Bounds on Modified SPT Heuristics

for Single Machine Flow-Time Scheduling

with a Single Breakdown

Omer Gurewitz and Igal Adiri

Technion - Israel Institute of Technology

Haifa 32000,

Israel

Abstract

Consider the problem of scheduling n jobs with known processing time on a single machine. The machine undergoes a breakdown at a fixed point in time, known in advance, during the processing of the jobs. The job preempted due to the breakdown has to be restarted from the beginning. The objective function is minimizing the sum of completion times of the jobs. It was found that the problem is NP-hard and the SPT heuristic has a tight bound of 9/7. In this paper, we present a scheme of a series of heuristic algorithms as a function of the number of jobs scheduled before the breakdown. Every algorithm is characterized, for the worst case, by its bound and complexity. Thus, we provide the scheduler with a simple tool for determining his/her choice in the trade-off between accuracy of the solution (deviation from the optimum) and the computational effort.

Index Terms

Deterministic Scheduling, Minimum Flow-Time, Preemptive Repeat, Bounds, Heuristics

I. PRELIMINARIES

Consider the problem of scheduling n jobs with known processing time on a single machine. The machine undergoes a breakdown at a fixed point in time, known in advance, during the processing of