Guest Editor’s Introduction

Computer Graphics Tokyo 84
Part 2: Geometric Modeling

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Computer Graphics Tokyo 84 attracted more than 14,000 participants from all over the world. Of that number 20 percent attended the excellent technical sessions that were offered. When we started to gather the best and most representative papers from that event to share with those of you in the field who could not be at Computer Graphics Tokyo 84, it quickly became apparent that there would be too many for a single issue of this magazine. Therefore, we brought you articles last month on graphics language design, software, and geometric modeling. This month it is my privilege to share with you the rest of the papers on geometric modeling that have been chosen by the reviewers to appear in IEEE CG&A.

First Ingrid Carlomb, Indranil Chakravarty, and David Vanderschel describe a generalization of the octree data structure for representing polyhedral objects. This data structure, called the polytree, is a cellular spatial decomposition of the object space into primitive cells, the increased complexity of which has several advantages over octrees, according to the authors, who also present a recursive subdivision algorithm for the creation of a polytree from a boundary representation.

Next Hiroaki Chiyokura and Fumihiko Kimura propose a method for representing the solid design process in terms of a set of primitive operations that would result in a much more user-friendly modeling system. In their system, Modif, high-level operations modify solid shapes through primitive operations, each of which has a corresponding inverse operation. All are stored in a design process representation. When Modif is used with boundary representation as the method of internal representation, the authors show that their system can quickly regenerate previously designed solids at any stage of their design.

Tapio Takala then brings us an in-depth consideration of user interface management systems, or UIMSs, for interactive CAD systems. Takala looks at the updating of models and the operation of different tool algorithms, giving us suggestions about UIMS contents and the changes needed to keep up with present-day user needs.

Next we are treated to a discussion of the use of a 4 x 4 determinant by Fujio Yamaguchi and Toshiba Tokieda. The authors also describe Boolean shape operations of a solid modeling system, Freedom II. This simple and efficient algorithm makes use of the continuity of a shape.

Then Yoshimi Ota, Hiroshi Arai, Shinji Tokumasu, and Toshio Ochi suggest that some computer graphics applications can borrow from the coloring data for 3-D objects used in CAD/CAM applications and not only save many man-hours of work but get more precise results in the process. By choosing the proper division parameter, they tell us, they have attained a very high degree of accuracy.

Steven G. Satterfield and David F. Rogers then bring us a procedure for generating accurate contour lines for a B-spline surface. This procedure includes two steps: The first is a modification of a traditional routine for contouring over a triangular mesh, and the second uses B-spline surface generation over a limited area to produce the contour accurately.

I extend many thanks to all these scientists for their valuable contributions to Computer Graphics Tokyo 84 and their contributions to this issue of IEEE Computer Graphics and Applications. It has been an excellent experience to work with each of them.

The computer graphics rendering is from the article by Carlomb, Chakravarty, and Vanderschel on page 24 of this issue.

Tosiyasu L. Kunii is currently a professor of information and computer science at the University of Tokyo. He started work there in raster graphics in 1968, which led to the Tokyo Raster Technology Project. His research interests include computer graphics, database systems, and software engineering. He has authored and edited 20 computer science books and published 75 refereed academic/technical papers in computer science and applications areas.

Kunii is president of the Computer Graphics Society, chairman of the board of the Handheld Computer Society, and a member of the Editorial Board of CG&A. He is active in IFIP; has organized and is ex-chair of the Technical Committee on Software Engineering of the Information Processing Society of Japan, and has organized and is ex-president of the Japan Computer Graphics Association. He served as general chairman of the Third International Conference on Very Large Data Bases in 1977, program chairman of Intergraphics 83, and program chairman of Computer Graphics Tokyo 84, which he will also chair in 1985.

Kunii received his BSc, MSc, and DSc in chemistry from the University of Tokyo in 1962, 1964, and 1967.

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