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Assembly sequence planning with a weighted graph

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Assembly sequence planning is a typical of representative combinatorial optimization problems in manufacturing. The general methods are used to generate a large number of feasible assembly sequences and find the best sequence through evaluation. A lot of computation time and memory space are needed and many methods usually find a local optimum. To reduce the hardness of assembly sequence planning, the assembly model is converted into a directed weighted graph considering the assembly constraints which are classified into the qualitative and quantitative constraints. The qualitative constraints including the topological and geometrical assembly constraints between parts are adopted to configure out the feasible assembly sequences and they are represented as the directed edges in the weighted graph. A portion of process constraints is also used as the qualitative constraints. The other process constraints, such as the assembly tolerance, assembly stability, assembly directions and tools, are quantified with the fuzzy analytical hierarchy process method and attached to the edges. The weights are taken as the heuristic information to find the optimal fragments of the optimal or near-optimal assembly sequences. With the assembly weighted graph, the optimal or near-optimal assembly sequences will be searched in the generation of the feasible sequences and the search space of the best solution will be decreased. A branch and bound algorithm is designed to find the optimal sequence with the weighted graph. The results illustrate that the optimal assembly sequences are found quickly. The method is expected to apply to the complex products.

Biography

Yong Wang has completed his PhD at the age of 32 years from Beihang University, China and worked for North China Electric Power University for 5 years. He is the Associate Director of Research Center of Wind Power System, School of Renewable Energy. He has published more than 15 papers in reputed journals and conferences.

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