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Average-case analyses of first fit and random fit bin packing. (English) Zbl 0953.68146

Summary: We prove that the First Fit bin packing algorithm is stable under the input distribution $U\{k-2, k\}$ for all $k \geq 3$, settling an open question from the recent survey by E. G. Coffmann jun., M. R. Garey and D. S. Johnson [“Approximation algorithms for bin packing: A survey,” Approximation algorithms for NP-hard problems, D. Hochbaum (ed.) (Boston, 1996)]. Our proof generalizes the multidimensional Markov chain analysis used by Kenyon, Sinclair, and Rabani to prove that Best Fit is also stable under these distributions [C. Kenyon, A. Sinclair and Y. Rabani, Biased random walks, Lyapunov functions, and stochastic analysis of Best Fit bin packing, Proc. Seventh Annual ACM-SIAM Symposium on Discrete Algorithms, 351-358 (1995)]. Our proof is motivated by an analysis of Random Fit, a new simple packing algorithm related to First Fit, that it is interesting in its own right. We show that Random Fit is stable under the input distributions $U\{k-2, k\}$, as well as present worst case bounds and some results on distributions $U\{k-1, k\}$ and $U\{k, k\}$ for Random Fit.

MSC:
68W05 Nonnumerical algorithms

Keywords:
First Fit bin packing algorithm

Full Text: DOI

References:

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