
Geometric Modeling and Processing

*Huangshan, China
June 18-24, 2012*

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Geometric Modeling and Processing (GMP 2012)

June 18-24, 2012, Huangshan, China

Program



University of Science and Technology of China

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Conference Overview

Welcome to participate in GMP 2012, which will be held in Yellow Mountain (Huangshan), China, from June 18-24, 2012 (including a two day tutorial during June 18-19).

Geometric Modeling and Processing (GMP) is a biannual international conference series on geometric modeling, simulation, and computing. The modeling and processing of geometric data is fundamental to many computer applications, including computer graphics, computer vision, CAD/CAM, medical imaging, engineering analysis, robotics, and scientific computation topics. GMP conferences provide researchers and practitioners with a forum for exchanging new ideas, discussing new applications, and presenting new solutions. GMP 2012 is the seventh GMP conference.

GMP 2012 received 80 paper submissions, covering a wide spectrum of geometric modeling and processing. Each paper was reviewed by at least three members of the program committee and external reviewers in a double-blind and two-stage reviewing process. Based on the recommendations of the reviewers, 30 submissions were selected for oral presentation and 8 for poster presentation. Of the 30 accepted papers, 17 are published in a special issue of Graphical Models (Volume 74, Issue 4) and 13 are published in a special issue of Computer Aided Geometric Design (Volume 29, Issue 7). **These two special issues will be open to everyone for 30 days from the start of the conference.** The links are

GMOD <http://www.sciencedirect.com/science/journal/15240703/>

CAGD <http://www.sciencedirect.com/science/journal/01678396/>

Program of Tutorials

Chair: Ligang Liu

June 18, 2012		
9:30-11:30	Generalized Barycentric Coordinates	Kai Hormann
11:30-13:30	Lunch	
13:30-15:30	Computational Conformal Geometry, Theory, Algorithm and Application	David Xianfeng Gu
15:30-16:00	Break	
16:00-18:00	Discrete Geodesics	Ying He Shi-Qing Xin
June 19, 2012		
8:30-12:00	Numeric and Symbolic Processing in Geometric Modeling	Myung Soo Kim Gershon Elber
12:00-13:30	Lunch	
13:30-15:30	Computation and Applications of Centroidal Voronoi Tessellations	Wenping Wang
15:30-16:00	Break	
16:00-17:00	Isogeometric Analysis	Bert Jüttler

Program of Conference

June 20, 2012		
8:45-9:00	Open Ceremony	Chair: Falai Chen
Invited Talk 1		
9:00-10:00	Charles Loop <i>Analytic Displacement and GPU Rendering of Catmull-Clark Subdivision Surfaces</i>	Chair: Kai Hormann
10:00-10:20	Tea Break	
Session 1		
10:20-10:45	Stefano Marras, Michael M. Bronstein, Kai Hormann, Riccardo Scateni, and Roberto Scopigno <i>Motion-based Mesh Segmentation Using Augmented Silhouettes (GMOD)</i>	Chair: Bert Jüttler
10:45-11:10	Hui Wang, Zhixun Su, Junjie Cao, Ye Wang, and Hao Zhang <i>Empirical Mode Decomposition on Surfaces (GMOD)</i>	
11:10-11:35	Shoichi Tsuchie and Masatake Higashi <i>Surface Mesh Denoising with Normal Tensor Framework (GMOD)</i>	
11:35-12:00	Tsz-Ho Kwok, Yunbo Zhang, and Charlie C. L. Wang <i>Constructing Common Base Domain by Cues from Voronoi Diagram (GMOD)</i>	

Session 2		
14:00-14:25	Hiroki Yoshihara, Tatsuya Yoshii, Tadahiro Shibutani, and Takashi Maekawa <i>Topologically Robust B-spline Surface Reconstruction from Point Clouds Using Level Set Methods and Iterative Geometric Fitting Algorithms (CAGD)</i>	Chair: Ron Goldman
14:25-14:50	Shengjun Liu and Charlie C. L. Wang <i>Quasi-Interpolation for Surface Reconstruction from Scattered Data with Radial Basis Function (CAGD)</i>	
14:50-15:15	Wenni Zheng, Pengbo Bo, Yang Liu, and Wenping Wang <i>Fast B-spline Curve Fitting by L-BFGS (CAGD)</i>	
15:15-15:40	Hongwei Lin <i>Adaptive Data Fitting by the Progressive-Iterative Approximation (CAGD)</i>	
15:40-16:10	Tea Break	
Session 3		
16:10-16:35	Tingbo Hou and Hong Qin <i>Continuous and Discrete Mexican Hat Wavelet Transforms on Manifolds (GMOD)</i>	Chair: Ying He
16:35-17:00	Xin Li and Jianmin Zheng <i>An Alternative Method for Constructing Interpolatory Subdivision from Approximating Subdivision (CAGD)</i>	

17:00-17:25	Teng Ma, Xiang Long, Lu Feng, Pei Luo, and Zhuangzhi Wu <i>Visible Neighborhood Graph of Point Clouds (GMOD)</i>	
June 21, 2012		
Invited Talk 2		
9:00-10:00	Bert Jüttler <i>Exact Geometry Description as a Key Technology for Numerical Simulation</i>	Chair: Falai Chen
10:00-10:20	Tea Break	
Session 4		
10:20-10:45	Yu-Kun Lai and Ralph R. Martin <i>Vertex Location Optimisation for Improved Remeshing (GMOD)</i>	Chair: Takashi Maekawa
10:45-11:10	Hua Zhu, Shuming Gao, Ming Li, and Wanbin Pan <i>Adaptive Tetrahedral Remeshing for Modified Solid Models (GMOD)</i>	
11:10-11:35	Abel João Padrão Gomes and Adriano N. Raposo <i>3D Molecular Assembling of B-DNA Sequences using Nucleotides as Building Blocks (GMOD)</i>	
11:35-12:00	Dao T. P. Quynh, Ying He, Shi-Qing Xin, and Zhonggui Chen <i>An Intrinsic Algorithm for Computing Geodesic Distance Fields on Triangle Meshes with Holes (GMOD)</i>	

Session 5		
14:00-14:25	Carlotta Giannelli, Bert Jüttler, and Hendrik Speleers <i>THB-Splines: The Truncated Basis for Hierarchical Splines (CAGD)</i>	Chair: Charles Loop
14:25-14:50	Meng Wu, Jinlan Xu, Ruimin Wang, and Zhouwang Yang <i>Hierarchical Bases of Spline Spaces with Highest Order Smoothness over Hierarchical T-subdivisions (CAGD)</i>	
14:50-15:15	Rushan Ziatdinov <i>Family of Superspirals with Completely Monotonic Curvature Given in Terms of Gauss Hypergeometric Function (CAGD)</i>	
15:15-15:40	Iddo Hanniel, Adarsh Krishnamurthy, and Sara McMains <i>Computing the Hausdorff Distance between NURBS Surfaces using Numerical Iteration on the GPU (GMOD)</i>	
15:40-16:00	Tea Break	
16:00-17:30	Posters (16:00-16:40: Oral Presentation)	Chair: Zhouwang Yang
18:00-20:00	Banquet	
June 22, 2012		
Invited Talk 3		
9:00-10:00	Wenping Wang <i>Free-form Shape Modeling Using Cyclides Splines</i>	Chair: Myung-Soo Kim

10:00-10:20	Tea Break	
Session 6		
10:20-10:45	David Großmann, Bert Jüttler, Helena Schlusnus, Johannes Barner, and Anh-Vu Vuong <i>Isogeometric Simulation of Turbine Blades for Aircraft Engines (CAGD)</i>	Chair: Kai Hormann
10:45-11:10	Gershon Elber, Yong-Joon Kim, and Myung-Soo Kim <i>Volumetric Boolean Sum (CAGD)</i>	
11:10-11:35	Xiaoran Shi, Xuhui Wang, and Ron Goldman <i>Using μ-Bases to Implicitize Rational Surfaces with a Pair of Orthogonal Directrices (CAGD)</i>	
11:35-12:00	Yong-Joon Kim, Jieun Lee, Myung-Soo Kim, and Gershon Elber <i>Efficient Offset Trimming for Planar Rational Curves using Biarc Trees (CAGD)</i>	
Session 7		
14:00-14:25	Sen Wang, Jianhuang Wu, Mingqiang Wei, and Xin Ma <i>Robust Curve Skeleton Extraction for Vascular Structures (GMOD)</i>	Chair: Gershon Elber
14:25-14:50	Min Ki Park, Seung Joo Lee, and Kwan H. Lee <i>Multi-Scale Tensor Voting for Feature Extraction from Unstructured Point Clouds (GMOD)</i>	
14:50-15:15	Yong Jin, Qingbiao Wu, and Ligang Liu <i>Unsupervised Upright Orientation of Man-Made Models (GMOD)</i>	

15:15-15:40	Long Zeng, Yong-Jin Liu, Ming Chen, and Matthew Ming-Fai Yuen <i>Least Squares Quasi-Developable Mesh Approximation (CAGD)</i>	
15:40-16:10	Tea Break	
Session 8		
16:10-16:35	Long Zhang, Jiazhi Xia, Xiang Ying, Ying He, Wolfgang Mueller-Wittig, and Hock-Soon Seah <i>Efficient and Robust 3D Line Drawings Using Difference-of-Gaussian (GMOD)</i>	Chair: Ligang Liu
16:35-17:00	Wei Zeng, Ren Guo, Feng Luo, and Xianfeng Gu <i>Discrete Heat Kernel Determines Discrete Riemannian Metric (GMOD)</i>	
17:00-17:25	Wei Yu, Maoqing Li, and Xin Li <i>Fragmented Skull Modeling Using Heat Kernels (GMOD)</i>	
17:25-17:45	Close Ceremony	Chair: Myung-Soo Kim

Information of Invited Talks

Invited Talk 1: Charles Loop, Microsoft Research

Title: Analytic Displacement and GPU Rendering of Catmull-Clark Subdivision Surfaces

Abstract:

We present a novel method for high-performance GPU based rendering of Catmull-Clark subdivision surfaces called feature adaptive subdivision. Unlike previous methods, our algorithm computes the true limit surface up to machine precision, and is capable of rendering surfaces that conform to the full RenderMan specification for Catmull-Clark surfaces. Specifically, our algorithm can accommodate base meshes (possibly with boundary) consisting of arbitrary valence vertices and faces, and the surface can contain any number and arrangement of semi-sharp creases. Though considerably more general, the performance of our algorithm is comparable to the best approximating method, and is considerably faster than Stam's exact method.

Displacement mapping is ideal for modern GPUs since it enables high-frequency geometric detail on surfaces with low memory I/O. However, problems such as texture seams, normal re-computation, and under-sampling artifacts have limited its adoption. To tackle these problems, we introduce a GPU-friendly tile based texture format, store the coefficients of a smooth displacement function in these tiles, and form a multi-resolution hierarchy of this function. Using a scalar valued biquadratic B-spline with Doo-Sabin connectivity, we displace the Catmull-Clark base limit surface in its normal direction. We accurately compute surface normal variation at the pixel level; obviating the need for pre-computed normal maps while allowing correct shading under animation. Additionally, we propose a smooth level of detail scheme where we compute per vertex adaptive tessellation factors and select appropriate pre-filtered mip levels of the displacement function to prevent under-sampling.

Invited Talk 2: Bert Jüttler, Johannes Kepler Universität Linz, Austria

Title: Exact geometry description as a key technology for numerical simulation

Abstract:

Choosing the "right" representation of geometric objects can provide tremendous advantages

for subsequent computations, e.g., for numerical simulation. The talk will illustrate this observation by two case studies. First, we will report about the use of arc splines for computing medial axes and Voronoi diagrams for planar domains with free-form boundaries. Compared to existing methods, which are based on point samples or piecewise linear representations, the use of splines eliminates the need for pruning and leads to more efficient algorithms. Second, we will describe our recent experiences with Isogeometric Analysis (IGA). IGA, which was proposed by T. Hughes et al. (2005) provides a new approach to bridge the gap between numerical simulation and geometric design of engineering objects. We will focus on the challenges for the geometric design community that arise from using this approach and demonstrate the potential gains.

Invited Talk 3: Wenping Wang, University of Hong Kong

Title: Free-form Shape Modeling Using Cyclides Splines

Abstract:

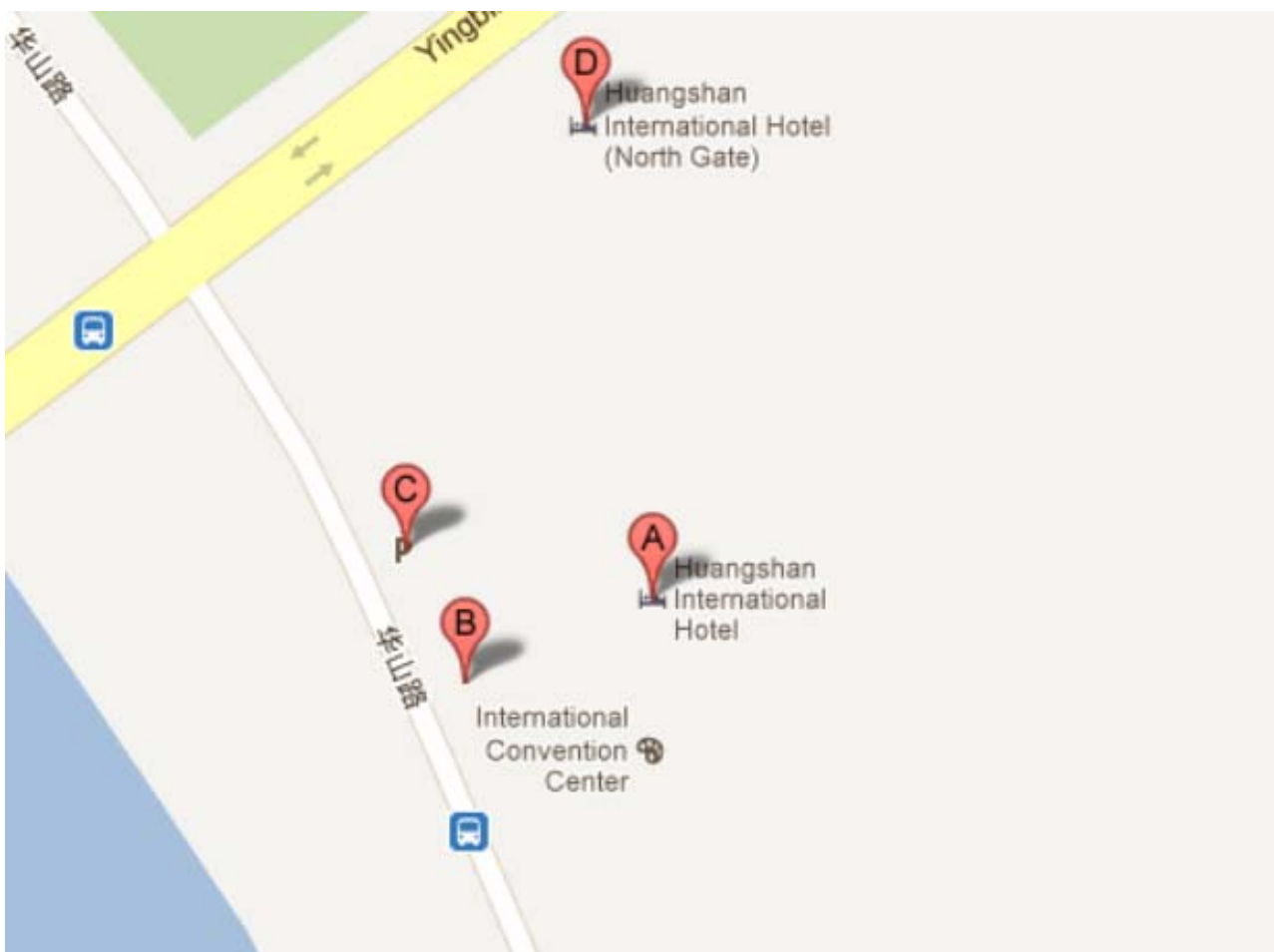
Dupin cyclides are classical surfaces discovered by the French mathematician Charles Dupin in the early 19th century. These surfaces have been extensively studied for surface representation for about three decades since Ralph Martin introduced them to surface modeling in early 1980s. Cyclides have several remarkable properties; for instance, they are low-degree algebraic surfaces (degree 4 or less) and have rational bi-quadratic parameterization. Furthermore, the offsets of a cyclide are again cyclides. However, despite all these advantages cyclide could potentially offer for shape modeling, all previous attempts at using cyclides to model free-form surfaces have been unsuccessful because of the relative inflexibility of cyclide patches. Therefore, it is widely believed that cyclides do not have enough freedom to represent free-form shapes. The applications of cyclides are currently limited to modeling blend surfaces or canal surfaces.

I shall propose an effective approach to modeling free-form shapes using fair, smooth cyclide splines. The key ideas behind the approach are vertex relaxation and global optimization. Specifically, the inflexibility of cyclides is overcome by relaxing the vertices of cyclide patches in a constrained optimization framework. I shall present results on using cyclide splines for free-form surface fitting and general free-form shape modeling, thus proposing cyclide splines as the first practical free-form surface representation with the exact offset property.

General Information

The Meeting Venue

All the Tutorials and talks will be given at Hui-Zhou hall (徽州厅), which lays on the 2nd floor of the Huangshan International Convention Center.



In the map, A is for Huangshan International Hotel and B is for Huangshan International Conference Center

Accommodation Arrangements and Meals

All the conference attendees if registered for the conference via smart-chair system can be arranged at the Huangshan International Hotel (Huashan Road, Tunxi, Huangshan, Anhui, China), which is very close to the Huangshan International conference Center, according to your choice in the register system.

The hotel will provide meals for Conference attendees daily at Huangshan hall (黄山厅), which lays on the 2nd floor of the Huangshan International Hotel. Breakfast will be served for free, however lunch and supper will be served after you show them the meal voucher which you will get from the conference staffs.

In particular, there will be a banquet on June 20 evening for all the conference attendees.

Huangshan International Hotel

Invested by Huangshan Travel Development LTD. CO and Chinese Travel Group Company, Huangshan International Hotel is located in Tunxi, where there is beautiful scenery, quiet and elegant environment, as well as convenient transport of four kilometers from the airport and two kilometers from the railway station. Facing the Xin'an River, standing in front of Xiao Hua Mountain, the hotel has an ancient style of Hui building in accordance with the ancient looking of the streets. It is an ideal accommodation.

Travel Information

After the conference, you can join a one-day trip (on June 23) to the Yellow Mountain and a half-day trip (on the morning of June 24) to Xidi Village if you want.

- **Yellow Mountain**

Situated at the confluence of Shexian, Yixian and Xiuning counties, Huangshan Mountain (Yellow Mountain) covers an area of about 1,200 square km, the highlights of which occupy 154 km². It is a landform typical of Mesozoic granite. Its highest peak, the Lotus Peak, rises 1,864 m above sea level.

Officially designated as one of China's top 10 scenic spots, it has charmed countless number of tourists from home and abroad. Huangshan Mountain can be regarded as an amalgamation of all the merits of other mountains: grand, steep, picturesque, and with a rich cultural heritage. Xu Xiake, a well-known geographer of the Ming Dynasty (1368-1644), once said, "When I have visited Huangshan Mountain, I don't even wish to visit others."

Blessed with a mild climate, Huangshan Mountain presents different scenery in four seasons. Its "four major marvels" are the uniquely shaped pines, oddly-shaped rocks, seas of clouds and hot springs, all of which are well known both inside and outside China. The abundant remains of glaciers and water resources, a geological structure unique to Huangshan Mountain, have produced such natural wonders as the Kuzhu Brook, Xiaoyao Brook, Renzi Waterfall, Baizhang Spring, and Jiulong Waterfall. In addition, thanks to a complicated natural environment, Huangshan Mountain has a well-balanced ecosystem, thus becoming renowned as "a natural zoo and a botanical garden extremely rich in plant varieties".

How to reach Huangshan International Conference Center (Huangshan International Hotel)?

From	Taxi	Bus
Tunxi Airport, Huangshan (黄山屯溪机场)	15 minutes	<ol style="list-style-type: none"> 1. Take the bus No.18, 2. Get off at "Hengjiang Bridge Stop"(横江桥站 about 20 minutes, 7 stops) 3. Walk about 260m to Huangshan International Conference Center
Huangshan Bus Station (汽车客运总站)	10 minutes	<ol style="list-style-type: none"> 1. Take the bus No.19 2. Get off at "Hengjiang Bridge Stop"(横江桥站 about 15 minutes, 5 stops) 3. Walk about 260m to Huangshan International Conference Center

Huangshan Railway Station (黄山火车站)	10 minutes	<ol style="list-style-type: none"> 1. Take the bus No.12 2. Get off at “Hengjiang Bridge Stop”(横江桥站 about 30 minutes, 12stops) 3. Walk about 260m to Huangshan International Conference Center
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How to leave Huangshan City?

To	Taxi	Bus
Tunxi Airport, Huangshan (黄山屯溪机场)	15 minutes	<ol style="list-style-type: none"> 1. Walk to “Hengjiang Bridge Stop” (横江桥站, about 280m) 2. Take the bus No.18, and get off at “Airport Stop” (机场站, 7 stops). 3. Walk to the airport (about 30m).
Huangshan Bus Station (汽车客运总站)	10 minutes	<ol style="list-style-type: none"> 1. Walk to “Hengjiang Bridge Stop” (横江桥站, about 280m) 2. Take the bus No.19, and get off at “Bus Station Travel Distribution Center Stop” (汽车站旅游集散中心站, 3 stops) 3. Walk to the bus station (about 120m).
Huangshan Railway Station (黄山火车站)	10 minutes	<ol style="list-style-type: none"> 1. Walk to “Hengjiang Bridge Stop” (横江桥站, about 280m) 2. Take the bus No.12, and get off at “Railway Station” (火车站, 12 stops). 3. Walk to the railway station (about 130m).

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