Abstract

In the reordering buffer problem a sequence of items located in a metric space arrive online, and have to be processed by a single server moving within the metric space. At any point in time, the first k still unprocessed items from the sequence are available for processing and the server has to select one of these items and process it by visiting its location. The goal is to process all items while minimizing the total distance the server moves. Englert, Räcke, Westermann (STOC'07) gave a deterministic $O(D \cdot \log k)$-competitive online algorithm for weighted tree metrics with hop-diameter D. We improve the analysis of this algorithm and significantly improve the dependency on D. Specifically, we show that the algorithm is in fact $O(\log D + \log k)$-competitive. Our analysis is quite robust. Even when an optimal algorithm, to which we compare the online algorithm, is allowed to choose between the first $h > k$ unprocessed items, the online algorithm is still $O(h \cdot (\log D + \log h)/k)$-competitive. For $h = (1 + \varepsilon) \cdot k$, with constant $\varepsilon > 0$, this is optimal. Our results also imply better competitive ratio for general metric spaces, improving the randomized $O(\log n \cdot \log^2 k)$ result for n-point metric spaces from STOC'07 to $O(\log n \cdot \log k)$.