Resource Scheduling to Minimize Average Completion Time for a Single Machine

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ABSTRACT

We address the resource scheduling problem with unknown but bounded utilization times. The objective is to minimize the average weighted completion time. Since average or total completion time is directly related to work in process (WIP) inventory and holding WIP inventory can be very costly due to inventory storage and handling costs, taxes and insurance costs, damage, loss and spoilage, many researchers worked on this topic. It is well known that when job processing times are known as fixed values, the sequence obtained by shortest processing times rule yields the optimal solution. However, due to many reasons like machine breakdowns and uncertainties in production, job processing times might not be known exactly in advance. We consider the case where the job processing times are not known but the lower and upper bound of a job processing time is known. The problem was already considered in the literature but in this work, several new heuristics are proposed and evaluated. Based on the numerical results, two newly proposed heuristics have a much smaller absolute error than the best existing heuristic in the literature. Moreover, the computational times of the new heuristics are much smaller than that of the best existing heuristics. More specifically, the errors of the proposed heuristics are about one fifth of those of the best existing heuristics. Moreover, the computational times of the existing heuristics are at least ten times of those of newly proposed heuristics. This indicates the superiority of the proposed heuristics.

Keywords: Scheduling, mean completion time, single machine, heuristics