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An integrated search heuristic for large-scale flexible job shop scheduling problems

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Abstract

The flexible job shop scheduling problem (FJSP) is a generalization of the classical job shop scheduling problem (JSP), where each operation is allowed to be processed by any machine from a given set, rather than one specified machine. In this paper, two algorithm modules, namely, hybrid harmony search (HHS) and large neighborhood search (LNS), are developed for the FJSP with makespan criterion. The HHS is an evolutionary-based algorithm with the memetic paradigm, while the LNS is typical of constraint-based approaches. To form a stronger search mechanism, an integrated search heuristic, denoted as HHS/LNS, is proposed for the FJSP based on the two algorithms, which starts with the HHS, and then the solution is further improved by the LNS. Computational simulations and comparisons demonstrate that, the proposed HHS/LNS shows competitive performance with state-of-the-art algorithms on large-scale FJSP problems, and some new upper bounds among the unsolved benchmark instances have even been found.

Keywords: Scheduling, Flexible job shop, Harmony search, Large neighborhood search, Makespan

1. Introduction

The classical job shop scheduling problem (JSP) is one of the most important and difficult problems in the field of production scheduling and has received an

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