Foreword

This volume contains contributions presented at the Winter School of Computer Graphics and CAD Systems 94 international conference held at the University of West Bohemia, Plzeň, Czech Republic.

I would like to thank all the authors who submitted papers as well as the members of Department of Informatics and Computer Science who helped very much and especially to Mrs.I.Kolingerová for her help and afford she spend organizing things.

Václav Skala

Address for correspondence:

Doc.Ing.Václav Skala,CSc.
Dept. of Informatics and Computer Science
University of West Bohemia
Americká 42, Box 314
306 14 Plzeň
Czech Republic e-mail: skala@kiv.zcu.cz

tel.+42-19-2171-212 fax +42-19-220019

Triangular Patches under Tension

F. Schindler
Dept. of Computer Science and Engineering
Slovak Technical University
SK-81219 Bratislava, Slovakia

Abstract: Given a triangular surface scheme that only approximates the initial data the resulting surfaces do not reflect the shape of control vertices as much as the user would have liked. By supplying tension parameters, or what in this case might be called "shape" parameters, the user is able to force the triangular surface patch to follow the control vertices as closely as desired without moving or introducing additional control points.

Introduction

Let n be a positive integer and for each set of nonnegative integers i, j, k such that i+j+k = n, let $\alpha_{ijk} > 0$, define

$$Q_{ijk}(\alpha,u,v,w) = \alpha_{ijk}\,(n!/i!j!k!)\,u^i v^j w^k / d(\alpha,u,v,w),$$

where

$$d(\alpha,u,v,w) = \Sigma_{i+j+k=n}\,\alpha_{ijk}\,(n!/i!j!k!)\,u^i v^j w^k,$$

the last sum being taken over all nonnegative integers i,j,k summing to n. Thus the surface patch

$$Q(\alpha,u,v,w) = \Sigma_{i+j+k=n}\,Q_{ijk}\,(\alpha,u,v,w)\,P_{ijk}$$

clearly interpolates to the points P_{n00}, P_{0n0}, P_{00n}, where as usual the P_{ijk} are labeled as in the typical Bezier triangle method [Farin 1983] (see Fig. 7.1). The patches above are two-variable functions, e.g. if u, v are given such that $u \in [0,1]$, $v \in [0,1-u]$, then $w = 1 - u - v$ is determined. Triangular patches have been subject of an extensive research since in certain situations we need to draw non-rectangular patches. These surfaces have similar properties as those of tensor product Bezier patches, e.g. convex hull property, affine invariance, and the most techniques used in rectangular patch geometry can be extended to triangular ones, e.g. recursive definition of surface points [de Casteljau Algorithm], degree elevation and subdivision.