EXPERT REVIEW

on the habilitation application of György Dósa

György Dósa PhD, DSc, associate professor has submitted his application for habilitation titled "Tight Results for some Classical Bin Packing Algorithms" of the Doctoral School of Information Science and Technology of Pannonia University.

The habilitation application (286 pages) and the habilitation thesis (26 pages) include all the documents and data prescribed by the Habilitation Regulation of Pannonia University and the supplementary Habilitation Regulation of the Doctoral School of Information Science and Technology of Pannonia University in detail.

The main scientific results of György Dósa stated in the Thesis related to the classical problem of one-dimensional Bin Packing belong to combinatorial optimization, which have many applications in the area of computer science and operations research.

It is known from scientific literature (e.g., Coffman, Garey, Johnson 1997) that the Bin Packing problem has been also of fundamental theoretical significance because it led firstly to the classical approaches to analyzing the performance of approximation algorithms for determining worst-case performance ratios, identifying lower bounds on the best possible online performance, and analyzing average-case behavior.

The general one-dimensional Bin Packing (BP) problem is the following. We are given a set of items with sizes $0 < p_1, p_2, \ldots, p_n < 1$. Determine (exactly or approximately) the minimum number of unit-capacity bins, into which all items can be packed in such a way that the sum of the sizes of items being packed into each bin is at most 1.

In case of the Cardinality Constrained Bin Packing problem (CCBP) an integer parameter k is also given and the further condition is that each bin can contain at most k items.

In case of Batched Bin Packing problem (BBP) items come in K consecutive batches, and the items of the earlier batches must be packed without any knowledge of later batches.

There are two main versions of BP, i.e. the offline and the online case. The offline problem, where all information about the data set are known before running an algorithm, is well-known to be *NP*-hard, therefore approximation algorithms are needed, which run in polynomial time, and they find optimal or near-optimal solutions. Some classical fundamental

approximation algorithms, determined by several rules of packing, are considered in the literature such as First Fit (FF), Best Fit (BF), and First Fit Decreasing (FFD).

The Author has summarized his research results of the past approximately in the past 10 years in five complex thesis points related to the offline BP problems and to the FF, BF and FFD algorithms.

The reviewer is quite at ease when assessing the quality of the scientific results of the applicant. A certain number of the results solve such problems and give final answers thereto which have been unsolved and open for four decades for optimum number related to the algorithms. The results are included point by point in the 5 theses.

The Thesis of the applicant deals with the efficiency of different algorithms which is a highly important area from both practical and theoretical point of view in the field of Bin Packing algorithms. With regard thereto, the Thesis contains such breakthrough solutions, which give final answers to such questions, which has been unsolved for several decades. In proving the results, the significant enhancement of the well-known methods, new ideas and new sophisticated methods were required.

Concerning the examined area at issue, it is worth mentioning that it has deep roots in the Hungarian tradition as well. Note that on the basis of results stated in the Thesis, the applicant earned this year the DSc degree of the Hungarian Academy of Sciences.

Without going into unnecessary detail it is worth mentioning that the educational activity of György Dósa is also outstanding. He by far overachieves (at times multifold) the formal criteria prescribed in the regulations and meets the high quality requirements stipulated in the application.

CONCLUSION

Based on the above described achievements I do propose to start the public phase of the habilitation procedure of György Dósa and support him that the habilitation title be awarded to him.

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