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Editorial

Foreword to the special section on SIBGRAPI 2021

SIBGRAPI (Conference on Graphics, Patterns and Images) is an international event annually supported by the Brazilian Computer Society (SBC) and one of the most well-known Brazilian scientific conferences in the Computer Science field. It is attended by researchers, developers, and students from colleges, universities, research centers, and companies, uniting participants from Brazil and abroad.

The 34th edition of SIBGRAPI was planned to be held in the beautiful city of Gramado, Rio Grande do Sul, Brazil. Due to the COVID-19 pandemic, the conference was virtual from October 18th through 22nd, 2021. Fig. 1 shows the conference logo. Moreover, SIBGRAPI 2021 occurred in conjunction with two other major events: the Symposium on Virtual and Augmented Reality (SVR 2021) and the Symposium on Computer Games and Digital Entertainment (SBGames 2021).

SIBGRAPI 2021 featured an outstanding technical program, including 51 full papers published in the conference proceedings by IEEE Computer Society Press (since 1997) and available in IEEE Xplore Digital Library. Furthermore, the conference also has selected papers published in special sections of the IEEE Geoscience and Remote Sensing Letters (IEEE GRSL), Pattern Recognition Letters, and Computers & Graphics journal.

The papers presented in this special section were previously submitted to the special track on SIBGRAPI 2021 for the Computers & Graphics. This year, we had 33 pre-conference submissions, and only eight papers have been accepted for publication, resulting in an acceptance rate of 24%. To ensure the high-quality standards of the journal, each paper underwent two cycles of double-blind reviewing and it was reviewed by at least three members of the Program Committee formed by well-renowned researchers.

Besides, the authors of the two best papers on graphics and visualization of the SIBGRAPI 2021 Main Track were invited to revise and substantially extend their papers to publish in this special section. These extended versions underwent the same rigorous review process of pre-conference submissions, where each paper was reviewed by four members of the Program Committee.

The ten outstanding papers selected in this special section provide remarkable results in Visualization and Computer Graphics fields, tackling the following topics:

Learning in Graphics. Figueiredo et al. [1] introduce a deep learning-based framework for shape instance registration of complex 3D CAD models. Their method employs the PointNet++ neural network to precisely identify similar instances of triangle meshes to determine an optimal affine transformation between them. Dorta Marques et al. [2] present a real-time lighting model for mixed reality applications applying a novel deep neural network architecture to represent spatially-varying environments lighting from a single image of the scene.

Shadows and Fluids. Mesquita et al. [3] provide an efficient shadow mapping algorithm that delivers good performance and a low memory footprint. Their geometrical framework allows the real-time generation of shadows in complex scenarios, removing the hidden geometry that does not contribute to the shadow rendering. Parreiras et al. [4] introduce a framework for anisotropic particle-in-cell fluid simulation based on the Fluid-Implicit-Particle (FLIP) method. The authors propose a novel numerical scheme based on Marker-and-Cell grids to perform an anisotropic pressure projection solver and a tensor-based advection as well.

Video and Appearance. Fontanari and Oliveira [5] present a novel method for simultaneous magnification of intensity/color variations and subtle motions in videos by scaling amplitude coefficients and residues of Riesz Pyramids. da Silva Nunes et al. [6] propose an approach to create new customized materials from a Bidirectional Reflectance Distribution Function (BRDF) samples captured from real-world. Their approach builds an appearance-driven space using a dimensionality reduction method, allowing the user to explore and retrieve new BRDFs.

Dimensionality Reduction. Marcílio-Jr et al. [7] introduce a novel visual metaphor to explore Dimensionality Reduction (DR) results represented by scatterplots and understand clusters' formation using contrastive analysis. The authors use a bipartite graph to represent statistical relationships in order to interpret the formation of the cluster regarding the data features. Neves et al. [8] present a novel incremental DR technique for streaming data applications. The technique's efficiency results from a multidimensional re-projection scheme to update visual data representation without requiring to revisit the input data.

Ball Trees and Visual Analytics. Retondaro and Esperança [9] propose an efficient and optimized data structure of ball trees for the interactive creation of 2D layouts. Pocco et al. [10] introduce a novel visual analytic framework for exploring scientific literature collections, combining tools from image retrieval to word clouds. These two papers were selected as the best papers of the SIBGRAPI 2021 Main Track.

This year, the conference gathered 62 articles presented orally, divided into 11 thematic sessions. Four distinguished keynote speakers enhanced the SIBGRAPI 2021 program: Cláudio Rosito Jung (UFRGS, Brazil) introduced *"Beyond Horizontal Bounding Boxes for Object Detection"*; Gladimir Baranoski (U. of Waterloo, Canada) presented *"The Quest for Fundamental Biophysical Data"*;

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Fig. 1. SIBGRAPI 2021 logo designed by Thiago Thamay (UFRGS, Brazil).

Hugo Proença (U. of Beira Interior, Portugal) discussed *"Advances in Visually Interpretable Biometric Recognition"*; and Luis Gustavo Nonato (ICMC-USP, Brazil) presented *"From Geometry Processing to Spatio-Temporal Data Analysis and Visualization: a historical view"*.

SIBGRAPI 2021 also hosted the following workshops: Workshop of Undergraduate Works (WUW), Workshop of Theses and Dissertations (WTD), Workshop of Industry Applications (WIA), Workshop of Works in Progress (WiP) and Workshop on Visual Analytics, Information Visualization and Scientific Visualization (WVIS). Furthermore, four tutorials were presented: *Neural Networks for Implicit Representations of 3D Scenes* by Luiz Schirmer, Guilherme Schardong, Vinícius da Silva, Hélio Lopes, Tiago Novello, Daniel Yukimura, Thales Magalhães and Luiz Velho, from PUC-Rio and IMPA; *Training Deep Networks from Zero to Hero: avoiding pitfalls and going beyond* by Moacir A. Ponti, Fernando P. dos Santos, Leo S. F. Ribeiro and Gabriel B. Cavallari, from ICMC-USP; *Machine Learning Bias in Computer Vision: Why do I have to care?* by Camila Laranjeira, Virgínia F. Mota and Jefersson A. dos Santos, from UFMG; and *PGA: reflecting on easier math for graphics programmers* by Leo Dorst and Steven De Keninck, from University of Amsterdam and Origami Digital LLC.

The Program Chairs wish to acknowledge the people who contributed to the successful organization of the program: Eduardo S. L. Gastal and Marcelo Walter (General Chairs of SIBGRAPI 2021, UFRGS, Brazil); Leandro A. F. Fernandes (UFF, Brazil), and Sandra Avila (UNICAMP, Brazil) (Tutorial Chairs of SIBGRAPI 2021); Javier Gurrola (IEEE Computer Society, editor of the conference proceedings) and all the IEEE team; Avik Bhattacharya (Editor-in-Chief of IEEE GRSL); Joaquim Jorge (Editor-in-Chief of Computers & Graphics) and all Elsevier staff.

In addition, we would like to thank the guest editors of IEEE GRSL: Gilson Costa (IME-UERJ, Brazil), Jocelyn Chanussot (Grenoble INP, France), Keiller Nogueira (U. of Stirling, Scotland), and Wallace Casaca (UNESP, Brazil). Also, the support of Gerald Banon and Thales Sehn Körting (INPE, Brazil) for keeping alive the SIBGRAPI Digital Library Archive repository[1] and Maurício Barbosa da Rocha (UFRGS, Brazil) for the development and design of the SIBGRAPI 2021 website. Finally, we are grateful to all the members of the Program Committee for their hard work and commitment during the peer review process. Without their efforts, this conference would not have been possible.

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[1] http://sibgrapi.sid.inpe.br/

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