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A layered genetic algorithm with iterative diversification for optimization of flexible job shop scheduling problems

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ABSTRACT

Flexible job shop scheduling problem (FJSSP) is a further expansion of the classical job shop scheduling problem (JSSP). FJSSP is known to be NP-hard with regards to optimization and hence poses a challenge in finding acceptable solutions. Genetic algorithm (GA) has successfully been applied in this regard since last two decades. This paper provides an insight into the actual complexity of selected benchmark problems through quantitative evaluation of the search space owing to their NP-hard nature. A four-layered genetic algorithm is then proposed and implemented with adaptive parameters of population initialization and operator probabilities to manage intensification and diversification intelligently. The concept of reinitialization is introduced whenever the algorithm is trapped in local minima till predefined number of generations. Results are then compared with various other standalone evolutionary algorithms for selected benchmark problems. It is found that the proposed GA finds better solutions with this technique as compared to solutions produced without this technique. Moreover, the technique helps to overcome the local minima trap. Further comparison and analysis indicate that the proposed algorithm produces comparative and improved solutions with respect to other analogous methodologies owing to the diversification technique.

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