

On the k -Resource Problem

Marcin Bieńkowski

Institute of Computer Science, University of Wrocław, Poland

Abstract. We define a natural generalization of the prominent k -server problem, the k -resource problem. It occurs in metric spaces with some demands and resources given at its points. The demands may vary with time, but the total demand may never exceed k . The goal of an online algorithm is to satisfy demands by moving resources, while minimizing the cost for transporting resources.

We give an asymptotically optimal $\mathcal{O}(\log(\min\{n, k\}))$ -competitive randomized algorithm and an $\mathcal{O}(\min\{k, n\})$ -competitive deterministic one for the k -resource problem on uniform metric spaces consisting of n points. This extends known results for paging to the more general setting of k -resource. Basing on the results for uniform metric spaces, we develop a randomized algorithm solving the k -resource and the k -server problem on metric spaces which can be decomposed into components far away from each other. The algorithm achieves a competitive ratio of $\mathcal{O}(\log(\min\{n, k\}))$, provided that it has some extra resources more than the optimal algorithm.

References

1. M. Bieńkowski and J. Kutyłowski. The k -resource problem on uniform and on uniformly decomposable metric spaces. In *Proc. of the 10th Int. Workshop on Algorithms and Data Structures (WADS)*, pages 337–348, 2007.
2. M. S. Manasse, L. A. McGeoch, and D. D. Sleator. Competitive algorithms for server problems. *Journal of the ACM*, 11(2):208–230, 1990. Also appeared as Competitive algorithms for on-line problems in *Proc. of the 20th STOC*, pages 322–333, 1988.