Curves and Surfaces in Geometric Modeling: Theory & Algorithms (The Morgan Kaufmann Series in Computer Graphics)

Jean Gallier

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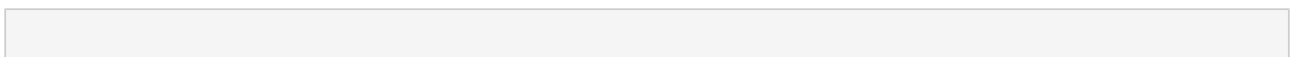
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Curves and Surfaces for Geometric Design offers both a theoretically unifying understanding of polynomial curves and surfaces and an effective approach to implementation that you can bring to bear on your own work-whether you're a graduate student, scientist, or practitioner.

Inside, the focus is on "blossoming"-the process of converting a polynomial to its polar form-as a natural, purely geometric explanation of the behavior of curves and surfaces. This insight is important for far more than its theoretical elegance, for the author proceeds to demonstrate the value of blossoming as a practical algorithmic tool for generating and manipulating curves and surfaces that meet many different criteria. You'll learn to use this and related techniques drawn from affine geometry for computing and adjusting control points, deriving the continuity conditions for splines, creating subdivision surfaces, and more.

The product of groundbreaking research by a noteworthy computer scientist and mathematician, this book is destined to emerge as a classic work on this complex subject. It will be an essential acquisition for readers in many different areas, including computer graphics and animation, robotics, virtual reality, geometric modeling and design, medical imaging, computer vision, and motion planning.

* Achieves a depth of coverage not found in any other book in this field.

* Offers a mathematically rigorous, unifying approach to the algorithmic generation and manipulation of curves and surfaces.

* Covers basic concepts of affine geometry, the ideal framework for dealing with curves and surfaces in terms of control points.

* Details (in Mathematica) many complete implementations, explaining how they produce highly continuous curves and surfaces.

* Presents the primary techniques for creating and analyzing the convergence of subdivision surfaces (Doo-Sabin, Catmull-Clark, Loop).

* Contains appendices on linear algebra, basic topology, and differential calculus.

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