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Editorial

Foreword to the Special Section on Shape Modeling International 2025 (SMI 2025)

This Special Section of Computers & Graphics (C&G), features the full papers presented at the Shape Modeling Inter national 2025 conference - SMI 2025 (https://smiconf.github.io/2025/). SMI 2025 was co-located with Solid and Physical Modeling (SPM) 2025. The joint conference took place from October 29 to November 2, 2025, at The Dragon Hotel Hangzhou, in Hangzhou, Zhejiang, P.R. China. The conference was organized by Zhejiang University and Hangzhou Dianzi University, China. Fig. 1 shows a group picture of the joint SMI 2025 and SPM 2025 conference.

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. The keynote speakers, Professor **Gershon Elber** from Technion, Israel, Professor **Charlie C. L. Wang** from the University of Manchester (UoM), and Professor **Hang Si** from Dalian University of Technology (DLUT), provided interesting insights on *Volumetric Representations: the Geometric Modeling of the Next Generation*, *Integrating Manufacturing into Design Optimization: Why and How*, and *Robust Quality Delaunay Mesh Generation for Numerical Simulations of Multi-physics problems in EDA*, respectively.

SMI 2025 continued the tradition of recognizing outstanding contributions in the field: The Tosiyasu L. Kunii Distinguished Researcher Awards were presented to **Brian Wyvill** and **Hong Qin** for their long-standing scientific influence in shape modeling and related areas, acknowledging distinguished careers in research and community leadership. The SMI Young Investigator Awards were given to **Chiara Romanengo** and **Guillaume Cordonnier**, honoring notable early-career contributions to shape modeling research. The Alexander Pasko Service Award was presented to **Yang Liu** for exceptional contributions to the organization and community service within the SMI conference series. All awardees were invited to present keynote talks during the conference, continuing the community tradition of integrating award lectures into the scientific program.

The full paper submission track followed a 2-stage double blind review process. Each paper was assessed by 4 reviewers on average. Of the 70 papers submitted to the full paper track 18 were accepted and are published in this Special Section of Computers & Graphics, and 8 were recommended to Computers & Graphics with a major review. Besides the 26 conference reviewed papers, SMI 2025 invited 2 papers [1,2] from Computer & Graphics and 1 paper [3] from TVCG, which have been presented at the conference.

SMI 2025 received financial sponsorship from Elsevier for one Best Paper Award and two Honorable 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 SMI 2025 best paper award has been presented to Siqi Li, Haoyu Tang, Peng Song, Bailin Deng and Jianmin Zheng for the paper *Conformable Mechanisms on Freeform Surfaces*; and the honorable mentions went to Yu Chen and Hongwei Lin for the paper *Analyzing Singular Patterns in Vector Fields via Persistent Path Homology* and Hao-Xiang Chen, Xiao-Lei Li, Tai-Jiang Mu, Qunce Xu and Shi-Min Hu for the paper *SDLKF: Signed Distance Linear Kernel Function for Surface Reconstruction*.

Selected full papers are available at https://www.sciencedirect.com/journal/computers-and-graphics/vol/133/suppl/C#article-2. 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 and grouped into the following themed sessions:

Session I: Splines 1

- Narrowing-Cascade splines for control nets that shed mesh lines, *Serhat Cam, Erkan Gunpinar, Kestutis Karciauskas and Jörg Peters* [4].
- Interpolating splines over triangulated surfaces by blending vertex-centric local geometries, *Tobias Djuren, Ugo Finnendahl, Maximilian Kohlbrenner, Markus Worchel and Marc Alexa* [5].
- A general framework for adding interior control to ribbon-based multi-sided surfaces, *Márton Vaitkus, Péter Salvi and Tamás Várady* [6].

Session II: AI and anatomical models

- Learning center- and boundary-aware instance representation for 3D tooth segmentation, *Hairong Jin, Jianwen Lou, Teng Wu, Kun Zhou and Youyi Zheng* [7].
- Multimodal conditional 3D face geometry generation, *Christopher Otto, Prashanth Chandran, Sebastian Weiss, Markus Gross, Gaspard Zoss and Derek Bradley* [8].
- HDFSN: A hybrid dynamic fracture segmentation network based on pelvic CT images, *Fujiao Ju, Jianyu Zhu, Yichu Wu and Jingxin Zhao* [9].

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Fig. 1. The group picture of the joint SMI 2025 and SPM 2025 conference in Hangzhou, China.

Session III: Fields and distances

- DCUDF2: improving efficiency and accuracy in extracting zero level sets from unsigned distance fields, *Xuhui Chen, Fugang Yu, Fei Hou, Wencheng Wang, Zhebin Zhang and Ying He* [3]. **[invited from TVCG]**
- SDLKF: signed distance linear kernel function for surface reconst ruction, *Hao-Xiang Chen, Xiao-Lei Li, Tai-Jiang Mu, Qunce Xu and Shi-Min Hu* [10].
- HR-IDF: Hessian-regularized implicit displacement fields for high precision industrial assembly representation, *Linxu Guo, Yutaka Ohtake, Tatsuya Yatagawa, Tetsuya Shimmyo, Shoichiro Hosomi and Kazutoshi Miyamoto* [11].
- Analyzing singular patterns in discrete planar vector fields via persistent path homology, *Yu Chen and Hongwei Lin* [12].

Session IV: Modeling applications

- Customization of 3D printed sensing devices in the layered fab rication space, *José Eduardo Aguilar Segovia, Yamil Salim Perchy Bocanegra, Pierre-Alexandre Hugron, Sylvain Guegan, Marie Babel and Sylvain Lefebvre* [13].
- Conformable mechanisms on freeform surfaces, *Siqi Li, Haoyu Tang, Peng Song, Bailin Deng and Jianmin Zheng* [14].
- Clock mechanism generation using interaction graphs, *Vincent Commin, Samuel Peltier, Arthur Cavalier and Sébastien Horna* [15].

Session V: Points and meshes

- Geometry-aware estimation of photovoltaic energy from aerial LiDAR point clouds, *Chiara Romanengo, Tommaso Sorgente, Daniela Cabiddu, Lorenzo Belussi, Matteo Ghellere, Ludovico Danza and Michela Mortara* [16].
- De(l)Noise: A Delaunay triangulation based point cloud denoising algorithm, *Minu Reghunath, Keerthana Muralidharan, Keerthiharan Ananth, Harishankar Veena Sureshkumar, Adithyaa Rettaikudi Gurumoorthi, Safeer Babu Thayyil and Ramanathan Muthuganapathy* [17].
- Surface remeshing with preservation of sharp features through iterative identification and optimization of sample points, *Jingjing Liu, Yuyou Yao, Yue Fei, Gaofeng Zhang and Liping Zheng* [1]. **[invited from C&G]**
- High-quality parameterization of single-axis swept volumes for isogeometric analysis, *Jinlan Xu, Jiakai Yu, Haiyan Wu and Gang Xu* [18].

Session VI: Splines 2

- Computing planar PHT-spline parameterization via quasi-confor mal mapping fitting, *Linfeng Zhang, Yuhao Han and Xuhui Wang* [19].
- A parameterization method for B-spline curve interpolation via supervised regression, *Shangyi Lin and Jieqing Feng* [20].
- Implicit curve reconstruction with sharp features, *Yuhao Han, Xuhui Wang, Qian Ni, Yuan Liu and Jinna Zhang* [21].

Session VII: Indoor and outdoor modeling

- Scene layout via conceptual design, *Wenzheng Wu, Chucheng Xiang, Zhi Lin, Yirui Guan, Ruchao Bao, Zhongyuan Liu, Ziqi Wang and Ligang Liu.*
- Size-aware indoor scene retargeting with generalized summariza tion, *Yao Cheng, Weilin Chen, Yizhe Gu, Yue Sun, You Zhai, Xuan Cheng and Juncong Lin* [22].
- Realistic reconstruction of trees from sparse images in volumetric space, *Weihuan Feng, Mingxin Jiao, Ning Liu, Long Yang, Zhiyi Zhang and Shaojun Hu* [2]. **[invited from C&G]**
- ArchComplete: autoregressive 3D architectural design generation with hierarchical diffusion-Based upsampling, *Shervin Rasoulzadeh, Mathias Bank Stigsen, Iva Kovacic, Kristina Schinegger, Stefan Rutzinger and Michael Wimmer* [23].

Session VIII: 3D Gaussians

- LFGS: a lightweight framework for efficient 3D Gaussian splatting with minimal memory footprint, *Ruiqi Wu, Linlin Jiao, Gang Liu, Li Zhu, Xuan Fei, Yashuang Mu and Chao Fan* [24].
- MSGS: multi-space Gaussian splatting for mirror reflections, *Zhankong Bao, Jiayi Xu, Masahiro Toyoura, Gefei Xie, Qianhong Xiang and Huaming Lin.*
- High-fidelity 3D Gaussian inpainting: preserving multi-view con sistency and photorealistic details, *Jun Zhou, Dinghao Li, Nannan Li and Mingjie Wang* [25].

We would like to thank the 86 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 Falai Chen, Erkan Gunpinar, Ying He, Hongwei Lin, Ligang Liu, Yang Liu, Michela Mortara, Ramanathan Muthuganapathy, Jörg Peters, Zichun Zhong, Qian Zou for their caring and timely direction of the SMI sessions; to the conference co-chairs Georges-Pierre Bonneau, Gang Xu, Weiwei Xu; 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 2025 and the speakers for making SMI 2025 a lively and exiting conference.

International program committee

CRediT authorship contribution statement

Hongwei Lin: Writing – original draft, Writing – review & editing.
Michela Mortara: Writing – original draft, Writing – review & editing.
Zichun Zhong: Writing – original draft, Writing – review & editing.

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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Hongwei Lin is a Professor and Ph.D. supervisor at the School of Mathematical Sciences and the State Key Laboratory of CAD&CG, Zhejiang University. He received his B.S. in Applied Mathematics in 1996 and his Ph.D. in Mathematics in 2004 from Zhejiang University, after three years of industry experience. He has held visiting and collaborative research positions at HKUST, Brigham Young University, The Chinese University of Hong Kong, and Yokohama National University. His research focuses on computer-aided geometric design, computer-aided topological design, and quantum graphics, and he has published over 100 papers in leading journals such as CAD, CAGD, TVCG, and TOG. He has led or participated in major national research projects and received multiple prestigious awards, including national and ministerial-level science awards, and he serves on professional committees of the China Society for Industrial and Applied Mathematics and the China Computer Federation. He is a Technical Paper Chair of SMI 2025.

Michela Mortara is a Senior Research Scientist at IMATI-CNR Genova, where she has been a member of the Shape Modeling Group since graduating from the University of Genova in 1999. Her research evolved from 2D shape analysis to 3D shape modeling, focusing on morphology, curvature, skeleton extraction, segmentation, and semantic analysis of 3D objects. She earned a Ph.D. in Robotics in 2004 and contributed significantly to the AIM@SHAPE Network, including award-winning work on automatic human body part identification and anthropometric analysis. Her interests later expanded to semantic rendering, optimal viewpoint selection, serious games, and the application of 3D modeling in gaming, medicine, cultural heritage, urban intelligence, and geosciences. She is currently a principal investigator at IMATI for several national and international projects. She is a Technical Paper Chair of SMI 2025 and 2026.

Zichun Zhong is Associate Professor of Computer Science at Wayne State University, USA. He received his Ph.D. from The University of Texas at Dallas in 2014 and was a postdoctoral fellow at UT Southwestern Medical Center at Dallas from 2014 to 2015. His research interests focus on geometric modeling and computing for computer graphics, 3D computer vision, visualization, and medical image processing. He serves as the associate editor of GMOD, guest editors of CAGD and C&G. He is a Technical Paper Chair of SMI 2024, 2025, a Program Co-Chair of GMP 2024, and a Communication Chair of SMI 2026. He serves as a program committee member, area chair, and reviewer for many international conferences and journals in his research field. He received the NSF CAREER Award and NSF CRII Award in 2016. He is in the SMI Steering Committee since 2025.

Hongwei Lin
Zhejiang University, China
E-mail address: hwlin@zju.edu.cn.

Michela Mortara
CNR-IMATI Genova, Italy
E-mail address: michela.mortara@cnr.it.

Zichun Zhong
Wayne State University, USA
E-mail address: zichunzhong@wayne.edu.