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## Foreword to the Special Section on Shape Modeling International 2024 (SMI2024)

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## ABSTRACT

This Special Section of Computers & Graphics (C&G), features the full papers presented at the Shape Modeling International 2024 conference — SMI 2024 (<https://smiconf.github.io/2024/>). The conference was organised by the *Computer Graphics and Imaging Lab* and hosted at *Wayne State University*, July 11 to 13, 2024.

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 invited speakers, Professor Wenping Wang from Texas A&M University, USA, and Professor Hao (Richard) Zhang from Simon Fraser University, Canada, provided interesting insights on Neural reconstruction and generation of 3D shapes and on Learning differentiable primitive representations for CAD shape modeling, respectively.

SMI2024 has assigned four prestigious prizes, namely, two Tosiyasu L. Kunii distinguished researcher awards, presented to **Prof. Stefanie Hahmann** from *Grenoble INP and INRIA*, France and to **Prof. Gershon Elber** from *Technion*, Israel, and two SMI young investigator awards, presented to **Dr. Amal Dev Parakkat** from *Telecom Paris Tech* in France and to **Dr. Gianmarco Cherchi** from *University of Cagliari*, Italy. Furthermore, this year the Alexander Pasko service award, recognizing people who made significant contributions to the organization of SMI conferences, has been presented to **Prof. Ergun Akleman** from

*Texas A&M University*, USA, for his long-standing support to Shape Modeling International, besides his scientific contributions to the field. Interviews of all awardees featuring pictures have been collected and published in *Computer & Graphics* [1].

The full paper submission track followed a 2-stage double-blind review process. Each paper was assessed by 4 reviewers on average. Of the 31 papers submitted to the full paper track 11 were accepted and are published in this Special Section of Computers & Graphics. Besides the 11 reviewed papers, SMI2024 invited papers from *Computer & Graphics*; 4 accepted the invitation and have been presented at the conference: *Interactive pose and shape editing with simple sketches from different viewing angles* [2], by Caro Schmitz, Constantin Rösch, Domenic Zingsheim and Reinhard Klein, *Neural inverse procedural modeling of knitting yarns from images* [3] by Elena Trunz, Jonathan Klein, Jan Müller, Lukas Bode, Ralf Sarlette, Michael Weinmann and Reinhard Klein, *TAssembly: Data-driven fractured object assembly using a linear template model* [4] by Ziyue Deng, Junfeng Jiang, Zhengming Chen, Wenxi Zhang, Qingqiang Yao, Chen Song, Yifan Sun, Zhenpei Yang, Siming Yan, Qixing Huang and Chandrajit Bajaj, and *TARig: Adaptive template-aware neural rigging for humanoid characters* [5], by Jing Ma and Dongliang Zhang.

SMI2024 received financial sponsorship from Elsevier for the *Best Paper Award* and one *Honourable Mention*. 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 SMI2024 best paper award has been presented to Yukun Lu, Yuhang Wang, Peng Song, Hang Siang Wong, Yingjuan Mok and Ligang Liu for the paper *Computa-*

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tional design of custom-fit PAP masks [6], and the honourable mention went to Guillaume Gisbert, Raphaëlle Chaine and David Coeurjolly for the paper *Neural inpainting of folded fabrics with interactive editing* [7].

Selected full papers are available at <https://www.sciencedirect.com/special-issue/1009JL5V4RL>. 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 and grouped into the following themed sessions:

### Interactive Modeling

- **3D sketching in immersive environments: Shape from disordered ribbon strokes**, *Georges-Pierre Bonneau and Stefanie Hahmann* [8].
- **Interactive pose and shape editing with simple sketches from different viewing angles**, *Caro Schmitz and Constantin Rösch and Domenic Zingsheim and Reinhard Klein* [2]. **[Invited from C&G]**
- **Neural inpainting of folded fabrics with interactive editing**, *Guillaume Gisbert and Raphaëlle Chaine and David Coeurjolly* [7]. **[Honourable Mention and Replicability Stamp]**

### Computational Design

- **Neural inverse procedural modeling of knitting yarns from images**, *Elena Trunz, Jonathan Klein, Jan Müller, Lukas Bode, Ralf Sarlette, Michael Weinmann and Reinhard Klein* [3]. **[Invited from C&G]**
- **Volumetric nonwoven structures, Shape algebra, Shape modeling and design, P-adic numbers**, *Tolga Yildiz and Ergun Akleman* [9]. **[Replicability Stamp]**
- **Differentiable microstructures design via anisotropic thermal diffusion**, *Qi Wang and Qing Fang and Xiaoya Zhai and Ligang Liu and Xiao-Ming Fu* [10]. **[Replicability Stamp]**

### Parametric and Subdivision Surfaces

- **Interior control structure for Generalized Bézier patches over curved domains**, *Márton Vaitkus and Péter Salvi and Tamás Várady* [11].
- **Computational design of custom-fit PAP masks**, *Yukun Lu and Yuhang Wang and Peng Song and Hang Siang Wong and Yingjuan Mok and Ligang Liu* [6]. **[Best Paper and Replicability Stamp]**
- **Quadratic-attraction subdivision with contraction-ratio  $\lambda=12$** , *Kestutis Karčiauskas and Jörg Peters* [12]. **[Replicability Stamp]**

### Shape and Learning

- **Multi-scale Knowledge Transfer Vision Transformer for 3D vessel shape segmentation**, *Michael J. Hua and Junjie Wu and Zichun Zhong* [13].
- **TAssembly: Data-driven fractured object assembly using a linear template model**, *Ziyue Deng and Junfeng Jiang and Zhengming Chen and Wenxi Zhang and Qingqiang Yao and Chen Song and Yifan Sun and Zhenpei Yang and Siming Yan and Qixing Huang and Chandrajit Bajaj* [4].
- **Conditional room layout generation based on graph neural networks**, *Zhihan Yao and Yuhang Chen and Jiahao Cui and*

*Shoulong Zhang and Shuai Li and Aimin Hao* [14].

### Simulation and Deformation

- **An improved CPU–GPU parallel framework for real-time interactive cutting simulation of deformable objects**, *Jingqiang Wang and Shiyu Jia and Guodong Wang and Zhenkuan Pan and Xiaokang Yu* [15].
- **Dynamics simulation-based packing of irregular 3D objects**, *Qiubing Zhuang and Zhonggui Chen and Keyu He and Juan Cao and Wenping Wang* [16].
- **Retargeting of facial model for unordered dense point cloud**, *Yuping Ye and Juncheng Han and Jixin Liang and Di Wu and Zhan Song* [17].
- **TARig: Adaptive template-aware neural rigging for humanoid characters**, *Jing Ma and Dongliang Zhang* [5]. **[Invited from C&G]**

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 Zichun Zhong, Georges-Pierre Bonneau, Richard Zhang, Tao Ju and Jörg Peters for their caring and timely direction of the SMI sessions; to the conference co-chairs Jing Hua, Raphaëlle Chaine and Hui Huang; to the communication chairs Silvia Biasotti, 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 2024 and the speakers for making SMI2024 a lively and exiting conference.

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