Using Multi-objective Simulated Annealing Algorithm to Solve a Multi-objective Facility Layout Problem in Dynamic Cellular Manufacturing

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Abstract
In cellular production, the production system is aimed at transforming several subsystems into a cell in order to produce similar products in a cell with a higher efficiency. In this paper, a multi-objective model in the layout-routing problem of cell production with the goal of minimizing costs, maximizing the level of service to customers has been addressed and solved using the meta-heuristic algorithm MOSA. The results of solving a bi-objective model using this meta-heuristic algorithm with its results in its previous solution method, the meta-heuristic algorithm NSGAII and the Epsilon constraint method showed that MOSA is able to provide better responses than NSGAII for large-scale issues. That is, at approximately equal times, algorithm MOSA was able to produce more accurate and better answers for the second objective function.
Keywords: Cellular Production; Multi-objective Model; Meta Heuristic Algorithms; MOSA; NSGAII; Epsilon Constraint

1- Introduction

The cell production system is one of the most efficient systems for production environments with high volume and high product diversity. In cellular production, the production system is attempted to transform into several subsystems and indeed cells, in order to produce similar products in a cell with a higher efficiency. Wang et al. [6] for the first time, considered the minimization of intracellular and intracellular transport costs in the cellular model simultaneously and used simulated annealing to solve it. Safaei et al. [8] reviewed the research on cell formation issues in cellular production systems. Saidi et al. [7] used a neural network method to solve the formation problem of the cell with the aim of minimizing the cost of redeployment, fixed cost and machine change, taking into account the multiple paths and repetitions of machines. Mahdavi et al. [9] the mathematical model developed the correct integer for the design of the cell production system, taking into account the factors of labor. Deljo et al. [13] presented a mathematical model for cellular production, and solved it with an improved genetic algorithm. Kia et al. [11] studied a nonlinear mathematical model for designing a cellular production system and used an efficient refrigeration simulation algorithm to solve this problem. Yu and Chen [5] provided a solution to the data structure in optimizing the combined colony algorithm for solving dynamic arrangement problems of large-size facilities. Bozorgi et al. [16] provided a tabu-search algorithm for the problem-setting problem of facility arrangement. Li et al. [10] introduced the dynamic arrangement of facilities, including transportation and material