Preface

Dr. András Prékopa, full member of the Hungarian Academy of Sciences, Professor Emeritus of the Operations Research Department of Eötvös Loránd University of Sciences and of Rutgers Center of Operations Research, Széchenyi prize winner Hungarian mathematician, passed away in Budapest at the age of 87 on the 18th of September 2016. In addition to being an internationally leading researcher he is truly the Father of operations research (OR) in Hungary. For his major achievements and contributions to the science of OR he was also awarded "Honorary Doctorate" by the Óbuda University. This volume of Acta Polytechnica Hungarica (APH) is devoted to his memory.

Originally, the idea of the APH volume came from András Bakó the founding editor of the journal. He was assigned the position of editor-in-chief of this volume with two co-editors István Maros and Tamás Szántai. While the work was well in progress András Bakó suddenly and unexpectedly passed away. The two co-editors took over the job and did the rest of the work. Herewith we pay tribute to András Bakó for his unforgettable personality, for his original thinking, his contributions to the theory and practice of operations research and also for his care for others.

The volume contains 13 accepted papers that have undergone the strict editorial procedure of APH.

Bakó and Gáspár summarize the development procedure of the optimal maintenance and rehabilitation strategies (models) of roads and bridges in Hungary. In these models the deterioration depending on time and other parameters is given by Markov transition probability matrices. The paper presents the development phases of models concentrating not only on economic aspects but also environmental (sustainability) ones, as well. The Hungarian multi-periodical PMS model was one of the very first models applying total optimization over a ten years' time horizon.

Smidla and Maros study the possibility of improving the accuracy of certain additive floating point operations, especially that of the vector-vector addition and dot-product operations. In stabilized dot product calculations it is customary to use branching which makes it a bottleneck in parallel computations The authors define the „safe add" operation and show how it can be implemented on modern SIMD architecture. They show that the operations can be executed without loss of time and the increased accuracy dot products can be computed without branching. The summarized results of a computational study are also presented.

Böröcz, Tar and Maros perform a thorough comparison of vector operations of open-source linear optimization kernels: CLP, GLPK and Pannon Optimizer (PO). Such kernels are responsible for the speed and accuracy of most optimization algorithms. In PO they introduce a new data type for sparse computing called

indexed dense vectors and point out its beneficial properties that make PO more than competitive among the investigated kernels.

Szántai, on the basis of an earlier Hungarian language paper by Prékopa, Szántai and Zsuffa, investigates the water streamflow on probability theoretical bases. It is shown that under some realistic conditions its probability distribution is of gamma type. Then the optimal capacity of a storage reservoir is determined. In a second model optimal water release policy is sought, given that water demands should be met by a prescribed large probability. Finally, in addition to the aforementioned reliability type constraint an upper bound is imposed on the number of days when demands may not be met and the cost of the intake facility is to be minimized.

Szántai, Kovács and Egri are dealing with forecasting of the demand during a sales period. They present two dynamic methodologies for calculating the quantity which has to be placed on the shelves at the beginning of each day such that some constraints expressing lower and upper bounds on the quantities are kept. Both methodologies are new to this field and are useful because of some specific properties of the problem. The new methods use historical data of the demands in previous promotions and the consumptions registered in the previous days. Since the promotion period is relatively short, other methods such as time series analysis can hardly be used.

Fábián, Csizmás, Drenyovszki, van Ackooij, Vajnai, Kovács and Szántai propose a new algorithm for probability maximization under linear constraints by inner approximation. The proposed algorithm has the advantage that it can easily be implemented and is immune to possible noises in gradient computation. They prepared a simple implementation of the proposed new algorithm and show that it is quite reliable and robust.

Illés and Lovics present a new computational method for the linearly constrained convex multi-objective optimization (LCCMO) problem. They propose some techniques for finding joint decreasing directions for both the unconstrained and the linearly constrained case. Utilizing these techniques, they introduce a method using a subdivision technique to approximate the whole Pareto optimal set of the LCCMO problem.

Izsák and Szeidl are dealing with species abundance models. They suppose the process describing the entering time points of the new species in the system to be Poisson process. In earlier papers the Poisson process was supposed to be homogeneous when the logarithmic distribution played important role in description of the model parameters. In the present paper the authors showed that in the case of inhomogeneous Poisson process the Yule distribution takes over the role of the logarithmic distribution.

Bánhelyi, Csendes, Krisztin and Neumaier give an elementary derivation of a bounding scheme to prove Wright's conjecture on the delay differential equation. Then the elaborated bounding scheme can be applied in a verified computational

algorithm for systematic checking the parameter value α in the delay differential equation. Earlier the authors worked out a simpler technique for doing this. By applying this it was possible to prove the truth of Wright's conjecture for $\alpha \in [1.5, 1.5706]$. The main goal of the present paper is to improve the upper limit point of this interval. By applying the described bounding technique the authors continued the computational part of the proof with unchanged theoretical background and they were able to increase the upper limit of the interval up to 1.57065. However the time of computation for this was more than 466 hours (almost 20 days) on a quite strong PC configuration. So the authors conclude that additional theoretical insight should be utilized to achieve a substantial progress in the proven α values.

Abaffy and Galántai present a bisection type global optimization algorithm for continuous real functions over a rectangle. The suggested method combines the branch and bound technique with an always convergent solver of underdetermined nonlinear equations. The paper concludes with a detailed numerical testing of the algorithm.

Dombi, Jónás and Tóth elaborate a new probability distribution which they call epsilon probability distribution. First they introduce the concept of the *n*-th order epsilon differential equation then show that the solution of the 0-th order epsilon differential equation is the exponential function. They solve the 1-st order epsilon differential equation and its solution, which is a power function, they call epsilon function. As an interesting fact they show that this function is in a strong connection with the Dombi operators in continuous logic. Using this new function a new probability distribution is constructed which is called the epsilon probability distribution. It is proved that the epsilon probability distribution is asymptotically equivalent to the exponential probability distribution. The hazard function of the new epsilon probability distribution is determined and its advantages are shown in a practical example.

London, Gera and Bánhelyi examine Markowitz portfolio selection using various estimators of expected returns and filtering techniques for correlation matrices. They use several methods to estimate expected returns. The authors conclude that the James-Stein estimator improves the reliability of the portfolio. It means that the realized risk is closer to the estimated risk in the investigated case.

Fullér, Harmati and Várlaki summarize the measures of dependence between possibility distributions known in the literature. One of them is the measure of possibilistic correlation between marginal possibility distributions of a joint possibility distribution what can be defined as the weighted average of the probabilistic correlations between marginal probability distributions whose joint probability distribution is defined as uniform distribution on the level sets of their joint possibility distribution. Using the averaging technique they discuss three quantities (correlation coefficient, correlation ratio and informational coefficient of correlation) which are used to measure the strength of dependence between two

possibility distributions. They also discuss the cases when the level sets of joint possibility distribution are equipped with non-uniform probability distributions.

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