Ant colony optimization for a multi-criteria generalized job-shop scheduling problem

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This work offers to use an Ant Colony Optimization (ACO) to solve a multi-criteria generalized job-shop factory scheduling problem. We consider a job-shop problem with unrelated parallel machines and precedence constraints between the jobs operations. The objective is to simultaneously minimize the jobs completion time (makespan) [1] and enforce the Just In Time (JIT) production concept [2]. This multi-criteria scheduling problem is NP-hard. Therefore, the development of meta-heuristics that may give optimal or near optimal solutions is well justified. We observe that the considered generalized job shop scheduling problem is an under-studied subject in the literature. Our purpose is to solve the considered scheduling problem by using an algorithm based on the framework of the Ant Colony System (ACS) technique [3]. In order to build a solution, we take into consideration a number of design decisions. Thus we have to define an adequate pheromone model representation, the mechanism of updating of its quantity and the visibility information. We also specify the assignment and the sequencing of operations on eligible machines. Constructive heuristics either conceived or found in the literature [4] are customized and hybridized to our algorithm. They are used for the modeling of the visibility of each subset of ants. We assess our solutions by employing an aggregation weighted by the respective significance of each criterion in the eyes of the decision-maker. The efficiency of our algorithm has been tested on randomly generated instances with interesting results.

References

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