TabuSearch: Job-shop scheduling problem

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1 Introduction

The job shop scheduling problem is one of many theoretic scheduling problems. In a paper by Dell'Amico and Trubian [1] it was classified as $J||C_{\max}$ using the notation introduced by R.L.Graham et al. [2]. Letter J represents „job shop scheduling problem", two vertical lines with nothing in between mean no further job characteristics are given and $C_{\max}$ defines the optimization problem as minimizing the maximum completion time of all given jobs.

Of course, there are many different types of such problems e.g. there can be a predetermined quantity of machines e.g. only one machine, jobs can have certain characteristics e.g. each job has a *fuzzy due date* etc. but in this paper the problem classified in the previous paragraph will be examined.

We are given following resources:

1. a set J of n jobs to schedule,
2. a set $O = \{1, \ldots, N\}$ of N atomic operations
3. a set M of m machines.

For each job J_j there is a sequence of operations $O_{i,j} \in O$ and each of these operations has to be processed without interruption separately on a machine $\mu_{i,j} \in M$ for $d_{i,j}$ units of time.

For better understanding of a such schedule problem a visual aid of a Gantt chart can be used:

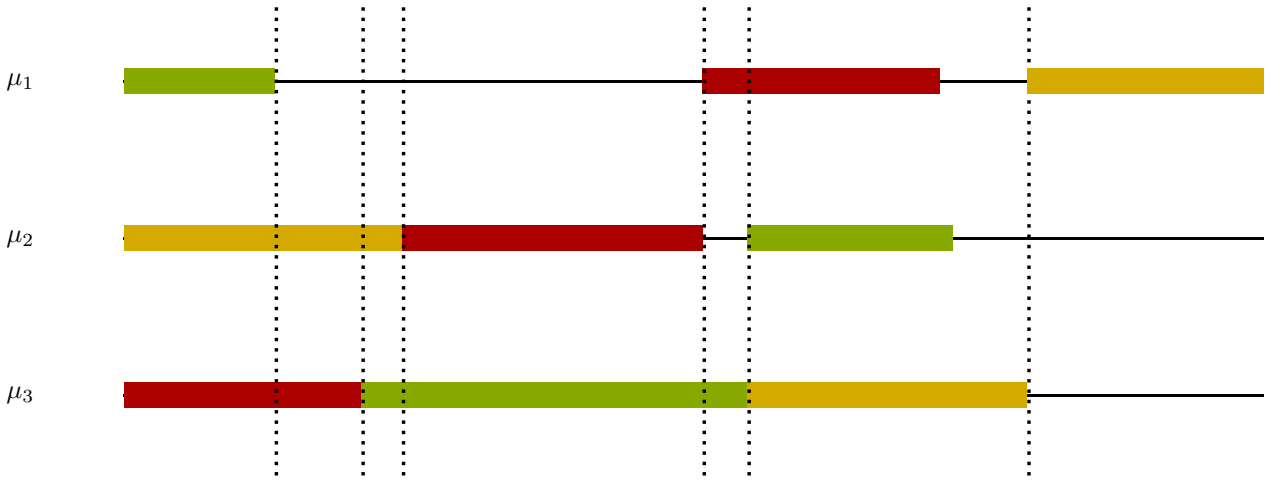

Figure 1: Example Gantt chart

which represents one feasible solution for scheduling three jobs (each consisting of three operations) on three machines. We can see now, there are some difficulties to solve when dealing with such a problem. For example, in this solution machine μ_1 runs idle for a very long time which can be an indicator on how good this solution is. The main goal is to minimize the running time of the machine that completes its tasks last.

//TODO: disjunctive graphs

References

[1] Mauro Dell'Amico and Marco Trubian. *Applying tabu search to the job-shop scheduling problem.* Politecnico di Milano, 1-20133 Milano, Italy, 1993. doi: 10.1007/BF02023076.

[2] R.L.Graham, E.L.Lawler, J.K. Lenstra, and A.H.G. Rinnooy Kan. *Optimization and Approximation in Deterministic Sequencing and Scheduling: a Survey.* Elsevier B.V., 1979. doi: 10.1016/S0167-5060(08)70356-X.