An Ant Colony System for Solving Connector-Based Assembly Planning Problems

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ABSTRACT

Products assembly can be defined as a task in which components are turned into a final product according to specific assembly sequence. Rembold et al. (1985) once mentioned that product-assembly cost occupie up to 50% of the total manufacturing cost. Working out an optimal assembly sequence is, therefore, an important issue for modern enterprises. This research uses an ant colony algorithm to solve connector-based assembly sequence. Connectors that are equipped with assembly engineering information (combination, direction, tool) serve as the basic unit to replace the traditional way where only parts are taken into consideration. Under the constraints of connector ’s precedence graph, similarity between connectors is used to arrange assembly tasks. Based upon the research of Tseng et al.(2004), the degree of complexity in assembly planning can be effectively reduced. In the case of larger constraint assembly problem, genetic algorithms will generate a larger number of infeasible solutions in the evolution procedure, thus reducing the efficiency of the solution-searching process. In the past, Chang Y. H.(2004) proposed a guided-based genetic algorithm to solve this problem. In this study, guided-based genetic algorithm is used to be a bench mark for comparison. Finally, practical examples were offered to verify the feasibility of ant colony algorithm-based approach.

Keywords : assembly planning ; ant colony system ; connector

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