A New Optimization via Invasive Weeds Algorithm for Dynamic Facility Layout Problem

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***Abstract*— The dynamic facility layout problem (DFLP) is the problem of finding positions of departments on the plant floor for multiple periods. Such that departments do not overlap, and the sum of the material handling and rearrangement costs is minimized. In this paper a new optimization algorithm inspired from colonizing weeds IWO is utilized to solve the well-known dynamic facility layout problem. A set of reference numerical problems is taken in order to evaluate the efficiency of the algorithm compared with the previous ones which had been applied to solve the addressed problem.**

Keywords- Dynamic Facility layout Problem, Discrete Invasive Weed Optimization

I. INTRODUCTION

Nowadays, due to competitive and global markets, there exist more changeability in design of products and life cycle of products has become too short. Therefore, in most industries, products are under alternation and this issue has direct influence on layout of facilities. Regarding that; changes of demand increases costs of the organization because of adaptation; hence, organizations seek methods for satisfying demands with less costs. In this regard, recently, Dynamic facility layout planning has been considered by many researchers. DFLP, based on prediction of changes that might occur in material flow in future, divides the future into time periods and yields an efficient layout by minimizing summation of material transportation and rearrangement costs [1].

Plenty of factors are at work in proposing an efficient design for an industrial unit. In most studies, transportation cost of materials has been considered as the most significant criterion. But by considering the current competiveness and short life cycle merely analyzing this criterion may not be appropriate. It is obvious; in different conditions those criteria should be considered which are associated with that condition.

If we consider *T* periods, and *N* parts, maximum number of facility layout plans for DFLP is 〖(N!)〗^T. For example, *N*=6 and *T*=5, so we have as facility layout plans. This calculation shows that even for the small scaled problem there is a huge complexity, so the problem is NP-Hard [2].

Literature Review

Rosenblatt showed the first research to develop an optimization approach based on a dynamic programming model for the DFLP [1]. Rosenblatt proposed two heuristics that were based on dynamic programming, each of which simply considers a set of limited good layouts for a single period [1]. Urban developed a steepest-descent heuristic based on a pairwise exchange idea, which is similar to CRAFT [3]. Lacksonen and Enscore introduced and compared five heuristics to solve the DFLP, which were based on dynamic programming, a branch and bound algorithm, a cutting plane algorithm, cut trees, and CRAFT [4].

It should be mentioned that in addition to exact algorithms, many metaheuristic algorithms have been reported in the literature such as a genetic algorithm by [5] and a tabu search (TS) heuristic by [6].This TS heuristic is a two-stage search process that incorporates diversification and intensification strategies. Baykasoglu and Gindy developed a simulated annealing (SA) heuristic for the DFLP, in which they used the upper and lower bound of the solution of a given problem instance to determine the SA parameters [7]. Balakrishnan et al. presented a hybrid genetic algorithm [8]. Erel et al. introduced a new heuristic algorithm to solve the DFLP. They used weighted flow data from various time periods