
Application of oriented constraint hypergraphs in designing manufacturing technology precision structure

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When designing the assembly processes of engineering products one of the tasks is to select a sequence of product assembly (assembly route), which is influenced by the requirements for inspection and testing, the availability of standard processes, regulated sequence of certain operations. In terms of design process automation, multi-variance of assembly technology is the problem. In addition, in precision structure assembling it is necessary to take into account the geometry of the components, methods of connection and patterns of individual surfaces conjugation. To reduce the manual labor in the design of technology it is necessary to create a system of computer-aided design for technology of high-precision structure assembling. To develop such a system it is proposed to use the design algorithm of technological assembly processes based on oriented constraint hypergraphs describing variants of part combinations, making impossible subsequent assembling other components. When using this algorithm the pairs of conjugated parts are considered alternately and those parts which cannot be installed in the assembly unit in assembling the pairs are indicated as restrictions. Constraint hypergraph description can be presented both in graphical and tabular form.

Variants of processes not contradicting with the constraints for a given assembly unit are calculated on the basis of the constraint hypergraph. This approach can significantly reduce the number of assembly options under consideration and offer the technology developer a list of options, ranked according to certain criteria or the value of the objective function.

This algorithm has been tested in the development of assembly technology for high-precision shaped charge. It reduced the number of considered technology options from more than 5000 to 32. It is proposed to consider the possibility of progressive assembly taking into account production section turnover as a criterion of assembly option selection.

Keywords: *sequence of assembly, assembly technology, constraint hypergraph.*

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