Parameter Learning Algorithms in Online Scheduling

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The effeciency of online scheduling algorithms is usually measured by the competitive analysis, which is a worst case bound on the ratio of the cost of the online algorithm, and the optimal offline cost. Only a few result exists which investigate the average behavior of the algorithms on real inputs or on randomly generated inputs. Such results are presented for the multiprocessor makespan minimizing scheduling problem in [1], where it is shown that the simple List scheduling algorithm is not worst from the average case point of view than the much more difficult algorithms with better competitive ratio. In some scheduling model parametrized algorithms are developed and such parameter value is used which yields the best worst case bound for the algorithm. In this paper we investigate the question whether is it possible to improve the average efficency by an algorithm which learns the value of the parameter which results the smallest cost. We consider the problem of online multiprocessor scheduling with rejection which problem can be defined as follows.

There are jobs, and each job has a processing time and a penalty. The problem is online, the jobs arrive one by one and when a job arrives the decision maker either has to schedule it on one of the machines or to reject the job. The cost of the schedule is the sum of the makespan and the total penalty of the rejected jobs. This problem was defined in [2], and a class of algorithm depending on a parameter α is given for the solution of the problem. The optimal value (considering the competitive ratio) of the parameter is determined for any fixed number of machines. We define the following algorithm for the solution of the problem. The algorithm works in phases, and in each phase it uses a fixed value of the parameter. After the phase it approximates the optimal value of the parameter by the known part of the input, and it uses this new value of the parameter for the next phase. We compare this new algorithm to the algorithm which uses the optimal worst case parameter setting (defined in [2]) on several test cases. We use randomly generated tests and also real data to analyse the algorithms. We also present the extension of the algorithm for the two sets scheduling model of [3] which can be considered as a generalization of the multiprocessor scheduling problem with rejection.

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