

## Special Issue: **Mathematical methods for CAD**

In this special issue of *Computer-Aided Design*, mathematical and geometrical methods are presented for a set of problems in computer-aided design. In particular, the issue contains seven papers that deal with topics in the synthesis and analysis of surfaces and solids.

The first three papers deal with topics in surface design. A basic problem in shape design is the fitting of smooth surfaces over a given mesh of curves, e.g. cubic Bézier curves. In the first paper, **Liu and Sun** present two methods for interpolating the mesh by  $G^1$  smooth rectangular Bézier patches. Next, the assessment of surface quality is dealt with, and **Beier and Chen** in their paper propose a highlight-line model for the smoothness evaluation of surfaces. The third paper, by **Aono, Breen and Wozny**, describes the kernel of a computer-aided lamination system for fitting woven-cloth fabric (composite ply) on curved surfaces. Such modelling techniques are also important in the light of layered manufacturing, which provides the capability to build 3D objects by 'stacking' 2D surfaces (or layers).

The remaining four papers are on solids. The fourth and fifth papers are concerned with representations and conversions. The reconstruction of contours of solids from digitized (voxel) data is important in computer-aided inspection, and this is the topic of the paper by

**Gargantini, Schrack and Kwok**. A procedure for spatial enumeration to CSG conversion, in an integrated system that automatically derives the shape and topology of structural components, is described in the paper by **Chirehdast and Papalambros**. Swept volumes are useful for a host of CAD/CAM applications, and, in the sixth paper, **Blackmore, Leu and Shih** extend the sweep-differential method to incorporate deformations in swept-volume analysis. Finally, **Srinivas and Dutta**, in the last paper, consider the cyclide (a variable-radius torus), and outline methods for the synthesis of geometrically complex objects using smoothly joined pieces of cyclides.

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