



HAL
open science

Foreword to the special section on Shape Modeling International 2023 (SMI2023)

Georges-Pierre Bonneau, Ligang Liu, Michela Mortara

► **To cite this version:**

Georges-Pierre Bonneau, Ligang Liu, Michela Mortara. Foreword to the special section on Shape Modeling International 2023 (SMI2023). *Computers and Graphics*, 115, pp.A6-A9, 2023, 10.1016/j.cag.2023.10.008 . hal-04322799

HAL Id: hal-04322799

<https://inria.hal.science/hal-04322799v1>

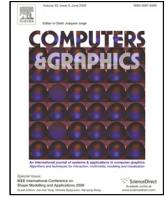
Submitted on 5 Dec 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



Foreword to the Special Section on Shape Modeling International 2023 (SMI2023)

Georges-Pierre **Bonneau**^{a,b,c}, Ligang **Liu**^d, Michela **Mortara**^e

^aUniversité Grenoble Alpes, France

^bLaboratoire Jean Kuntzmann, France

^cINRIA Rhône-Alpes, France

^dGraphics & Geometric Computing Laboratory, School of Mathematical Sciences, University of Science and Technology of China

^eIstituto di Matematica Applicata e Tecnologie Informatiche E. Magenes - CNR, Italy

This Special Section of Computers & Graphics (C&G), features the full papers presented at the Shape Modeling International 2023 conference — SMI 2023 (<https://smiconf.github.io/2023/>). After the COVID pandemic, the desire was strong to bring the community together again in person. The conference was organised by CNR-IMATI and hosted at the DAD – Department of Architecture and Design - in Genova, Italy, from 4 to 6 July 2023. This year SMI was co-located with the Symposium on Physical and Solid Modeling (SPM 2023), Geometric Modeling and Processing (GMP2023), the SIAM Conference on Computational Geometric Design (GD2023), and the EG Symposium on Geometry Processing (SGP2023) within the International Geometry Summit 2023, 3-7 July 2023. Overall, the Geometry Summit gathered more than three hundred researchers from all over the world.

Shape Modeling International provides yearly an international forum for the dissemination of new mathematical theories and computational techniques for modeling, simulating, and processing digital representations of shapes and their properties to a community of researchers, developers, students, and practitioners across a wide range of fields. This year, the call for paper has been enriched to explicitly address new emerging topics related to digital shapes, like deep geometric learning and 3D digital twins. The invited speakers, Professor Angela Dai and Professor Thomas Kolbe, both from the *TUM, Technical University of Munich*, accordingly, provided interesting insights on Learned Parametric 3D Shape Models and on Spatio-Semantic Modeling for Urban Digital Twins, respectively.

SMI2023 has assigned two prestigious prizes, namely, the Toshiyasu L. Kunii distinguished researcher award, presented to Prof. Wenping Huang from the *Department of Computer Science & Engineering at Texas A&M University*, and the SMI young investigator award, presented to Dr. Etienne Corman from the *CNRS - LORIA lab* in Nancy, France. Furthermore, this year the Alexander Pasko service award has been estab-

lished, to recognise people who made significant contributions to the organization of SMI conferences. This first edition of the prize has been presented to Dr. Michela Spagnuolo from *CNR-IMATI, Italy*, for her long-standing support to Shape Modeling International, besides her scientific contributions to the field.

The full paper submission track followed a 2-stage double-blind review process. Each paper was assessed by 4 reviewers on average. Of the 61 papers submitted to the full paper track 18 were accepted and are published in this Special Section of Computers & Graphics. Contributions came from all over the world, with a significant amount of papers from China, France, Italy and the United States. 6 papers applied and received the Replicability Badge issued by the *Graphics Replicability Stamp Initiative (GRSI)*. Besides the 18 reviewed papers, SMI2023 invited for oral presentation 10 papers from *C&G*; of these, 2 accepted the invitation and has been presented at the conference: *Saliency Detection for Large-Scale Mesh Decimation*, by Rafael Kuffner dos Anjos, Richard Andrew Roberts, Benjamin Allen, Joaquim Jorge and Ken Anjyo, presented by Professor Jorge from the *Institute for Computer and Systems Engineering INESC-ID* in Portugal, and *An interactive sketch-based CAD interface realizing geometrical and topological editing across multiple objects based on fuzzy logic* by Tomohiko Ito, Teruyoshi Kaneko, Yoshiki Tanaka and Sato Saga, presented by Professor Saga from the *Muroran Institute of Technology* in Japan.

SMI2023 received financial sponsorship from Elsevier for the *Best Paper Award* and two *Honourable Mentions*. After all the presentations, the SMI award committee selected the best paper among those who have obtained the replicability stamp, to encourage researchers to publish their code and make it available to the community. The SMI2023 best paper award has been presented to Mattéo Clémot and Julie Digne for the paper *Neural skeleton: implicit neural representation away from the surface*, and honourable mentions went to Guillaume Gisbert, Raphaëlle Chainé and David Coeurjolly for the paper *Inpainting Holes in Folded Fabric Meshes* and to Felix Dellinger, Xinye Li and Hui Wang for the paper *Discrete Orthogonal Structures*.

Selected full papers are available at <https://www.sciencedirect.com/journal/computers-and-graphics/>

e-mail: georges-pierre.bonneau@inria.fr (Georges-Pierre Bonneau), lgliu@ustc.edu.cn (Ligang Liu), michela.mortara@cnr.it (Michela Mortara)

special-issues. These works cover a variety of topics, including geometric modelling and processing, curves and surfaces, object and scene reconstruction and understanding. All accepted papers and invited talks were orally presented in person and grouped into the following themed sessions:

Geometry Processing

- **Inpainting Holes In Folded Fabric Meshes**, *Guillaume Gisbert, Raphaëlle Chaine and David Coeurjolly*, [1]. [**Honourable Mention and Replicability Stamp**]
- **Crossing-Free Paths in the Square Grid**, *Lidija Comic and Paola Magillo*, [2]. [**Replicability Stamp**]
- **Exploration of 3D Motorcycle Complexes from Hexahedral Meshes**, *Erkan Gunpinar, Marco Livesu and Marco Attene*, [3].
- **Saliency Detection for Large-Scale Mesh Decimation**, *Rafael Kuffner dos Anjos, Richard Andrew Roberts, Benjamin Allen, Joaquim Jorge and Ken Anjyo*, [4]. [**invited from C&G**]

Scene Understanding

- **Analyzing Part Functionality via Multi-modal Latent Space Embedding and Interweaving**, *Jiahao Cui, Shuai Li, Fei Hou, Aimin Hao and Hong Qin*, [5]. [**Replicability Stamp**]
- **Lightweight Integration of 3D Features to Improve 2D Image Segmentation**, *Olivier Pradelle, Raphaëlle Chaine, David Wendland and Julie Digne*, [6].

Meshless and Implicit

- **Neural Skeleton: Implicit Neural Representation Away From The Surface**, *Mattéo Clémot and Julie Digne*, [7]. [**Best Paper Award and Replicability Stamp**]
- **Forward Inclusion Functions for Ray-Tracing Implicit Surfaces**, *Melike Aydinlilar and Cédric Zanni*, [8].
- **Meshless Power Diagrams**, *Yanyang Xiao, Juan Cao, Shaoping Xu and Zhonggui Chen*, [9]. [**Replicability Stamp**]
- **Learning Neural Implicit Representations with Surface Signal Parameterizations**, *Yanran Guan, Andrei Chubarau, Ruby Rao and Derek Nowrouzezahrai*, [10].

Curves and Surfaces

- **Discrete Orthogonal Structures**, *Felix Dellinger, Xinye Li and Hui Wang*, [11]. [**Honourable Mention**]
- **Constrained Modeling of Multi-sided Patches**, *Péter Salvi, Márton Vaitkus and Tamás Várady*, [12].
- **A Skinning Technique for Modeling Artistic Disk B-spline Shapes**, *Kinga Kruppa, Roland Kunkli and Miklós Hoffmann*, [13].
- **Curvature Monotonicity Evaluation Functions on Rational Bézier Curves**, *Takafumi Saito and Norimasa Yoshida*, [14].

Geometry and Matter

- **A Modular Approach for Creation of Any Bi-Axial Woven Structure with Congruent tiles**, *Tolga Yildiz, Ergun Akleman, Matthew Ebert and Vinayak Krishnamurthy*, [15]. [**Replicability Stamp**]
- **Bending the Light: Next Generation Anamorphic Sculptures**, *Louis Pratt, Andrew Johnston and Nico Pietroni*, [16].

Sketch-based CAD and Surface Reconstruction

- **Automatic 3D CAD Models Reconstruction from 2D Ortho-**

graphic Drawing, *Chao Zhang, Romain Piquié, Arnaud Pollette, Gregorio Carasi, Henri Gautier De Charnace and Jean-Philippe Pernot*, [17].

- **Multi-Grid Representation with Field Regularization for Self-Supervised Surface Reconstruction from Point Clouds**, *Chuan Jin, Tieru Wu and Junsheng Zhou*, [18].
- **Contact-conditioned Hand-held Object Reconstruction from Single-view Images**, *Xiaoyuan Wang, Yang Li, Adnane Boukhayma, Changbo Wang and Marc Christie*, [19].
- **An Interactive Sketch-based CAD Interface Realizing Geometrical and Topological Editing Across Multiple Objects Based on Fuzzy Logic**, *Tomohiko Ito, Teruyoshi Kaneko, Yoshiki Tanaka and Sato Saga*, [20]. [**Invited from C&G**]

Keynotes

- **Learned Parametric 3D Shape Models**, Professor Angela Dai, School of Computation, Information and Technology, Technische Universität München (TUM), Germany
- **Spatio-Semantic Modeling for Urban Digital Twins**, Professor Thomas Kolbe, School of Engineering and Design, Technische Universität München (TUM), Germany

We would like to thank the 75 IPC members and the invited external reviewers for their reviewing efforts, which helped us to create a high-quality program and led to the success of this Special Section. We are grateful to all session chairs Daniela Giorgi, Amir Vaxman, Ergun Akleman, Gershon Elber, ChiaraEva Catalano, and Raphaëlle Chaine for their caring and timely direction of the SMI sessions; to the conference co-chairs Giuseppe Patané, Jorg Peters and Hui Huang; to the communication chairs Silvia Biasotti and Yang Liu for their support and for the timely management of the conference web site; to Ergun Akleman who supervised the SMI organization and to Joaquim Jorge, editor in-chief of C&G and to the whole Elsevier C&G Team for making this Special Section possible. Finally, we deeply thank all authors for their interest and support to SMI 2023 and the speaker for making SMI2023 a lively and exiting conference.

International Program Committee

Valery Adzhiev, Bournemouth University, England
Marco Attene, CNR-IMATI, Italy
Gill Barequet, Technion Israel Institute of Technology, Israel
Loic Barthe, Université de Toulouse, France
Alexander Belyaev, Heriot-Watt University, UK
Pengbo Bo, Harbin Institute of Technology, P.R. China
Adrien Bousseau, Inria Sophia-Antipolis, France
Marcel Campen, Osnabrück University, Germany
Juan Cao, Xiameng University, P.R. China
Chiara Eva Catalano, CNR-IMATI, Italy
Raphaëlle Chaine, Université of Lyon, France
Zhonggui Chen, Xiameng University, P.R. China
Renjie Chen, University of Science and Technology of China, P.R. China
Edward Chien, MIT, USA
Tao Du, Tsinghua University, P.R. China
Jeremie Dumas, Adobe Research, USA
Ye Duan, University of Missouri, USA
Gershon Elber, Technion, Israel

Bianca Falcidieno, CNR-IMATI, Italy
Leila De Floriani, University of Maryland, USA
Hongbo Fu, City University of Hong Kong, P.R. China
Xiaoming Fu, University of Science and Technology of China, P.R. China
Eric Galin, University of Lyon, France
Lin Gao, Chinese Academy of Sciences, P.R. China
Yotam Gingold, George Mason University, USA
Daniela Giorgi, CNR-ISTI, Italy
Eric Guerin, INSA de Lyon, France
Jianwei Guo, Chinese Academy of Sciences, P.R. China
Fazhi He, Wuhan University, P.R. China
Franck Hetroy-Wheeler, University of Strasbourg, France
Klaus Hildebrandt, TU Delft, Netherlands
Haibin Huang, Kwai Inc., USA
Kai Hormann, Università della svizzera italiana, Switzerland
Jin Huang, Zhejiang University, P.R. China
Ioannis Ivriissimtzis, Durham University, UK
Xiaohong Jia, Chinese Academy of Sciences, P.R. China
Bert Jüttler, Johannes Kepler University, Austria
Takashi Kanai, University of Tokyo, Japan
Myung-Soo Kim, Seoul National University, Korea
Hamid Laga, Murdoch University, Australia
Xin Li, Texas A&M University, USA
Zhouhui Lian, Peking University, P.R. China
Hongwei Lin, Zhejiang University, P.R. China
Peter Lindstrom, Lawrence Livermore National Laboratory, USA
Lin Lu, Shandong University, P.R. China
Chongyang Ma, Kuaihou Technology, P.R. China
Luigi Malomo, CNR-ISTI, Italy
Claudio Mancinelli, University of Genova, Italy
Martin Marinov, Autodesk, USA
Nicolas Mellado, CNRS IRIT, France
Serena Morigi, University of Bologna, Italy
Ahmad Nasri, Boulder Graphics LLC, USA
Stefan Ohrhallinger, Vienna University of Technology, Austria
Yutaka Ohtake, University of Tokyo, Japan
Amal Dev Parakkat, Institut Polytechnique de Paris, France
Konrad Polthier, Freie Universität Berlin, Germany
Andreas Scalas, CNR-IMATI, Italy
Hong Qin, Stony Brook University, USA
Camille Schreck, INRIA Nancy, France
Carlo Sequin, UC Berkeley, USA
Liyong Shen, Chinese Academy of Sciences, P.R. China
Zhenyu Shu, Zhejiang University, P.R. China
Karan Singh, University of Toronto, Canada
Keke Tang, Guangzhou University, P.R. China
Daniel Thalmann, Swiss Federal Institute of Technology, Switzerland
Georg Umlauf, HTWG Konstanz, Germany
Amir Vaxman, The University of Edinburgh, UK
Remco Veltkamp, Utrecht University, the Netherlands
Pengshuai Wang, Peking University, P.R. China
Weiming Wang, Dalian University of Technology, P.R. China
Kui Wu, Tencent North America, USA

Tieru Wu, Jilin University, P.R. China
Kai Xu, National University of Defense Technology, P.R. China
Gang Xu, Hangzhou Dianzi University, P.R. China
Qiang Zou, Zhejiang University, P.R. China

External Reviewers

Simone Cammarasana, CNR-IMATI, Italy
Sumita Dahiya, Netaji Subhas University of Technology, India
Haitham Fadina, Technion, Israel Institute of Technology, Israel
Stefanie Hahmann, INRIA, G-INP, France
Ulrich Reitebuch, Freie Universität Berlin, Germany
Chiara Romanengo, CNR-IMATI, Italy
Jakub Rondonansk, Freie Universität Berlin, Germany
Amani Shhadi, Technion, Israel Institute of Technology, Israel
Yawen Shi,
Tommaso Sorgente, CNR-IMATI, Italy
Alexander Tereshin,
Jianpeng Wu,
Q Youn Hong, Hanyang University at Ansan, Republic of Korea
Eric Zimmermann, Freie Universität Berlin, Germany
Qianfang Zou.

References

- [1] Gisbert, G, Chaine, R, Coeurjolly, D. Inpainting holes in folded fabric meshes. *Computers Graphics* 2023;114:201–209. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000808>. doi:<https://doi.org/10.1016/j.cag.2023.05.025>.
- [2] Čomić, L, Magillo, P. Crossing-free paths in the square grid. *Computers Graphics* 2023;114:296–305. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001115>. doi:<https://doi.org/10.1016/j.cag.2023.06.015>.
- [3] Gunpinar, E, Livesu, M, Attene, M. Exploration of 3d motorcycle complexes from hexahedral meshes. *Computers Graphics* 2023;114:105–115. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000948>. doi:<https://doi.org/10.1016/j.cag.2023.06.005>.
- [4] Kuffner dos Anjos, R, Roberts, RA, Allen, B, Jorge, J, Anjo, K. Saliency detection for large-scale mesh decimation. *Computers Graphics* 2023;111:63–76. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000134>. doi:<https://doi.org/10.1016/j.cag.2023.01.012>.
- [5] Cui, J, Li, S, Hou, F, Hao, A, Qin, H. Analyzing part functionality via multi-modal latent space embedding and interweaving. *Computers Graphics* 2023;115:1–12. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001267>. doi:<https://doi.org/10.1016/j.cag.2023.06.031>.
- [6] Pradelle, O, Chaine, R, Wendland, D, Digne, J. Lightweight integration of 3d features to improve 2d image segmentation. *Computers Graphics* 2023;114:326–336. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000936>. doi:<https://doi.org/10.1016/j.cag.2023.06.004>.
- [7] Clémot, M, Digne, J. Neural skeleton: Implicit neural representation away from the surface. *Computers Graphics* 2023;114:368–378. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001085>. doi:<https://doi.org/10.1016/j.cag.2023.06.012>.

- [8] Aydinlilar, M, Zanni, C. Forward inclusion functions for ray-tracing implicit surfaces. *Computers Graphics* 2023;114:190–200. URL: <https://www.sciencedirect.com/science/article/pii/S009784932300081X>. doi:<https://doi.org/10.1016/j.cag.2023.05.026>.
- [9] Xiao, Y, Cao, J, Xu, S, Chen, Z. Meshless power diagrams. *Computers Graphics* 2023;114:247–256. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001073>. doi:<https://doi.org/10.1016/j.cag.2023.06.014>.
- [10] Guan, Y, Chubarau, A, Rao, R, Nowrouzezahrai, D. Learning neural implicit representations with surface signal parameterizations. *Computers Graphics* 2023;114:257–264. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001103>. doi:<https://doi.org/10.1016/j.cag.2023.06.013>.
- [11] Dellinger, F, Li, X, Wang, H. Discrete orthogonal structures. *Computers Graphics* 2023;114:126–137. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000791>. doi:<https://doi.org/10.1016/j.cag.2023.05.024>.
- [12] Salvi, P, Vaitkus, M, Várady, T. Constrained modeling of multi-sided patches. *Computers Graphics* 2023;114:86–95. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000754>. doi:<https://doi.org/10.1016/j.cag.2023.05.020>.
- [13] Kruppa, K, Kunkli, R, Hoffmann, M. A skinning technique for modeling artistic disk b-spline shapes. *Computers Graphics* 2023;115:96–106. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001255>. doi:<https://doi.org/10.1016/j.cag.2023.06.030>.
- [14] Saito, T, Yoshida, N. Curvature monotonicity evaluation functions on rational bézier curves. *Computers Graphics* 2023;114:219–228. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000742>. doi:<https://doi.org/10.1016/j.cag.2023.05.019>.
- [15] Yildiz, T, Akleman, E, Krishnamurthy, V, Ebert, M. A modular approach for creation of any bi-axial woven structure with congruent tiles. *Computers Graphics* 2023;114:357–367. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001127>. doi:<https://doi.org/10.1016/j.cag.2023.06.017>.
- [16] Pratt, L, Johnston, A, Pietroni, N. Bending the light: Next generation anamorphic sculptures. *Computers Graphics* 2023;114:210–218. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000778>. doi:<https://doi.org/10.1016/j.cag.2023.05.023>.
- [17] Zhang, C, Pinquie, R, Polette, A, Carasi, G, De Charnace, H, Pernot, JP. Automatic 3d cad models reconstruction from 2d orthographic drawings. *Computers Graphics* 2023;114:179–189. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323000766>. doi:<https://doi.org/10.1016/j.cag.2023.05.021>.
- [18] Jin, C, Wu, T, Zhou, J. Multi-grid representation with field regularization for self-supervised surface reconstruction from point clouds. *Computers Graphics* 2023;114:379–386. URL: <https://www.sciencedirect.com/science/article/pii/S0097849323001097>. doi:<https://doi.org/10.1016/j.cag.2023.06.016>.
- [19] Wang, X, Li, Y, Boukhayma, A, Wang, C, Christie, M. Contact-conditioned hand-held object reconstruction from single-view images. *Computers Graphics* 2023;114:150–157. URL: <https://www.sciencedirect.com/science/article/pii/S009784932300078X>. doi:<https://doi.org/10.1016/j.cag.2023.05.022>.
- [20] Ito, T, Kaneko, T, Tanaka, Y, Saga, S. An interactive sketch-based cad interface realizing geometrical and topological editing across multiple objects based on fuzzy logic. *Computers Graphics* 2022;103:153–167. URL: <https://www.sciencedirect.com/science/article/pii/S0097849322000243>. doi:<https://doi.org/10.1016/j.cag.2022.02.007>.



Georges-Pierre Bonneau is Professor of Computer Science at Université Grenoble Alpes. GP Bonneau received his MS degree in Mathematics from the Ecole Normale Supérieure de Cachan, France, the DEA in Numerical Analysis at the University of Paris VI, France, and the PhD degree in Computer

Science from the University of Kaiserslautern, Germany, in 1993. His research centres on Computer Aided Geometric Design, Computational Fabrication, Data Visualization and Visual perception for Computer graphics. He was co-organizer of two Dagstuhl seminars on Scientific Visualization. He is a member of the Editorial Board Committee of Computer Aided Design, Elsevier.



Ligang Liu is Professor of Mathematical Sciences at the University of Science and Technology of China. He received his PhD from Zhejiang University in 2001. He once worked at Microsoft Research Asia, Zhejiang University, and visited Harvard University. His research interests include computer graphics and geometry processing. He serves as the

associated editors for journals including IEEE TVCG, CAGD, C&G, etc. He served as the conference co-chairs and the program co-chairs of many conferences. He serves as the steering committee member of GMP and the secretary of Asiagraphics Association.



Michela Mortara is Senior Researcher at the Institute of Applied Mathematics and Information Technologies (IMATI) of the Italian National Research Council (CNR). Her research interests are in Shape Modelling and Analysis, Cultural Heritage and Serious Games. More recently, she has been working on 3D modelling for

Geosciences, with applications to environmental monitoring and interpretation of geological structures, and on Urban Intelligence, to develop digital twins of Matera and Catania in Italy. She is member of the Editorial Board of The Visual Computer, The International Journal of Serious Games and recently Computers&Graphics.