Abstract of

Online Scheduling & Project Scheduling

by Jacob Jan Paulus

This thesis presents new and improved scheduling algorithms for a number of scheduling problems. The first part of the thesis deals with online-list scheduling problems. In the second part, a new solution methodology for the time-constrained project scheduling problem is developed, and a decomposition method for the time-constrained project scheduling problem with adjacent resources is presented.

The first online problem considered, is online-list scheduling of parallel jobs with the objective to minimize the makespan, and some special cases. Among other results, a 6.6623-competitive online algorithm and a lower bound of 2.43 on the competitive ratio of any online algorithm are presented.

The second online problem is the online-list batch scheduling problem with the objective to minimize the makespan. There is one machine with a given batch capacity that processes the jobs in a parallel batching manner. A complete classification of the tractability of this online problem is given.

The second part of this thesis presents a new scheduling approach for scheduling with strict deadlines on the jobs. This approach is applied to the time-constrained project scheduling problem. In the developed two stage heuristic, the key step lies in the first stage where partial schedules are constructed. In the computational tests, many instances are solved to optimality, and lead only to a small increase of costs if the deadline is substantially decreased.

Finally, the time-constrained project scheduling problem is considered under the addition of a new type of constraint, namely an adjacent resource constraint. An adjacent resource constraint requires that the units of the resource assigned to a job have to be adjacent. The presented decomposition method forms a first promising approach.