

Tenth SIAM Conference on Geometric Design and Computing

The Historic Menger Hotel *** San Antonio, TX *** November 4–8, 2007

Sunday, November 4	
10:00	<p style="text-align: center;">Minitutorial (Ballroom A/B)</p> <p>Organizer: Bernard Mourrain, <i>INRIA, France</i></p> <p>Title: Subdivision Methods for the Solution of Non-linear Equations or How to Cut a Long Story Short</p> <p>Abstract: Many operations in shape processing reduce to the resolution of non-linear equations. Among numerous methods which exists for solving such equations, the subdivision approach appears to be practically efficient for solving problems which occur in geometric modeling problems. The objectives of this tutorial, is to give a comprehensive overview of such methods based on divide-and-conquer schemes to localize the (real) solutions of polynomial equations. We will briefly describe the landscape of polynomial solvers and the family of subdivision solvers from this perspective. After this introduction, we will consider solvers of univariate equations, detail their subdivision strategies and the properties they exploit to isolate efficiently the real solutions. This tour will bring us to Descartes rule of sign, De Casteljaou algorithm, Continued fraction expansion, and numerical approximation issues.</p> <p>The second part will be devoted to multivariate equations. Techniques which reduce to solving univariate problems will be explained and analysed. Preconditioning operations and certification criteria will be detailed and illustration on practical problems will be given. Finally, we will consider extensions of this approach to problems where solution sets are curves or surfaces. We will see how their topology can be computed from the application of such subdivision techniques, including the treatment of singular points. These developments will be illustrated by examples, and experimentation with a computer algebra system and a geometric modeler software. We plan to provide a support in order to encourage the audience to do the experimentation itself.</p>
12:00	Lunch
14:00	<p style="text-align: center;">Minitutorial (Ballroom A/B)</p> <p>Organizers: Christoph M. Hoffmann, <i>Purdue University</i> Meera Sitharam, <i>University of Florida</i></p> <p>Title: The ABC of Geometric Constraint Solving</p> <p>Abstract: The tutorial will present a birds-eye view of geometric constraint solving, motivated by applications in engineering and in molecular biology. We will discuss elementary methods that anyone can implement and advanced questions that are at this time in the research domain. The following topics will be explored:</p> <ul style="list-style-type: none"> A) Applications in engineering and molecular biology; underlying equational problems; sequential vs. simultaneous problems. B) Basic techniques for bottom-up triangle decomposition; extensions to higher dimensions and to higher-order subproblems; solution space issues. C) Advanced topics: intrinsic complexity, DR plans, special techniques. <p>At the end, participants will be ready to implement a simple constraint solver engine and have enough background to fast-track into the literature on the subject.</p>

	Monday Morning, November 5	
7:45	Opening (Ballroom A/B)	
	Session P-1 Chair: <i>Larry Schumaker</i>	
8:00	Helmut Pottmann , <i>Vienna University of Technology, Austria</i> , Architectural Geometry	
8:50	Coffee Break	
	Session C-2A Chair: <i>Joe Warren</i>	Session C-2B Chair: <i>Ming-Jun Lai</i>
9:30	Michael Lachance , <i>University of Michigan-Dearborn</i> , A Numerical Control Feed Rate Problem	Martin Reuter , <i>MIT, Cambridge, MA</i> , Global Isometry Invariant Shape Analysis
9:50	Xiaoping Qian , <i>Illinois Institute of Technology, Chicago, IL</i> , Computing Curvatures for Point-Set Surfaces and its Application in Layered Manufacturing	Christian Schulz , <i>CMA/IFI, University of Oslo, Norway</i> , Curve Intersection and Bézier Clipping
10:10	Madan Mohan Dabbeeru , <i>Indian Institute of Technology, Kanpur, India</i> , Function Considerations in Specifying the Design Space for Mechanical Assemblies using Configuration Space Analysis	Kira Vyatkina , <i>Saint Petersburg State University, Russia</i> , Linear Axis for Planar Straight Line Graphs
10:30	R. Khardekar , <i>Univ. of California, Berkeley, CA</i> , NURBS Modeling Operations on the GPU	Michael Bartoň , <i>Johannes Kepler University, Linz, Austria</i> , Exact Rotation Minimizing Frame via Möbius Transformations
10:50	Tae-Wan Kim , <i>Seoul National University, Seoul, Korea</i> , Approximation of Intersection Curves in SSI within Prescribed Error Bound	David Brunner , <i>Chemnitz University of Technology, Chemnitz, Germany</i> , Fast Force Field Approximation and its Application to Skeletonization
11:10	Hüseyin Erdim , <i>University of Connecticut, Storrs, CT</i> , Classifying Points for Solid Sweeping	Per Bergström , <i>Luleå University of Technology, Luleå, Sweden</i> , A Method Suitable for Reiterated Matching of Surfaces
11:30	Liangjun Zhang , <i>Univ. of North Carolina at Chapel Hill</i> , Generalized Penetration Depth Computation and Applications to Robot Motion Planning	Fritz Klein , <i>The Boeing Company, Seattle, WA</i> , Practical Aspects of Surface Intersection
11:50	David Field , <i>General Motors Research</i> , New Problem, New Geometric Representation?	Dirk Roose , <i>K. U. Leuven, Belgium</i> , Meshless Extraction of Feature Lines from Point Clouds using Histogram Thresholding
12:10	Lunch	

	Monday Afternoon, November 5	
	Session P-3 Chair: <i>Konrad Polthier</i>	
13:30	Alexander Bobenko , <i>Technische Universität Berlin</i> , On Discretization Principles of Differential Geometry	
14:20	Coffee Break	
	Session M-4A Chair: <i>Konrad Polthier</i>	Session M-4B Chair: <i>Georg Umlauf</i>
15:00	Konrad Polthier , <i>Freie Universität Berlin</i> , QuadCover - Global Parameterization of Surface Meshes using Branched Coverings	Steven J. Owen , <i>Sandia National Laboratories</i> , An Immersive Topology Environment for Meshing: A 3D Geometry and Mesh Preparation Tool for CAE
15:30	Kai Hormann , <i>Clausthal University of Technology, Germany</i> , How to Measure the Distortion of a Parameterization?	David Field , <i>General Motors Research</i> , An Example Concerning the Interoperability of Engineering Applications
16:00	Michael Kazhdan , <i>Johns Hopkins University, Baltimore, MD</i> , Reconstruction of Solid Models from Oriented Point Sets	Thomas A. Grandine , <i>The Boeing Company</i> , Geometric Knowledge Capture for Engineering Design and Analysis
16:30	J. Warren , <i>Rice University</i> , Exact Evaluation of Non-Polynomial Subdivision Schemes at Rational Parameter Values	Zbynek Sir , <i>Charles University in Prague</i> , Construction Methods for Curves and Surfaces with Rational Offsets
17:00	Richard Zhang , <i>Simon Fraser University</i> , Spectral Processing for Surface Meshes	
17:30	E. Grinspun , <i>Columbia University, NY</i> , Discrete Quadratic Curvature Energies	
18:00	Business Meeting (Ballroom A/B)	
19:00	Welcome Reception (Minuet Room)	

Tuesday Morning, November 6			
Session P-5 Chair: <i>Tor Dokken</i>			
8:00	Craig Gotsman , <i>Center for Graphics and Geometric Computing, Technion, Israel</i> , Discrete Differential Geometry: Some Theory and Applications		
8:50	Coffee Break		
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9:30	Kai Hormann , <i>Clausthal University, Germany</i> , Polynomial Reproduction by Symmetric Subdivision Schemes		
9:50	Qi Chen , <i>Universität Karlsruhe, Karlsruhe, Germany</i> , Analyzing Midpoint Subdivision for all Orders		
10:10	Dianna Xu , <i>Bryn Mawr College</i> , A Manifold-based Construction of C^∞ Surfaces from Triangular Meshes		
10:30	Jörg Peters , <i>University of Florida</i> , Polar Perspective of Surface Design		
10:50	Minho Kim , <i>University of Florida, Gainesville, FL</i> , Fast and Stable Evaluation of Box Splines via the Bézier Form		
11:10	T. Sorokina , <i>Towson University, Towson, MD</i> , Geometric Constraints for Finite Elements: Why They Arise and How to Deal With Them		
11:30	Joon-Kyung Seong , <i>University of Utah, Salt Lake City, UT</i> , Trimming of Self-Intersecting Offset Surfaces using Distance Maps		
11:50	N. Parfynovych , <i>Dnepropetrovsk National University, Ukraine</i> , On Some Problems of Shape Preserving and Class Preserving Approximation		
12:10	Lunch		

Tuesday Afternoon, November 6																			
Session P-7 Chair: <i>Gershon Elber</i>																			
13:30	Nina Amenta , <i>University of California at Davis</i> , Point-Set Surfaces and Statistical Models																		
14:20	Coffee Break																		
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	Session P-9 Chair: <i>Thomas Grandine</i>	
8:00	Geoffrey Butlin , <i>TranscenData Europe Ltd.</i> , CAE Theory and Practice	
8:50	Coffee Break	
	Session C-10A Chair: <i>Michael Floater</i>	Session M-10B Chair: <i>Yuliya Babenko</i>
9:30	<p>9:30, Johan de Villiers, <i>Stellenbosch University, South Africa</i>, On the Construction and Convergence of a Class of Interpolatory Subdivision Schemes</p> <p>9:50, Carolina Beccari, <i>University of Bologna, Italy</i>, Tension-Controlled Ternary Subdivision</p> <p>10:10, Felix Kälberer, <i>Freie Universität Berlin, Germany</i>, Hierarchical Subdivision Surfaces from QuadCover Grids</p> <p>10:30, G. Umlauf, <i>Computer Science Department, University of Kaiserslautern, Germany</i>, Local Energy-Minimizing Subdivision Algorithms</p> <p>10:50, Charles Loop, <i>Microsoft Research, Texas A&M University</i>, Approximating Catmull-Clark Subdivision Surfaces</p> <p>11:10, Weiyin Ma, <i>City University of Hong Kong</i>, Constructing Interpolatory Subdivision Schemes from Approximatory Subdivisions</p> <p>11:30, H. Hagen, <i>University of Kaiserslautern, Germany</i>, Simulation, Visualization, and VR-based Modeling of Room Acoustics</p> <p>11:50, Boris Odehnal, <i>Vienna University of Technology, Vienna, Austria</i>, On Two-parameter Families of Spheres with Rational Envelopes</p>	<p>9:30, Yuliya Babenko, <i>Sam Houston State University, TX</i>, Error Analysis for Adaptive Approximation by Various Classes of Splines and Mesh Generation</p> <p>10:00, Weiming Cao, <i>University of Texas at San Antonio, San Antonio, Texas</i>, Optimal Mesh Metrics for Anisotropic Mesh Refinement Based on Interpolation Error Estimates</p> <p>10:30, Long Chen, <i>University of California, Irvine, CA</i>, Mesh Adaptation based on Optimal Delaunay Triangulation</p> <p>11:00, Weizhang Huang, <i>University of Kansas, Lawrence, Kansas</i>, Equidistribution and Alignment in Mesh Adaptation and Movement</p> <p>11:30, Vladislav Babenko, <i>Dnepropetrovsk National University & Institute of Mathematics NAS, Ukraine</i>, Exact Asymptotics of Weighted Uniform Error of Adaptive Interpolation by Multivariate Linear Splines</p>
12:10	Lunch	

Wednesday Afternoon, November 7																															
Session P-11 Chair: <i>Jörg Peters</i>																															
13:30	Ken Stephenson , <i>University of Tennessee, Knoxville</i> , You Want Some Geometry with That?																														
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19:00	Conference Dinner (Minuet Room) — Ticket Holders Only																														

Thursday Morning, November 8	
	Session P-13 Chair: <i>Mike Neamtu</i>
8:00	Lyle Noakes , <i>University of Western Australia</i> , Rigid Bodies, Riemannian Cubics and Lie Quadratics
8:50	Coffee Break
	<div style="width: 48%;"> <p style="text-align: center;">Session C-14A Chair: <i>Simon Foucart</i></p> </div> <div style="width: 48%;"> <p style="text-align: center;">Session M-14B Chair: <i>Kai Hormann</i></p> </div>
9:30	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>9:30, Larry L. Schumaker, <i>Vanderbilt University</i>, Computing Bivariate Splines in Scattered Data Fitting and the FEM Method</p> <p>9:50, H. Speleers, <i>Katholieke Universiteit Leuven, Belgium</i>, Local Adaptive Approximation with QHPS Splines</p> <p>10:10, S. Mann, <i>University of Waterloo, Waterloo, Ontario, Canada</i>, Tessellating Algebraic Surfaces with A-patches</p> <p>10:30, Leonardo Traversoni, <i>Universidad Autonoma Metropolitana (I), Mexico City, Mexico</i>, Movement Splines</p> <p>10:50, J. Kosinka, <i>University of Oslo, Norway</i>, From MPH Curves to MOS Surfaces</p> <p>11:10, Rubén Dorado, <i>University of Jaén, Spain</i>, Polynomial Approximation to the Isometric Mapping of a Developable Surface</p> <p>11:30, H.-P. Helfrich, <i>University of Bonn, Germany</i>, Second Order Approximation of the Squared Distance to Curves and Surfaces</p> <p>11:50, Boris Shekhtman, <i>University of South Florida</i>, Ideal and Hermite Interpolation</p> </div> <div style="width: 48%;"> <p>9:30, Kai Hormann, <i>Clausthal University of Technology, Germany</i>, Generalized Barycentric Coordinates</p> <p>9:55, Scott Schaefer, <i>Texas A&M University</i>, Barycentric Coordinates for Closed Curves</p> <p>10:20, M. Floater, <i>University of Oslo, Norway</i>, Hermite Mean Value Interpolation</p> <p>10:45, Tao Ju, <i>Washington University in St. Louis</i>, A General, Geometric Construction of Coordinates in any Dimensions</p> <p>11:10, S. Bruvoll, <i>University of Oslo, Norway</i>, Transfinite Mean Value Interpolation over Volumetric Domains</p> <p>11:35, N. Sukumar, <i>University of California, Davis, CA</i>, Barycentric Finite Element Methods</p> </div> </div>
12:10	Lunch

	Thursday Afternoon, November 8	
	Session P-15 Chair: <i>Stephen Mann</i>	
13:30	K. Haller , <i>SolidWorks Corporation, Concord, MA</i> , Geometric Constraints and Surfacing in Parametric Solid Modelers	
14:20	Coffee Break	
	Session C-16A Chair: <i>Daniel Gonsor</i>	Session C-16B Chair: <i>Leonardo Traversoni</i>
15:00	Yingbin Liu , <i>University of Waterloo, Waterloo, Ontario, Canada</i> , Discontinuity Analysis on Triangular Bézier Patch Surfaces with Approximate G^1 Continuity	Brenda Arredondo , <i>Universidad Autónoma Metropolitana (I), Mexico City, Mexico</i> , Quaternion Splines and Movement Reconstruction
15:20	Takafumi Saito , <i>Tokyo University of Agriculture and Technology, Japan</i> , Reflection Inflection Function: A Unified Analytical Theory of Reflection Distortion for Curved Surface Design	Tom Bobach , <i>Geometric Algorithms Group, University of Kaiserslautern, Germany</i> , Extending Incomplete Discrete Harmonic Functions to Open Meshes without Boundary Conditions
15:40	Norimasa Yoshida , <i>Nihon University, Japan</i> , Classification of Aesthetic Space Curves	Tae-wan Kim , <i>Seoul National University, Seoul, Korea</i> , Generate Triangle Meshes from Point Clouds by Moving Parabolic Approximation
16:00	Leonardo Fernández-Jambrina , <i>Universidad Politécnica de Madrid, Spain</i> , NURBS Developable Surfaces	Burkhard Lehner , <i>University of Kaiserslautern, Germany</i> , Generalized Swap Operations on Tetrahedral Meshes
16:20	Gerardo Paredes , <i>UNAM, Mexico</i> , Parallels	
16:40	End of Conference	