Modification of geometric models through variational geometry.

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Abstract

Systems for computer-aided mechanical design use geometric models for drafting, analysis and programming of NC machines. Because design is iterative in nature, the topology, geometry or dimensioning of a geometric model must be modified many times during the design cycle. The effectiveness of future CAD systems will depend in large part upon the ease with which geometric models can be created and modified.

This paper presents the results of a research effort to develop flexible procedures for the definition and modification of geometric models. A central idea of this effort is that dimensions, such as appear on a mechanical drawing, are a natural descriptorr of geometry and provide the most appropriate means for altering a geometric model.

A procedure is described by which geometry is determined from a set of dimensions. The geometry corresponding to an altered dimension is found through the simultaneous solution of the set of constraint equations. Presented in this paper are the basic

approach to modifications of geometric models, a procedure for significant reduction of the number of constraint equations to be solved, and the effect of sparse matrix methods in reducing the time required to solve the equations.

Keywords

computer-aided design; geometric model; variational geometry

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