore, the basic elements of the teradata architecture are described, such as processors parsing engine (PE) and access module processor (AMP). Emphasis was put on the analysis of query optimization methods. The impact of a primary index on the time of query execution is discussed. Furthermore, the paper shows different methods of optimization of data selection, data joins and data aggregation. All these methods can help to minimize the time for data processing. The paper presents experiments which show the usage of different methods of query optimization. Conclusions about different index usage are included.

Paweł Białoń in the paper *Solving Support Vector Machine with Many Examples* presents and compares various methods of dealing with linear support vector machine (SVM) problems with a large number of examples. The author believes that some interesting conclusions from this critical analysis apply to many new optimization problems and indicate in which direction the science of optimization will branch in the future. This direction is driven by the automatic collection of large data to be analyzed, and is most visible in telecommunications. A stream SVM approach is proposed, in which the data substantially exceeds the available fast random access memory (RAM) due to a large number of examples. Formally, the use of RAM is

constant in the number of examples (though usually it depends on the dimensionality of the examples space). It builds an inexact polynomial model of the problem. Another approach is exact. It also uses a constant amount of RAM but also auxiliary disk files, that can be long but are smartly accessed. This approach bases on the cutting plane method, similarly as Joachims' method (which, however, relies on early finishing the optimization).

Wojciech Szynkiewicz in the paper *Planning System for Multi-Agent Based Reconfigurable Fixtures* describes a concept of the planning system for self adaptable, reconfigurable fixtures composed of mobile locators (robotic agents) that can freely move on a bench and reposition below the supported part, without removing the part from the fixture. The main role of the planner is to generate the admissible plan of relocation of the mobile agents. A constrained nonlinear optimization problem is formulated to find the optimal locations for supporting heads.

Mahmoud Youssuf and Mohamed Z. Abdelmageed in the paper *Performance Analysis of Hybrid Phase Shift Keying over Generalized Nakagami Fading Channels* consider hybrid phase shift keying (HPSK) modulation that reduces the peak to average power ratio of the transmitted signal, reduces the zero crossings and the $0°$-degree phase transmissions, but also enhances the reduction of the bit error rate (BER) measure of the signal performance. The properties of HPSK are analyzed, and an expression for the conditional probability of HPSK modulation over additive white Gaussian noise (AWGN) is derived. This BER measure of HPSK is shown to outperform quadrature phase shift keying (QPSK) modulation. HPSK performance through a generalized Nakagami fading channel is also considered.

We wish our Readers an interesting reading time.

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Andrzej P. Wierzbicki
Guest Editor

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