Solid modeling deals with the representation, design, visualization, and analysis of models of 3D parts. While the embodiment of solid modeling technology in contemporary commercial CAD systems is finally beginning to fulfill the old promise of providing major improvements in the productivity of the manufacturing industry, solid modeling research remains in its infancy. Advances in solid modeling will continue to rely on results in other disciplines, such as topology, algebraic and differential geometry, Boolean algebra, fields and graphs theory, and computational geometry. Advances in solid modeling will also depend on the development of dedicated hardware architectures that perform advanced solid modeling and graphic functions.

Recent developments focus on advanced design paradigms, topological and geometric extensions of the domain, and the performance and reliability of the fundamental algorithms. The current trend follows two paths:

- capitalizing on the concepts of features, constraints, and model parameterization, which provide a more intuitive and suitable design vocabulary than the traditional edges, faces, or Boolean operations; and
- incorporating information about the tolerances, assembly relations, and mechanical properties of parts and assemblies, which provides a suitable product database for the development of analysis and planning applications.

A considerable amount of research effort concerns the reliable integration of these concepts into future solid modelers.

Focus on design and manufacturing

We selected the articles in this special issue carefully, choosing from among the papers presented at the 1993 ACM/IEEE Second Symposium on Solid Modeling and Applications, held in Montreal May 19-21. The symposium was second in a series of biennial meetings devoted to solid modeling and its applications, with a particular emphasis on design and manufacturing. The next symposium will be held in 1995. We selected the articles for this special issue based on the significance of the work reported.

The symposium series is intended to provide an international platform for researchers, developers, and users to meet and discuss the theory, algorithms, and software techniques of solid modeling. We advise interested readers to consult the full proceedings of the 1993 symposium, which capture the current state of the art in the various branches of this wide-ranging field. The proceedings, published by ACM Press (New York), include 44 technical papers and 20 poster abstracts on innovative concepts.

Additional selected papers from the 1993 conference will be published in a companion issue of Computer-Aided Design, which is scheduled for this spring. The selected papers were assigned to CG&A or to CAD based on our estimation of their relative interest to the respective readerships of the two publications.

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