A New Ant Colony Optimization Approach for the Single Machine Total Weighted Tardiness Scheduling Problem

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Abstract⎯In this paper the *NP*-hard single machine total weighted tardiness scheduling problem in presence of sequence-dependent setup times is faced with a new Ant Colony Optimization (ACO) approach. The proposed ACO algorithm is based on a new global pheromone update mechanism, which makes the pheromone trails asymptotically range between two bounds arbitrarily fixed and the ACO learning mechanism independent of the values of the objective function of the considered problem. Other features of the algorithm include a diversification mechanism for the solution construction phase based on a local pheromone update rule whose effects are restricted to the single iterations, and a cumulative option for the global pheromone update rule. An experimental campaign, carried out on a benchmark available from the literature, was executed to evaluate the proposed ACO and the effectiveness of its optional features. In particular, the obtained results were compared with the ones of a recently proposed ACO algorithm for the same problem by Liao and Juan (2007). The analysis of the outcomes showed the competitiveness of the new ACO approach, which was able to improve about 72% of the best known results for the benchmark. Finally, a further investigation on a different benchmark set of instances without setup times showed the robustness of the proposed ACO algorithm.

Keywords⎯Ant colony optimization, Metaheuristics, Scheduling, Total weighted tardiness

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