



Editorial

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

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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 organized 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 Tosiya 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 established, to recognize 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

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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 Chaine 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/special-issues>.

These works cover a variety of topics, including geometric modeling 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 Implicits

- [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 Orthographic Drawing](#), Chao Zhang, Romain Pinquié, Arnaud Polette, 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

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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