The last IEEE Computer Graphics and Applications special issue on CAD/CAM was in November 1995. Then, CAD/CAM was the major application for computer graphics with about 2.1 million PCs and conventional workstations used for CAD/CAM and more than 100 hardware, software, and systems and services vendors supplying products. Although 3D was available, it was more prevalent in research labs than design departments. In addition, the high-paying jobs were in creating 2D production drawings with some supplemental computer-aided engineering, such as finite analysis. Typical systems were closed, turnkey configurations with a single vendor supplying both hardware and software. The systems were sufficiently expensive that special rooms were assigned to CAD/CAM and users reserved time to use the facility or were assigned full time to a workstation.

This environment has undergone major changes in recent years. According to market studies from Machover Associates, in 2001, annual sales were about $20 billion (compared to about $12 billion in 1995). CAD/CAM now represents about 22 percent of the computer graphics market. Major price reductions accompanied by enormously improved performance has made the systems more ubiquitous. Today, more than 4.5 million PC and conventional workstations are installed for CAD/CAM. While drawing production is still a requirement, design and analysis have become significantly more important. Integration with other applications and, perhaps more importantly, with other enterprise functions is more widespread and important. As far back as 1986, Ford of Europe envisioned a six-phased evolution from department-wide single applications to company-wide CAD/CAM integration. Today, we see that collaborative, rather than serial engineering, is fast becoming the norm. The articles by Corney et al. and Cera et al. address aspects of this trend, and Contero et al.’s article surveys the state of product data quality and collaborative engineering.

Almost all systems are 3D capable, although the use of 3D still isn’t universal. Features like color, animation, and virtual reality enhance the systems’ capability. Significant vendor consolidation has occurred with many of the pioneering suppliers defunct or absorbed into one of the four major surviving system suppliers (Dassault/IBM; AutoDesk; Electronic Data Systems; and Parametric Technology Corporation, or PTC). For some however, 3D geometry is essential to designing and building physical products, and leading-edge users are looking for ways to evaluate the user impact of 3D display technology, as the article by Kasik et al. discusses.

For this special issue, we’ve selected the four articles mentioned and a tutorial by Dorst and Mann on Clifford algebra, which provides an alternate method of representing geometry in CAD/CAM systems. We believe these articles represent a reasonable snapshot of significant characteristics of the new CAD/CAM environment.

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Reference

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**2002 Editorial Calendar**

**January/February**

**Information Visualization**

Computer-based information visualization has emerged as a distinct field centered around helping people explore or explain data by designing software that exploits the properties of the human visual system. New methodologies and techniques are critical for helping people keep pace with the torrents of data.

**March/April**

**Image-Based Modeling, Rendering, and Lighting**

The field of image-based modeling and rendering has already established itself as an important tool for a wide range of computer graphics applications. Image-based techniques use real-world digital photographs to synthesize novel imagery, letting us creatively explore and reinterpret realistic geometry, surface properties, and illumination.

**May/June**

**Graphics in Advanced Computer-Aided Design**

Using computers in the design and manufacturing processes has come a long way from the first CAD systems in the automobile and aerospace industries, with the huge mainframes and enormously expensive displays. Current CAD systems exploit innovative uses of the technologies that help to move ideas from concept to model to prototype to product.

**July/August**

**Virtual Worlds, Real Sounds**

We only need to close our eyes for a moment to experience the amazing variety of information that our ears provide, often more quickly and richly than any other sense. Using real sounds in virtual worlds involves parametric computation; synthesis; and rendering sound for VR, entertainment, and user interfaces.

* Features a peer-reviewed, bonus CD-ROM

**September/October**

**Computer Graphics Art History and Archaeology**

Archaeologists can use computer graphics techniques to reconstruct and visualize archaeological data of a site that might otherwise be difficult to appreciate, with applications in analysis, teaching, and preservation. Similarly, art historians use computer graphics to analyze, study, and preserve great works of art.

**November/December**

**Tracking**

High-resolution tracking of user position and orientation (head, hand, feet, and so on) is increasingly a critical issue for virtual reality, augmented reality, modeling and simulation, and animation. Current tracking hardware is based on a variety of sensors including magnetic, optical, inertial, acoustic, and mechanical.