Resource-Constrained Assembly Line Balancing Problems with Multi-Manned Workstations

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Abstract : Assembly line balancing problems can be categorized into one-sided, two-sided, and multi-manned ones by using the number of operators deployed at workstations. This study explores the balancing problem of a resource-constrained assembly line with multi-manned workstations. Resources include machines or tools in assembly lines such as jigs, fixtures, and hand tools. A mathematical programming model was developed to carry out decision-making and planning in order to minimize the numbers of workstations, resources, and operators for achieving optimal production efficiency. To improve the solution-finding efficiency, a genetic algorithm (GA) and a simulated annealing algorithm (SA) were designed and developed in this study to be combined with a practical case in car making. Results of the GA/SA and mathematics programming were compared to verify their validity. Finally, analysis and comparison were conducted in terms of the target values, production efficiency, and deployment combinations provided by the algorithms in order for the results of this study to provide references for decision-making on production deployment.