A Competitive Online Algorithm for the Paging Problem with "Shelf" Memory

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Abstract

We consider an extension of the two-level online paging problem. Besides a fast memory (the cache) and a slow memory, we postulate a third memory, called the "shelf" in our paper, near the fast memory so that it takes less cost to store or retrieve a page from the shelf than to retrieve a page from the slow memory. Our goal is to establish an upper bound on the competitive ratio of this "three-level" memory paging problem. We show that unless per page storage costs more than per page retrieval from the shelf, a straightforward extension of the well-known LRU algorithm has competitive ratio of $2(k+l+1)$, where k and l are, respectively, the capacities of the cache and the shelf.