

Hybrid Metaheuristics for Flexible Jobshop Scheduling Problem

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This article addresses the flexible job-shop scheduling problem (FJSP) to minimize makespan. The flexible job shop problem is similar to the classical job shop problem. The problem consists to organize the execution of n jobs on m machines. Each job J_i represents n_i ordered operations. The execution of k^{th} operation of job J_i (noted O_{ik}) requires one machine M_j selected from a set of available machines μ_{kj} (noted $\mu_{kj} \subseteq m$). We denote with P_{ijk} the processing time of the operation O_{ik} when executed on machine M_j . Each operation cannot be interrupted during its performance (non-preemptive condition). Each machine can perform at most one operation any time (resource constraint). Finally the precedence constraints of the operations of any job can be defined for any pair of operations (sequencing constraint). It is well known that this problem is strongly NP-hard (Garey et al., 1976). To solve this problem, a hybrid estimation of distribution (EDA) and simulated annealing (SA) algorithms based on hierarchical approach are implemented. To show the effectiveness of the proposed hybrid algorithm, numerical experiments by using benchmark problems are conducted. Consequently, the computational results validate the quality of the proposed approach.