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Editorial

Foreword to the Special Section on Shape Modeling International 2020

Shape Modeling International (SMI) promotes the dissemination of new mathematical theories and novel computational techniques for modeling, simulating, and processing digital shape representations. Launched in 1997 by Prof. Tosyiasu L. Kunii, SMI is in its 20th anniversary, and proudly gathers a wide community of researchers, developers, practitioners, and students in academia and industry from all over the world. In the realm of Computer Graphics conferences, SMI is characterized by its particular focus on methods and techniques to model, design and analyse shapes in all their aspects. The scientific focus of SMI evolved over time, and emerging topics, such as shape semantics, shape similarity, and fabrication, have been introduced. In particular, this year there were several papers dealing with deep learning in shape understanding.

Starting from 2001, the SMI conference became an annual event with the venue rotating in turn among Asia, Europe and America: Italy (2001), Canada (2002), South Korea (2003), Italy (2004), USA (2005), Japan (2006), France (2007), USA (2008), China (2009), France (2010), Israel (2011), USA (2012), UK (2013), Hong Kong (2014), France (2015), Germany (2016), USA (2017), Portugal (2018), Canada (2019).

SMI has a tradition in seeking co-location with other conferences: in 2004, it was organized for the first time with the ACM Symposium on Solid and Physical Modeling (SPM); in 2016, it was held in conjunction with both SPM and the Symposium on Geometry Processing, as part of the first International Geometry Summit (IGS). In 2019 SMI was co-located with the second International Geometry Summit (IGS2019). In line with this tradition in 2020 it has been co-located with the **Symposium on Solid and Physical Modeling** (SPM 2020) and the **Fabrication and Sculpting Event** (FASE 2020). While the conference supposed to be located in Strasbourg (France) it has been organized as a teleconference due to the coronavirus outbreak. Paper sessions were run in real-time using efficient software for online streaming. The online event had good participation, including a significant amount of questions and interactions from the public. The main challenge was to organize the sessions between the presenters, considering their time zone. In this light, maybe using pre-recorded presentations from the authors would undoubtedly simplify this task.

The technical papers track for SMI'20 received a total of 52 paper submissions, and **21 full papers** were **accepted for publication** in this special issue of *Computers & Graphics* devoted to the Proceedings of SMI. Each paper received from three to five reviews from members of the International Program Committee, and underwent a two-stage review process. Four additional papers, which were previously published in a regular issue of *Computers & Graphics,* but not presented at a conference, were invited to be part of SMI'20 technical program. All the papers were orally presented at the Conference grouped into themed sessions as follows:

Curves, surfaces and meshes

- *A unified approach towards computing Voronoi diagram, medial axis, Delaunay graph and α-hull of planar closed curves using touching discs*, B. Sundar et al. [1]
- *HT-based identification of 3D feature curves and their insertion into 3D meshes*, C. Romanengo et al. [2]
- *Critical sets of PL and discrete Morse theory: a correspondence*, U. Fugacci et al. [3]

Fabrication I

- *Computational Design of Generalized Centrifugal Puzzles*, N. Kita et al. [4]
- *Ceramic 3D printed sweeping surfaces,* F. Zhong et al. [5]

Fabrication II

- *Encoding and Topological Computation on Textile Structures*, M. Bright et al. [6]
- *Interactive design of castable shapes using two-piece rigid molds,* O. Stein et al. [7]
- *Generalized Abeille Tiles: Topologically Interlocked Space-Filling Shapes Generated Based on Fabric Symmetries*

  E. Akleman et al. [8]

Machine learning

- *Attention-based relation and context modeling for point cloud semantic segmentation*, Z. Hu et al. [9]
- *Vectorization of Persistence Barcode with Applications in Pattern Classification of Porous Structures*, Z. Dong et al. [10]
- *Cross-Domain Retrieving Sketch and Shape using Cycle CNNs*, M. Chen et al. [11]

Medical

- *ANU-Net: Attention-based Nested U-Net to exploit full resolution features for liver CT image segmentation, C. LI et al.* [12]
- *Binary surface smoothing for abnormal lung segmentation*, L. Guo et al. [13]
- *cellPACKexplorer: Interactive Model Building for Volumetric Data of Complex Cells*, M. Schwarzl et al. [14]

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Subdivision I

- *Curve guided T-spline skinning for surface and solid generation, A. Lin et al.* [15]
- *Proxy-driven free-form deformation by topology-adjustable control lattice*, Y. Zhang et al. [16]

Subdivision II

- *Multi-sided implicit surfacing with I-patches, A. Sipos et al.* [17]
- *Data-driven quasi-interpolant spline surfaces for point cloud approximation*, A. Raffo et al. [18]
- *On Hamiltonian cycles in the FCC grid*, L. Comic et al. [19]

Shape description and modeling I

- *Conjugate shape simplification via precise algebraic planar sweeps toward gear design, J. Machchhar et al.* [20]
- *Automatically Modeling Piecewise Planar Furniture Shapes from Unorganized Point Cloud*, J. Zhao et al. [21]
- *Co-skeletons: Consistent Curve Skeletons for Shape Families*, Z. Wu et al. [22]

Shape description and modeling II

- *BOLD3D: A 3D BOLD Descriptor for 6DoF Pose Estimation, J. Zhou et al.* [23]
- *Skeleton Based Cage Generation Guided by Harmonic Fields*, S. Casti et al. [24]
- *Discrete Shell Deformation Driven by Adaptive Sparse Localized Components*, Y. Liu et al. [25]

Two outstanding **keynote speakers** further enriched SMI'20 program

- **Mario Botsch,** Universitaet Bielefeld, *Generation, Animation, and Evaluation of Realistic Virtual Humans;*
- **Maks Ovsjanikov,** Ecole Polytechnique, *Functional Approaches for Representing and Analyzing 3D Shapes With and Without Learning;*

In addition, SMI2020 hosted the **Fabrication and Sculpting Event (FASE2020)**, chaired by Oleg Fryazinov (Bournemouth University), Melina Skouras (Inria, Grenoble), and Shinjiro Sueda (Texas A&M University), which originated with SMI several years ago and is now featured as an independent component of the Symposium.

SMI'20 is held in-cooperation with ACM/SIGGRAPH and EUROGRAPHICS and received financial sponsorship from Elsevier for the Best Paper Award and one Honorable Mention. After all the presentations, the program chairs and conference organizers had voted online to chose the best paper and the honorable mention. The best paper has been chosen among those who have obtained the replicability stamp. We wanted to encourage the researchers to publish their code and make it available to the community. The Best Paper Award was given to Vectorization of Persistence Barcode with Applications in Pattern Classification of Porous Structures [10]. which in addition has received the Replicability Stamp. The honourable mention was awarded to Conjugate Shape Simplification via Precise Algebraic Planar Sweeps toward Gear Design [20].

The SMI'20 Program Chairs wish to acknowledge all the people who contributed to the successful organization of the program and conference: in particular, the **SMI Steering Committee, Joaquim Jorge** the Elsevier *Computers and Graphics* Editor in Chief, the **Elsevier CAG Team** (Ross Laman, Damien Rohmer, Qian Jiao), and the **Replicability committee**. We would also like to thank all the members of the **SMI2020 International Program Committee** and **additional Reviewers**.

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- Loic Barthe (University of Tolouse, France)
- Frédéric Cordier (University of Haute-Alsace, France)
- Hui Huang (Shenzhen University, China)

SMI2019 Program Chairs

- David Bommes (University of Bern, Switzerland)
- Nico Pietroni (University of Technology Sydney, Australia)
- Ruizhen Hu (Shenzhen University, China)

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