Optimisation of Assembly Line Balancing Type-E with Resource Constraints using NSGA-II

Masitah Jusop*, Mohd Fadzil Faisae Ab Rashid
Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

ABSTRACT

Assembly line balancing of Type-E problem (ALB-E) is an attempt to assign the tasks to the various workstations along the line so that the precedence relations are satisfied and some performance measures are optimised. A majority of the recent studies in ALB-E assume that any assembly task can be assigned to any workstation. This assumption lead to higher usage of resource required in assembly line. This research studies assembly line balancing of Type-E problem with resource constraint (ALBE-RC) for a single-model. In this work, three objective functions are considered, i.e. minimise number of workstation, cycle time and number of resources. In this paper, an Elitist Non-dominated Sorting Genetic Algorithm (NSGA-II) has been proposed to optimise the problem. Six benchmark problems have been used to test the optimisation algorithm and the results are compared to multi-objective genetic algorithm (MOGA) and hybrid genetic algorithm (HGA). From the computational test, it was found NSGA-II has the ability to explore search space, has better accuracy of solution and also has a uniformly spaced solution. In future, a research to improve the solution accuracy is proposed to enhance the performance of the algorithm.

KEYWORDS: Assembly Line Balancing, Type-E, Resource constraints, NSGA-II.