A three-stage integrated approach for assembly sequence planning using neural networks

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Abstract

This study develops a three-stage integrated approach with some heuristic working rules to assist the planner in generating a best and most effective assembly sequence. In the first stage, Above Graph and transforming rule are used to create a correct explosion graph of the assembly models. In the second stage, a three-level relational model, with geometric constraints and assembly precedence diagrams (APDs), is generated to create a complete relational model graph and an incidence matrix. In the third stage, the back-propagation neural network is employed to optimize the available assembly sequence. Two real-world examples are utilized to evaluate the feasibility of the proposed model in terms of the difference of assembly sequences. The results show that the proposed model can facilitate assembly sequence optimization and allows the designer to recognize the contact relationship and assembly constraints of three-dimensional (3D) components in a virtual environment type.

Keyword：Assembly sequence planning; Above Graph; Assembly precedence diagrams; Back-propagation neural network; Assembly sequence optimization