

Laudatio Test of Time Award WG, 2019

Hans L. Bodlaender, Rolf H. Möhring, Gerhard J. Woeginger

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At the meeting of the Steering Committee of WG 2017, it was decided to install the *WG Test of Time* award, to honour papers that appeared in a past WG, and that have proven to be very influential afterwards, and, with the paper, also to honour the authors.

The winner of the second WG Test of Time award was decided by a committee consisting of Hans Bodlaender, Rolf Möhring, and Gerhard Woeginger. This time, the award committee mainly concentrated on the papers that appeared during the years 1978-1983. The committee selected several papers that stood the test of time in a remarkable way, discussed their merits, and then unanimously agreed on a paper from the ninth Workshop on Graph Theoretic Concepts in Computer Science that took place in 1983 in Haus Ohrbeck near Osnabrück, Germany.

The paper that wins the second WG Test of Time award is:

“A local-ratio theorem for approximating the weighted vertex cover problem” written by Reuven Bar-Yehuda and Shimon Even

Many congratulations to the authors.

In their paper, the authors derive a polynomial time approximation algorithm for the vertex cover problem. A vertex cover for a vertex-weighted graph is a subset of the vertices, such that each edge has at least one endpoint in the subset. An approximation algorithm has performance guarantee R , if for every input graph it returns a vertex cover whose weight is at most R times as large as the weight of the cheapest possible vertex cover. Many approximation algorithms with performance guarantee $R = 2$ have been constructed for vertex cover over the years, some of which appeared before the paper by Bar-Yehuda and Even, some of which appeared later, and nowadays there is evidence that the value $R = 2$ actually can not be beaten.

The main contribution of Bar-Yehuda and Even is not in the concrete value of their performance bound, but in the underlying method that their

paper introduces: The local-ratio method. The technical main idea is to decompose the vertex weights in an optimal solution and in an approximate solution, and to establish connections between these two decompositions. The technique is remarkably simple and elegant, and can be applied to a variety of fundamental optimization problems, including all kinds of covering and packing problems in network design, scheduling theory, graph algorithms, etc. For instance, Bafna, Narayanan and Ravi applied the technique in 1996 to the feedback vertex set problem, and Fujito applied it in 1998 to approximate certain vertex-deletion problems in graphs.

The local-ratio method has triggered a long sequence of applications, variations and strengthenings. It has become a central tool in the development of approximation algorithms, and its impact goes far beyond graph theory. Google scholar (accessed on May 25, 2019) lists 495 citations to the award paper, and there are hundreds of further citations to the follow-up papers that applied and extended the technique to other problems.

The award paper started an entire branch of approximation algorithms and hence is a worthy winner of the 2019 *WG Test of Time* award. We are proud that WG has produced papers that so evidently stood the test of time.