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Chapter 1 : CiteSeerX â€” Citation Query Blossoming: A connect-the-dots approach to splines

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Show Context Citation Context Since any polygonal domain can be decomposed into triangles, the above theorem applies equally well to surfaces with triangular, rectangular, or arbitrary topolo Goldman, Hans Hagen, Stephen Mann , " In view of the fundamental role that functional composition plays in mathematics, it is not surprising that a variety of problems in geometric modeling can be viewed as instances of the following composition problem: Blossoming techniques are used to gain theoretical insight into the structure of the solution which is then used to develop efficient, tightly codable algorithms. From a practical point of view, if the composition algorithms are implemented as library routines, a number of geometric modeling problems can be solved with a small amount of additional software. Computational Geometry and Object Modeling - curve, surface, and object representations; J. This paper presents a new triangular B-spline scheme that allows to construct piecewise polynomial surfaces over arbitrary triangulations of the parameter plane. The development of this scheme is based on the study of polar forms [79]. Polar forms have originally been a tool from classical mathemati Polar forms have originally been a tool from classical mathematics [88]. Ramshaw [65, 66, 67]. The author has subsequently extended this theory to more general surface representations and has used polar forms for the development of B-patches [77, 76, 84]. Further extensions to simplex splines have finally led to the new triangular B-spline scheme described in this paper [18, 38, 39, 49, 78, 81]. While previous approaches to the construction of B-spline like surfaces over irregular domains have been based on subdivision, interpolation, and on the use of multisided patches the new scheme is based on blending functions and control points. The resulting surfaces are defined as linear combinations of the blending functions and are parametric piecewise polynomials over an arbitrary triangulation of the parameter plane, whose shape is determined by their control points. The paper is organized as follows: In connection with simplex splines Section 5 this finally leads to the construction of the new triangular B-spline scheme Section 6. Further extensions to simplex splines A new multivariate B-spline scheme based on blending functions and control vertices has recently been developed by Dahmen, Micchelli, and Seidel [4]. This surface scheme allows to model piecewise polynomial surfaces of degree k over arbitrary triangulations, such that the resulting surfaces are C The scheme exhibits both affine invariance and the convex hull property, and the control points can be used to manipulate the shape of the surface locally. Any piecewise polynomial can be represented by the new scheme [16]. This paper illustrates some of the algorithms underlying the new scheme by means of examples from a first test implementation [6]. Blossoming, B-patch, B-spline surface, blending functions, control points, simplex splines, polar forms. Instead, we try to illustrate the new triangular B-spline scheme [4, 16] by means of examples from a first test impleme Graph , " This paper studies geometrically continuous spline curves of arbitrary degree. The geometric constructions are based on the intersection of osculating flats. The concept of universal splines is defined in such a way that these intersections are guaranteed to exist. As a result of this development we obtain a generalization of polar forms to geometrically continuous spline curves by intersecting osculating flats. The presented algorithms have been coded in Maple, and concrete examples illustrate the approach. Categories and Subject Descriptors: Computational Geometry and Object Modelling - curve, surface, solid, and object representations General Terms: A planar map is a figure formed by a set of intersecting lines and curves. Such an object captures both the geometrical and the topological information implicitly defined by the data. In the context of 2D drawing, it provides a new interaction paradigm, map sketching, for editing graphic shapes. To build a planar map, one must compute curve intersections and deduce from them the map they define. The computed topology must be consistent with the underlying geometry. Robustness of geometric computations is a key issue in this process. This report presents a robust solution to Bezier curve intersection that uses exact forward differencing and bounded rational arithmetic. Data structures and algorithms supporting incremental insertion of Bezier curves in a planar map are described. A prototype illustration tool using this method is also discussed. Une carte planaire est une A high-order-of-approximation surface patch is used to construct continuous, approximating surfaces. This patch, together with a relaxation of tangent plane continuity, is used to approximate offset surfaces, algebraic surfaces, and S-patches.

Chapter 2 : Ebook Curves And Surfaces For Cagd as PDF Download Portable Document Format

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Jia, accepted to appear in the Journal of Symbolic Computation. Quantum B-splines, with P. Zafiris, Journal of Approximation Theory , Vol. Understanding Quaternions, Graphical Models , Vol. Dyn, Foundations of Computational Mathematics , Vol. Wang , accepted to appear in the Journal of Symbolic Computation. Division Algorithms for Bernstein Polynomials with L. Buse , accepted to appear in Computer Aided Geometric Design , vol. Vouga , Computing , Vol. Hassett , Journal of Bioinformatics , Vol. Schaeffer , Computers and Graphics , Vol. Schaeffer , Computer-Aided Design , Vol. Joe , Graphical Models , Vol. Subramanian , Research in Engineering Design , Vol. Morin , Computer Aided Geometric Design Fast Computation of the Bezout and Dixon E. Zhang , Journal of Symbolic Computation , Vol. Morin , Computer-Aided Design, , Vol. Spline Functions of Negative Degree with G. Zhang , Journal of Symbolic Computation, , Vol. Lodha , Journal of Approximation Theory, , Vol. Rational Quadratic Parametrizations of Quadrics with W. Lodha , Mathematics of Computation, , Vol. Du , Journal of Symbolic Computation, , Vol. Barry , Annals of Numerical Mathematics, , Vol. Warren , Annals of Numerical Mathematics, , Vol. Elimination and Resultants Part 1: Elimination and Bivariate Resultants with E. Elimination and Resultants Part 2: Multivariate Resultants with E. Graphical Models and Image Processing, , Vol. Barry , Computing, Computing Suppl. Micchelli , Advances in Computational Mathematics, , Vol. Functional Composition Algorithms via Blossoming with T. Mann , Transactions on Graphics, , Vol. Beatty , Computer-Aided Design, , Vol. Chionh , The Visual Computer, , Vol. Miller , Transactions on Graphics, , Vol. Micchelli , Aequationes Mathematicae, , Vol. Barry , Numerical Algorithms, , Vol. Barry , Constructive Approximation, , Vol. Barry , Computer-Aided Design, , Vol. Sederberg , Computer-Aided Design, , Vol. Filip , Computer-Aided Design, , Vol. The Method of Resolvents: Sederberg , The Visual Computer, , Vol. Jia, submitted to Advances in Applied Clifford Algebras. Wang, submitted to Computer Aided Geometric Design. Oruc, submitted to Advances in Computational Mathematics. The Multirational Blossom, submitted to Constructive Approximation. Warren, submitted to Computer-Aided Design. Wiggle, submitted to Journal of Computing. Geometric Modeling, Dagstuhl , S. Laenby, Springer, London , pp. Counting Pruned Bezier Curves with S. Mann , Mathematical Methods for Curves and Surfaces: Tromso , edited by M. Schumaker, Nashboro Press, , pp. Toric Bezier Patches with Depth with R. Schumaker, Vanderbilt University Press, , pp. Algorithms for Progressive Curves: Factored Knot Insertion with P. Knot Insertion Algorithms with P. Discrete Convolution Schemes with Y. First delivered orally by Y. First delivered orally by E. Tensor Product Slices with R. First delivered orally by R. More Matrices and Transformations: A Tutorial Introduction to Blossoming, with T. Lounsbery, Geometric Modeling, edited by H. Roller, Springer-Verlag, , pp. Mathematical and Physical Sciences, Vol. First delivered orally by P. What is the Natural Generalization of a Bezier Curve? First delivered orally by B. Algebraic Aspects of Geometric Continuity with C. Gotsman, Macau, China, October , pp. Algebraic Geometry and Geometric Modeling:

Chapter 3 : curves and surfaces | Download eBook PDF/EPUB

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We adopt the definition that CAGD deals with the construction and representation of free-form curves, surfaces, or volumes. Riesenfeld in when they organized a conference on that topic at the University of Utah. That conference brought together researchers from the U. It resulted in the widely influential proceedings [8]. Pratt [63], appeared in Its cover is shown in Figure 1. Another early conference was one held in Paris in It focussed on automotive design and was organized by P. Early Developments The earliest recorded use of curves in a manufacturing environment seems to go back to early AD Roman times, for the purpose of shipbuilding. These techniques were perfected by the Venetians from the 13th to the 16th century. The form of the ribs was defined in terms of tangent continuous 2 Figure 1. The cover of the journal CAGD. It shows a drawing by P. No drawings existed to define a ship hull; these became popular in England in the s. Nowacki [], was the earliest use of constructive geometry to define free-form shapes, see Figure 2. More modern developments linking marine and CAGD techniques may be found in [10,,,]. Another key event originated in aeronautics. In his book, classical drafting methods were combined with computational techniques for the first time. Conics were used in the aircraft as well as in 3 Figure 3. Liming realized that an alternative was more efficient: Thus he translated the classical drafting constructions into numerical algorithms. Another researcher was also involved in the transition of aircraft drawings to computations; this was S. Coons later gained fame for his work at MIT. Early computers were capable of generating numerical instructions which drove milling machines used for the production of dies and stamps for sheet metal parts. Digitizing points off the blueprints and fitting curves using familiar techniques such as Lagrange interpolation failed early on. New blueprint-to-computer concepts were needed. Ferguson at Boeing and S. Coons at MIT provided alternative techniques. Forrest began his work on curves and surfaces after being exposed to S. His PhD thesis Cambridge includes work on shape classification of cubics, rational cubics, and generalizations of Coons patches [65]. Sabin received his PhD from the Hungarian Academy of Sciences in , a seemingly odd choice which is explained by the close collaboration between researchers in Cambridge, U. K, and their counterparts in Hungary, under the leadership of J. All these approaches took place in the s. For quite a while, they existed in isolation until the seventies started to see a confluence of different research approaches, culminating in the creation of a new discipline, CAGD. Without the advent of computers, a disciplines such as CAGD would not have emerged. The initial main use of these computers was not so much to compute complex shapes but simply to produce the information necessary to drive milling machines. That information was typically output to a punch tape by a main frame computer. That tape was then transferred to the control unit of a milling machine. Early plotters were the size of a billiard table or larger; this was natural as drawings for most automotive parts were produced to scale. Before the advent of these systems, trivial-sounding tasks were extremely time consuming. For example, producing a new view of a complex wireframe object from existing views would take a draftsman a week or more; using computers, it became a matter of seconds. These went back to oscillographs which were used for many scientific applications. Another dimension was added to simple display technology by adding an interactive component to it. The first interactive graphics system was invented by I. Sutherland at MIT in , see []. Coons was a member of his PhD committee. He began to develop a system which primarily aimed at the ab initio design of curves and surfaces instead of focusing on the reproduction of existing blueprints. He adopted the use of Bernstein polynomials for his curve and surface definitions from the very beginning, together with what is now known as the de Casteljau algorithm. Figure 5 shows a part of his technical report [44]. Instead of defining a curve or surface through points on it, a control polygon utilizes points near it. Instead of changing the curve surface directly, one changes the control polygon, and the curve surface follows in a very intuitive way. In the area of differential geometry, concepts similar to control polygons were devised as early as , see [17], but had no impact on any applications. The first public mention of the algorithm although not including a mention of the inventor is [93]. Boehm was the first to give de Casteljau recognition for his work in the research community. The two cylinders were defined inside a parallelepiped. Affine transformations of this parallelepiped would then result in affine transformations of the curve. Vernet independently developed the de Casteljau algorithm. When they had to be drawn exactly, the most common tool was a set of templates known as French curves. These are carefully designed wooden curves and consist of pieces of conics and spirals. A curve is drawn in a piecewise manner by tracing appropriate parts of a French curve. Another mechanical tool, called a spline was also used. Ramshaw who independently discovered the concept, see []. When drawings had to be produced to scale, the attics or lofts of buildings were used to accommodate the large size drawings â€" the word lofting has its origins here. The mathematical counterpart to a mechanical spline is a spline curve, one of the most fundamental parametric curve forms. On the other hand, research in approximation theory and numerical analysis focused entirely on nonparametric functions. Both areas were brought together when they became important building blocks of CAGD. In a different part of the company, J. MacLaren developed a different kind of curve for the design of wings. They had the idea to piece cubic space curves together so that they formed composite curves which were overall twice differentiable [97,64]. These curves could easily interpolate to a set of points. They were referred to as spline curves since they minimize a functional similar to the physical properties of mechanical splines. Instead of referring to curves that minimize certain functionals, spline curves are now mostly thought of as piecewise polynomial or rational polynomial curves with certain smooth- ness properties. Ferguson derived his spline equations using the piecewise monomial form. But he also used the cubic Hermite form then referred to as F-curves which defines a cubic in terms of two endpoints and two endpoint derivatives. Coons used this curve type to build the patches which were named after him. In the UK, A. Kimura [83], although it was known to W. These curves are known as Wilson-Fowler splines [68]. After the advent of parametric curves, these piecewise explicit curves began to disappear. Another early curve scheme are biarcs. These are piecewise circular arcs which are pieced together to allow for tangent continuity. It is possible to fit two tangent continuous circles to two points and two tangents. If several points and tangents are given, one obtains a circle spline. The advantage of these curves is the fact that NC machines can process circular arcs directly, i. A drawback of circle splines is their piecewise constant and hence discontinuous curvature. The first developments are due to K. Bolton [23], followed by M. Sabin []; a generalization to 3D was given by T. Rectangular Surfaces Parametric surfaces were well understood after early work by Gauss and Euler. A standard application is tracing a surface for plotting or for driving a milling tool. Parametric surfaces are well-suited for both tasks. The most popular of all surface methods was to become the tensor product surface. It was first introduced by C. Theoretical studies of parametric surfaces for the purpose of interpolation and approximation go back to [33,88,87,,,] but had little influence on the development of industrial methods. In the late s, parametric surfaces were studied at several companies in Europe and the U. The first published result is due to J. Ferguson at Boeing, see [64]. Ferguson used an array of bicubic patches which interpolated to a grid of data points. While Ferguson developed C 2 cubic spline curves in the same paper, his surfaces were only C 1.

Chapter 4 : - Curves and Surfaces for CAGD by Gerald Farin

ZAMM - Journal of Applied Mathematics and Mechanics / Zeitschrift fÃ¼r Angewandte Mathematik und Mechanik.

This is a textbook on differential geometry well-suited to a variety of courses on this topic. For readers seeking an elementary text, the prerequisites are minimal and include plenty of examples and intermediate steps within proofs, while providing an invitation to more excursive applications and advanced topics. For readers bound for graduate school in math or physics, this is a clear, concise, rigorous development of the topic including the deep global theorems. For the benefit of all readers, the author employs various techniques to render the difficult abstract ideas herein more understandable and engaging. Over color illustrations bring the mathematics to life, instantly clarifying concepts in ways that grayscale could not. Green-boxed definitions and purple-boxed theorems help to visually organize the mathematical content. Color is even used within the text to highlight logical relationships. The study of conformal and equiareal functions is grounded in its application to cartography. Even better, a south-pointing chariot helps one visualize a parallel vector field along any curve in any surface. In truth, the most profound application of differential geometry is to modern physics, which is beyond the scope of this book. Throughout this book, applications, metaphors and visualizations are tools that motivate and clarify the rigorous mathematical content, but never replace it. This is an ideal introductory textbook for undergraduates studying the applications of mathematics of curves and surfaces, especially in the generation of computer graphics and computer-aided design. Written by establised textbook authors, the text develops ideas in differential and computational geometry, with numerous exercises, solutions, and worked examples throughout providing the student with ample opportunity to test their knowledge. Only a basic knowledge of vector and matrix algebra is assumed, making it invaluable for those coming to this difficult subject for the first time. Victor Andreevich Toponogov Language: Central topics covered include curves, surfaces, geodesics, intrinsic geometry, and the Alexandrov global angle comparision theorem Many nontrivial and original problems some with hints and solutions Standard theoretical material is combined with more difficult theorems and complex problems, while maintaining a clear distinction between the two levels Author by: Cambridge University Press Format Available: This text gives a step-by-step approach to the production of conics, cubics, more general curves, and rational surfaces. This fifth edition has been fully updated to cover the many advances made in CAGD and curve and surface theory since , when the fourth edition appeared. Material has been restructured into theory and applications chapters. The theory material has been streamlined using the blossoming approach; the applications material includes least squares techniques in addition to the traditional interpolation methods. In all other respects, it is, thankfully, the same. A Practical Guide a true classic. The author provides complete C implementations of many of the theories he discusses, ranging from the traditional to the leading-edge. Courier Dover Publications Format Available: One of the most widely used texts in its field, this volume introduces the differential geometry of curves and surfaces in both local and global aspects. The presentation departs from the traditional approach with its more extensive use of elementary linear algebra and its emphasis on basic geometrical facts rather than machinery or random details. Many examples and exercises enhance the clear, well-written exposition, along with hints and answers to some of the problems. The treatment begins with a chapter on curves, followed by explorations of regular surfaces, the geometry of the Gauss map, the intrinsic geometry of surfaces, and global differential geometry. For this second edition, the author has corrected, revised, and updated the entire volume. Luther Pfahler Eisenhart Language: Created especially for graduate students by a leading writer on mathematics, this introduction to the geometry of curves and surfaces concentrates on problems that students will find most helpful.

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Chapter 5 : CiteSeerX â€” Curves and Surfaces for CAGD

/ A survey of curve and surface methods in CAGD 5 For a triangular surface segment one introduces new affine coordinates r, s along two sides of the triangle in the uo-plane, such that the segment is the image of half the unit square of the rs-plane (see Fig. 3).

Deformable models in medical image analysis: This article surveys deformable models, a promising and vigorously researched computer-assisted medical image analysis technique. Among model-based techniques, deformable models offer a unique and powerful approach to image analysis that combines geometry, physics, and approximation theory. They have proven to be effective in segmenting, matching, and tracking anatomic structures by exploiting bottom-up constraints derived from the image data together with top-down a priori knowledge about the location, size, and shape of these structures. Deformable models are capable of accommodating the significant variability of biological structures over time and across different individuals. Furthermore, they support highly intuitive interaction mechanisms that, when necessary, allow medical scientists and practitioners to bring their expertise to bear on the model-based image interpretation task. This article reviews the rapidly expanding body of work on the development and application of deformable models to problems of fundamental importance in medical image analysis, includingsegmentation, shape representation, matching, and motion tracking. Show Context Citation Context Finite elements Zienkiewicz and Taylor , finite differences Press et al. The continuous model v s is represented in discrete form by a vector u of shape p A survey of free-form object representation and recognition techniques by Richard J. Flynn - Computer Vision and Image Understanding , " Advances in computer speed, memory capacity, and hardware graphics acceleration have made the interactive manipulation and visualization of complex, detailed and therefore large three-dimensional models feasible. These models are either painstakingly designed through an elaborate CAD process or re These models are either painstakingly designed through an elaborate CAD process or reverse engineered from sculpted prototypes using modern scanning technologies and integration methods. The availability of detailed data describing the shape of an object offers the computer vision practitioner new ways to recognize and localize free-form objects. This survey reviews recent literature on both the 3D model building process and techniques used to match and identify free-form objects from imagery. They can be used to generate realistic views. Kobbelt - The Visual Computer , " The representation of freeform surfaces by sufficiently refined polygonal meshes has become common in many geometric modeling applications where complicated objects have to be handled. While working with triangle meshes is flexible and efficient, there are difficulties arising prominently from the l While working with triangle meshes is flexible and efficient, there are difficulties arising prominently from the lack of infinitesimal smoothness and the prohibitive complexity of highly detailed 3Dmodels. In this paper we discuss the generation of fair triangle meshes which are optimal with respect to some discretized curvature energy functional. The key issues are the proper definition of discrete curvature, the smoothing of high resolution meshes by filter operators, and the efficient generation of optimal meshes by solving a sparse linear system that characterizes the global minimum of an energy functional. Results and techniques from differential geometry, variational surface design fairing , and numerical analysis are combined to find efficient and robust algorithms that generate smooth meshes of The Gordon-Wixom interpolation scheme [GW74] and transfinite counterparts of discrete harmonic and Wachspress-Warren coordinate The Gordon-Wixom interpolation scheme [GW74] and transfinite counterparts of discrete harmonic and Wachspress-Warren coordinates are studied as particular cases of that general construction. Finally we establish and analyze links between transfinite barycentric coordinates and certain inverse problems of di erential and convex geometry. Laser range-scanners are used in fields as diverse as product design, reverse engineering, and rapid prototyping to quickly acquire geometric surface data of parts and models. This data is often in the form of a dense, noisy surface mesh that must be simplified into piecewise-smooth surfaces. The method presented here facilitates this time-consuming task by automatically segmenting a dense mesh into regions closely approximated by single surfaces. The algorithm first estimates the noise and curvature of each vertex. Then it filters the curvatures and partitions the mesh into regions with fundamentally different shape characteristics. These regions are then contracted to create seed regions for region growing. For each seed region, the algorithm iterates between region growing and surface fitting to maximize the number of connected vertices approximated by a single underlying surface. The algorithm finishes by filling segment holes caused by outlier noise. We demonstrate the algorithm effectiveness on real data sets. However, the regions created by the region-growing algorithm are in general not convex and we cannot map them to rectangular or circular domains without significant distortion. In such cases, shape Multivariate Bernstein polynomials and convexity by Thomas Sauer - Comp. It is well known that in two or more variables Bernstein polynomials do not preserve convexity. Here we introduce two variations, one stronger than the classical notion, the other one weaker, which are preserved. Moreover, a weaker sufficient condition for the monotony of subsequent Bernstein polyno Moreover, a weaker sufficient condition for the monotony of subsequent Bernstein polynomials is given. A point p in the affine hull of p 0 ;: Moreover, the points of the simplex [p 0 ;: In other words, we can The formula, needed in this context is known as degree raising. A subdivision-based implementation of the hierarchical b-spline finite element method by P. A novel technique is presented to facilitate the implementation of hierarchical b-splines and their interfacing with conventional finite element implementations. The discrete interpretation of the two-scale relation, as common in subdivision schemes, is used to establish algebraic relations between The discrete interpretation of the two-scale relation, as common in subdivision schemes, is used to establish algebraic relations between the basis functions and their coefficients on different levels of the hierarchical b-spline basis. The subdivision projection technique introduced allows us first to compute all element matrices and vectors using a fixed number of same-level basis functions. Their subsequent multiplication with subdivision matrices projects them, during the assembly stage, to the correct levels of the hierarchical b-spline basis. The proposed technique is applied to convergence studies of linear and geometrically nonlinear problems in one, two and three space dimensions. For further details on b-splines we refer to standard textbooks, e. Subdivision shells with exact boundary control and non-manifold geometry by Fehmi Cirak, Quan Long, F. We introduce several new extensions to subdivision shells that provide an improved level of shape control over shell boundaries and facilitate the analysis of shells with non-smooth and non-manifold joints. To this end, modified subdivision schemes are used that enable to relax the continuity of the To this end, modified subdivision schemes are used that enable to relax the continuity of the limit surface along prescribed crease edges and to create surfaces with prescribed limit positions and normals. Furthermore, shells with boundaries in form of conic sections, such as circles or parabolas, are represented with rational subdivision schemes which are defined in analogy to rational b-splines. In terms of implementation, the difference between the introduced and conventional subdivision schemes is restricted to the use of modified subdivision stencils close to the mentioned geometric features. Hence, the resulting subdivision surface is in most parts of the domain identical to standard smooth subdivision surfaces. As in the original subdivision shells, surfaces created with the modified scheme are used for interpolating the reference and deformed shell configurations. At the integration points, the subdivision surface is evaluated using a newly developed discrete parameterisation approach. In the resulting finite elements the only degrees of freedom are the mid-surface displacements of the nodes and additional Lagrange parameters for enforcing normal constraints. The versatility of the newly developed elements is demonstrated with a number of geometrically nonlinear shell examples. In the spirit of isogeometric analysis, in [8, 11] the subdivision surfaces were propsed for geometric modelling and analysis of thin shells. In this paper we introduce a number of extensions to [8, We present a framework for smoothing grid-like digital terrain elevation data, which achieves fair shape by means of minimizing an energy functional. The minimization is performed under the side-condition of hard constraints which come from available horizontal and vertical accuracy bounds in the e The minimization is performed under the side-condition of hard constraints which come from available horizontal and vertical accuracy bounds in the elevation specification. We introduce the framework and demonstrate the suitability of this method for the tasks of accuracy-constrained smoothing, feature-preserving smoothing, and filling of data voids. A polyline network with ver We argue for a new research category, named Education-Driven Research abbreviated EDR , which fills the gap between traditional field-specific Research that is not concerned with educational objectives and Research in Education that focuses on fundamental teaching and learning principles and possib The objective of EDR is to simplify the formulation of the underlying theoretical foundations and of specific tools and solutions in a specialized domain, so as to make them easy to understand and internalize. As such, EDR is a difficult and genuine research activity, which requires a deep understanding of the specific field and can rarely be carried out by generalists with primary expertise in broad education principles. These examples demonstrate the value of using analogies, of introducing evocative terminology, and of synthesizing the simplest fundamental building blocks. The intuitive understanding provided by EDR enables the students and even the instructor to better appreciate the limitations of a particular solution and to explore alternatives. In particular, in these examples, EDR has allowed the author to: I decided to forgo generality and to focus on simple subdivision processes [WaWe02] that generate uniform cubic B-splines and 4-poi

Chapter 6 : A History of Curves and Surfaces in CAGD | Michele Rosa - calendrierdelascience.com

TY - JOUR. T1 - A survey of curve and surface methods in CAGD. AU - BÃ¶hm,Wolfgang. AU - Farin,Gerald. AU - Kahmann,JÃ¼rgen. PY - Y1 - KW - approximation.

Chapter 7 : A survey of curve and surface methods in CAGD â€” Arizona State University

Title: Barnhill, R. E.; Boehm, W. (eds.), Surfaces in CAGD ' Proceedings. Oberwolfach, F.R.G., Amsterdam-New York-Oxford, North-Holland

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This means you get the informal, friendly style and unique approach that has made Curves and Surfaces for CAGD: A Practical Guide a true classic. The book's unified treatment of all significant methods of curve and surface design is heavily focused on the movement from theory to application.