A Graph-based Model for Understanding Interlocking Assemblies

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Generating a feasible disassembling sequence of a mechinical assembly is a fundamental research topic in geometric reasoning. Recently, researchers in computer graphics are interested in the inverse problem, which creates feasible geometry with respect to predefined constraints on the order of assembly. Among them, the interlocking assemblies that all component parts must be disassembled after a key part, have a long history in the design of puzzles, furniture, architecture, and other complex geometric structures. Though many design tools that allow creating interlocking assemblies has been recently contributed, the interlocking mechanism has not yet been understood which prevents exploring the full searching space as well as restricts their applicability for design.

In this report, we propose a graph-based model for describing the interlocking mechanism. The core idea is to represent part relationships with a family of base *Directional Blocking Graphs (DBGs)*. With the help of classic graph theory, our approach build a connection between the connectivity of DBGs and its corresponding assembly's interlocking property. As a result, our model provide a easy guidebook for start-of-art interlocking design with more design flexibility.

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