The Accommodating Function – a generalization of the competitive ratio *†

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Abstract

A new measure, the *accommodating function*, for the quality of on-line algorithms is presented. The accommodating function, which is a generalization of both the competitive ratio and the competitive ratio on accommodating sequences, measures the quality of an on-line algorithm as a function of the resources that would be sufficient for an optimal off-line algorithm to fully grant all requests. More precisely, if we have some amount of resources n, the function value at α is the usual ratio (still on some fixed amount of resources n), except that input sequences are restricted to those where the optimal off-line algorithm will not obtain a better result by having more than the amount αn of resources.

The accommodating functions for three specific on-line problems are investigated: a variant of bin-packing in which the goal is to maximize the number of items put in n bins, the Seat Reservation Problem, and the problem of optimizing total flow time when preemption is allowed.

We also show that when trying to distinguish between two algorithms, the decision as to which one performs better cannot necessarily be made from the competitive ratio or the competitive ratio on

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accommodating sequences alone. For the variant of bin-packing considered, we show that Worst-Fit has a strictly better competitive ratio than First-Fit, while First-Fit has a strictly better competitive ratio on accommodating sequences than Worst-Fit.

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