



VISIGRAPP 2019

14th International Joint Conference on Computer Vision,
Imaging and Computer Graphics Theory and Applications

PROCEEDINGS

Volume 1: GRAPP

Prague, Czech Republic

25-27 February, 2019

EDITORS

Ana Paula Cláudio

Kadi Bouatouch

Jose Braz

<http://www.visigrapp.org/>

SPONSORED BY



PAPERS AVAILABLE AT



VISIGRAPP 2019

Proceedings of the
14th International Joint Conference on
Computer Vision, Imaging and Computer Graphics
Theory and Applications

Volume 1: GRAPP

Prague - Czech Republic

February 25 - 27, 2019

Sponsored by

INSTICC - Institute for Systems and Technologies of Information, Control and Communication

ACM In Cooperation

ACM SIGGRAPH - ACM Special Interest Group on Graphics and Interactive Techniques

In Cooperation with

EUROGRAPHICS - European Association for Computer Graphics

AFIG - French Association for Computer Graphics

Copyright © 2019 by SCITEPRESS – Science and Technology Publications, Lda.
All rights reserved

Edited by Ana Paula Cláudio, Kadi Bouatouch and Jose Braz

Printed in Portugal

ISSN: 2184-4321

ISBN: 978-989-758-354-4

Depósito Legal: 450998/19

<http://www.grapp.visigrapp.org>

grapp.secretariat@insticc.org

BRIEF CONTENTS

INVITED SPEAKERS	IV
ORGANIZING COMMITTEES	V
PROGRAM COMMITTEE	VI
AUXILIARY REVIEWERS	VIII
SELECTED PAPERS BOOK	VIII
FOREWORD	IX
CONTENTS	XI

INVITED SPEAKERS

Daniel McDuff

Microsoft
United States

Diego Gutierrez

Universidad de Zaragoza
Spain

Jiri Matas

Czech Technical University in Prague, Faculty of Electrical Engineering
Czech Republic

Dima Damen

University of Bristol
United Kingdom

ORGANIZING COMMITTEES

CONFERENCE CHAIR

Jose Braz, Escola Superior de Tecnologia de Setúbal, Portugal

PROGRAM CO-CHAIRS

Ana Paula Cláudio, BioISI, Faculdade de Ciências, Universidade de Lisboa, Portugal

Kadi Bouatouch, IRISA, University of Rennes 1, France

AREA CO-CHAIRS

Maria Beatriz Carmo, BioISI, Faculdade de Ciências da Universidade de Lisboa, Portugal

Ludovic Hoyet, INRIA Rennes - Centre Bretagne Atlantique, France

Jaroslav Krivanek, Charles University in Prague, Czech Republic

Bruno Levy, Inria Research, France

SECRETARIAT

Bruno Encarnação, INSTICC, Portugal

Ana Beatriz Filipe, INSTICC, Portugal

GRAPHICS PRODUCTION AND WEBDESIGNER

André Poeira, INSTICC, Portugal

WEBMASTER

João Francisco, INSTICC, Portugal

Carolina Ribeiro, INSTICC, Portugal

PROGRAM COMMITTEE

Francisco Abad, Universidad Politécnica de Valencia, Spain

Marco Agus, King Abdullah University of Science and Technology, Saudi Arabia

Lilian Aveneau, University of Poitiers, France

Gérard Bailly, GIPSA-Lab, Univ. Grenoble-Alpes/CNRS, France

Gonzalo Besuievsky, Universitat de Girona, Spain

Carla Binucci, Università Degli Studi Di Perugia, Italy

Venceslas Biri, University Paris Est, France

Fernando Birra, Faculdade de Ciências e Tecnologia / UNL, Portugal

Kristopher Blom, Virtual Human Technologies, Czech Republic

Stephen Brooks, Dalhousie University, Canada

Dimitri Bulatov, Fraunhofer IOSB, Ettlingen - Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Germany

Patrick Callet, Ecole Centrale Paris, France

Maria Beatriz Carmo, BioISI, Faculdade de Ciências da Universidade de Lisboa, Portugal

L. G. Casado, University of Almeria, Spain

Eva Cerezo, University of Zaragoza, Spain

Teresa Chambel, Lasige, Faculty of Sciences, University of Lisbon, Portugal

Parag Chaudhuri, Indian Institute of Technology Bombay, India

Hwan-gue Cho, Pusan National University, Korea, Republic of

Teodor Cioaca, University Politehnica Bucharest, Romania

António Coelho, Faculdade de Engenharia da Universidade do Porto, Portugal

Sabine Coquillart, INRIA, France

Vasco Costa, INESC-ID, Portugal

Rémi Cozot, IRISA, France

Luiz Henrique de Figueiredo, Impa, Brazil

Bailin Deng, Cardiff University, United Kingdom

Paulo Dias, Universidade de Aveiro, Portugal

John Dingliana, Trinity College Dublin, Ireland

Jean-Michel Dischler, Université de Strasbourg, France

Anastasios Drosou, Centre for Research & Technology, Hellas, Greece

Thierry Duval, IMT Atlantique, France

Elmar Eisemann, Delft University of Technology, Netherlands

Marius Erdt, Fraunhofer IDM@NTU, Singapore

Petros Faloutsos, York University, Canada

Jean-Philippe Farrugia, LIRIS Lab, France

Pierre-Alain Fayolle, University of Aizu, Japan

Francisco R. Feito, University of Jaén, Spain

Dirk Feldmann, Germany

Jie Feng, Peking University, China

Jie-Qing Feng, State Key Lab of CAD&CG, Zijingang Campus, Zhejiang University, China

Leandro Fernandes, Universidade Federal Fluminense, Brazil

Carla Freitas, Universidade Federal do Rio Grande do Sul, Brazil

Ioannis Fudos, University of Ioannina, Greece

Alejandro García-Alonso, University of the Basque Country, Spain

Miguel Gea, University of Granada, Spain

Djamchid Ghazanfarpour, Xlim Laboratory (UMR CNRS 7252) - University of Limoges, France

Enrico Gobetti, CRS4, Italy

Stephane Gobron, HES-SO / Arc, Switzerland

Alexandrino Gonçalves, Polytechnic Institute of Leiria, Portugal

Marcelo Guimarães, Federal University of São Paulo/ Master Program of Faculdade Campo Limpo Paulista, Brazil

James Hahn, George Washington University, United States

Vlastimil Havran, Czech Technical University in Prague, Faculty of Electrical Engineering, Czech Republic

Nancy Hitschfeld, University of Chile, Chile

Ludovic Hoyet, INRIA Rennes - Centre Bretagne Atlantique, France

Andres Iglesias, University of Cantabria, Spain

Juan Jiménez Delgado, Universidad de Jaen, Spain

Xiaogang Jin, Zhejiang University, China

Robert Joan-Arinyo, Universitat Politècnica de Catalunya, Spain

Chris Joslin, Carleton University, Canada

Cláudio Jung, Universidade Federal do Rio Grande do Sul, Brazil

Mubbasir Kapadia, Rutgers University, United States

Josef Kohout, University of West Bohemia, Czech Republic

Maciej Kot, Tokyo Institute of Technology, Japan

Torsten Kuhlen, RWTH Aachen University, Germany

Richard Kulpa, Université Rennes 2, France

Won-sook Lee, University of Ottawa, Canada

Alejandro León, University of Granada, Spain

Marco Livesu, Italian National Research Council (CNR), Italy

Hélio Lopes, PUC-Rio, Brazil

Joaquim Madeira, University of Aveiro, Portugal

Claus Madsen, Aalborg University, Denmark

Stephen Mann, University of Waterloo, Canada

Michael Manzke, Trinity College Dublin, Ireland

Ricardo Marroquim, Rio de Janeiro Federal University, Brazil

Belen Masia, Universidad de Zaragoza, Spain

Oliver Mattausch, Siemens, Switzerland

Nelson Max, University of California, United States

Eder Miguel, Universidad Rey Juan Carlos, Spain

José Molina Massó, Universidad de Castilla-la Mancha, Spain

Ramon Molla, Universitat Politècnica de València, Spain

David Mould, Carleton University, Canada

Afonso Paiva, Universidade de São Paulo – USP, Brazil

Georgios Papaioannou, Athens University of Economics and Business, Greece

Daniel Patel, University of Bergen, Norway

Sumanta Pattanaik, UCF, United States

Félix Paulano-Godino, University of Jaén, Spain

Aruquia Peixoto, CEFET/RJ, Brazil

João Pereira, Instituto Superior de Engenharia do Porto, Portugal

João Pereira, INESC-ID at IST, Portugal

Sinésio Pesco, PUC-Rio Institute, Brazil

Christopher Peters, KTH Royal Institute of Technology, Sweden

Ruggero Pintus, CRS4 - Center for Advanced Studies, Research and Development in Sardinia, Italy

Paulo Pombinho, Universidade de Lisboa, Portugal

Tomislav Pribanic, University of Zagreb, Croatia

Anna Puig, University of Barcelona, Spain

Inmaculada Remolar, Universitat Jaume I, Spain

Mickael Ribardièrre, University of Poitiers, XLIM, France

María Rivara, Universidad de Chile, Chile

Nuno Rodrigues, Polytechnic Institute of Leiria, Portugal

Rui Rodrigues, INESC Porto, Departamento de Engenharia Informática, Faculdade de Engenharia, Universidade do Porto, Portugal

Inmaculada Rodríguez, University of Barcelona, Spain

Przemyslaw Rokita, Warsaw University of Technology, Poland

Teresa Romão, Faculdade de Ciências e Tecnologia/Universidade de Nova Lisboa, Portugal

Luís Romero, Instituto Politecnico de Viana do Castelo, Portugal

Isaac Rudomin, BSC, Spain

Wang Rui, Zhejiang University, China

Beatriz Santos, University of Aveiro, Portugal

Muhammad Sarfraz, Kuwait University, Kuwait

Basile Sauvage, University of Strasbourg, France

Vladimir Savchenko, Hose University, Japan

Rafael J. Segura, Universidad de Jaen, Spain

Ari Shapiro, University of Southern California, United States

Frutuoso Silva, University of Beira Interior, Portugal

A. Augusto Sousa, FEUP/INESC Porto, Portugal

Jie Tang, Nanjing University, China

Gabriel Taubin, Brown University, United States

Matthias Teschner, University of Freiburg, Germany

Daniel Thalmann, Ecole Polytechnique Federale de Lausanne, Switzerland

Juan Carlos Torres, Universidad de Granada, Spain

Alain Tremeau, Université Jean Monnet in Saint Etienne, France

Torsten Ullrich, Fraunhofer Austria Research, Austria

Anna Ursyn, University of Northern Colorado, United States

Cesare Valenti, Università degli Studi di Palermo, Italy

Thales Vieira, Universidade Federal de Alagoas, Brazil

Andreas Weber, University of Bonn, Germany

Burkhard Wuensche, University of Auckland, New Zealand

Ling Xu, University of Houston-Downtown, United States

Lihua You, Bournemouth University, United Kingdom

Jian Zhang, Bournemouth University, United Kingdom

AUXILIARY REVIEWERS

Simone Balocco, University of Barcelona, Spain

Renan Vieira Bela, PUC-Rio, Brazil

Ehtzaz Chaudhry, Bournemouth University, United Kingdom

Andrea Lins, PUC-Rio, Brazil

Franziska Lippoldt, Fraunhofer Singapore, Singapore

Francisco Daniel Pérez Cano, University of Jaén, Spain

Joao Marcos Silva da Costa, PUC-Rio, Brazil

Meili Wang, Northwest A&F University, China

SELECTED PAPERS BOOK

A number of selected papers presented at GRAPP 2019 will be published by Springer in a CCIS Series book. This selection will be done by the Conference Chair and Program Co-chairs, among the papers actually presented at the conference, based on a rigorous review by the GRAPP 2019 Program Committee members.

FOREWORD

This book contains the proceedings of the 14th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISIGRAPP 2019) which was organized and sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC), in cooperation with ACM SIGCHI, ACM SIGGRAPH, AFIG, Eurographics and UXPA International.

The proceedings here published demonstrate new and innovative solutions and highlight technical problems in each field that are challenging and worthwhile being disseminated to the interested research audiences.

VISIGRAPP 2019 was organized to promote a discussion forum about the conference's research topics between researchers, developers, manufacturers and end-users, and to establish guidelines in the development of more advanced solutions.

We received a high number of paper submissions for this edition of VISIGRAPP, 396 in total, with contributions from all five continents. This attests to the success and global dimension of VISIGRAPP. To evaluate each submission, we used a double-blind evaluation method where each paper was reviewed by two to six experts from the International Program Committee (IPC).

The IPC selected for oral presentation and for publication as full papers 12 papers from GRAPP, 6 for HUCAPP, 12 papers for IVAPP, and 36 papers for VISAPP, which led to a result for the full-paper acceptance ratio of 17% and a high-quality program. Apart from the above full papers, the conference program also features 88 short papers and 115 poster presentations. We hope that these conference proceedings, which are submitted for indexation by Thomson Reuters Conference Proceedings Citation Index, SCOPUS, DBLP, Semantic Scholar, Google Scholar and EI, will help the Computer Vision, Imaging, Visualization and Computer Graphics communities to find interesting research work. Moreover, we are proud to inform that the program also includes four plenary keynote lectures, given by internationally distinguished researchers, namely Daniel McDuff (Microsoft, United States), Diego Gutierrez (Universidad de Zaragoza, Spain), Jiri Matas (Czech Technical University in Prague, Faculty of Electrical Engineering, Czech Republic) and Dima Damen (University of Bristol, United Kingdom), thus contributing to increase the overall quality of the conference and to provide a deeper understanding of the conference's interest fields.

Furthermore, a short list of the presented papers will be selected to be expanded into a forthcoming book of VISIGRAPP Selected Papers to be published by Springer during 2019 in the CCIS series. Also, a short list of presented papers will be selected for publication of extended and revised versions in a special issue of the Open Access Information Science Journal (IVAPP) and in a special issue of the Pattern Recognition and Artificial Intelligence Journal (VISAPP). All papers presented at this conference will be available at the SCITEPRESS Digital Library. Three awards are delivered at the closing session, to recognize the best conference paper, the best student paper and the best poster for each of the four conferences.

We would like to express our thanks, first of all, to the authors of the technical papers, whose work and dedication made possible to put together a program that we believe to be very exciting and of high technical quality. Next, we would like to thank the Area Chairs, all the members of the program committee and auxiliary reviewers, who helped us with their expertise and time. We would also like to thank the invited speakers for their invaluable contribution and for sharing their vision in their talks. Special thanks should be addressed to the INSTICC Steering Committee whose invaluable work made this event possible.

We wish you all an exciting conference and an unforgettable stay in Prague, Czech Republic. We hope to meet you again for the next edition of VISIGRAPP, details of which are available at <http://www.visigrapp.org>.

Ana Paula Cláudio

BioISI, Faculdade de Ciências, Universidade de Lisboa, Portugal

Kadi Bouatouch

IRISA, University of Rennes 1, France

Jose Braz
Escola Superior de Tecnologia de Setúbal, Portugal

CONTENTS

INVITED SPEAKERS

KEYNOTE SPEAKERS

Building Emotionally Intelligent AI: From Sensing to Synthesis <i>Daniel McDuff</i>	5
Reinventing Movies: How Do We Tell Stories in VR? <i>Diego Gutierrez</i>	7
Robust Fitting of Multiple Models in Computer Vision <i>Jiri Matas</i>	9
A Fine-grained Perspective onto Object Interactions from First-person Views <i>Dima Damen</i>	11

PAPERS

FULL PAPERS

Bootstrapping Vector Fields <i>Paula Ceccon Ribeiro and H�elio Lopes</i>	19
Enhancing Spatial Keyframe Animations with Motion Capture <i>Bernardo F. Costa and Claudio Esperan�a</i>	31
A Sketch-based Interface for Real-time Control of Crowd Simulations that Use Navigation Meshes <i>Luis Rene Montana Gonzalez and Steve Maddock</i>	41
Physically-based Thermal Simulation of Large Scenes for Infrared Imaging <i>B. Kottler, E. Burkard, D. Bulatov and L. Harak�e</i>	53
Proposing a Co-simulation Model for Coupling Heterogeneous Character Animation Systems <i>Felix Gaisbauer, Jannes Lehwald, Philipp Agethen, Julia Sues and Enrico Rukzio</i>	65
Attribute Grammars for Incremental Scene Graph Rendering <i>Harald Steinlechner, Georg Haaser, Stefan Maierhofer and Robert F. Tobler</i>	77
Reaction-diffusion Woodcuts <i>D. P. Mesquita and M. Walter</i>	89
Classification of Salsa Dance Level using Music and Interaction based Motion Features <i>Simon Senecal, Niels A. Nijdam and Nadia Magnenat Thalmann</i>	100
Character Motion in Function Space <i>Innfarn Yoo, Marek Fi�ser, Kaimo Hu and Bedrich Benes</i>	110
A Unified Curvature-driven Approach for Weathering and Hydraulic Erosion Simulation on Triangular Meshes <i>V�era Skorkovsk�a, Ivana Kolingerov�a and Petr Van�e�ek</i>	122
Using a Depth Heuristic for Light Field Volume Rendering <i>Se�an Martin, Se�an Bruton, David Ganter and Michael Manzke</i>	134

This Music Reminds Me of a Movie, or Is It an Old Song? An Interactive Audiovisual Journey to Find out, Explore and Play <i>Acácio Moreira and Teresa Chambel</i>	145
SHORT PAPERS	
Spectral Multi-Dimensional Scaling using Biharmonic Distance <i>Jun Yang, Alexander Jesuorobo Obaseki and Jim X. Chen</i>	161
A Fully Object-space Approach for Full-reference Visual Quality Assessment of Static and Animated 3D Meshes <i>Zeynep Cipiloglu Yildiz and Tolga Capin</i>	169
Generation of Approximate 2D and 3D Floor Plans from 3D Point Clouds <i>Vladeta Stojanovic, Matthias Trapp, Rico Richter and Jürgen Döllner</i>	177
Symmetry-aware Registration of Human Faces <i>Martin Prantl, Libor Váša and Ivana Kolingerová</i>	185
Novel View Synthesis using Feature-preserving Depth Map Resampling <i>Duo Chen, Jie Feng and Bingfeng Zhou</i>	193
Techniques for Automated Classification and Segregation of Mobile Mapping 3D Point Clouds <i>Johannes Wolf, Rico Richter and Jürgen Döllner</i>	201
A Video-texture based Approach for Realistic Avatars of Co-located Users in Immersive Virtual Environments using Low-cost Hardware <i>Robin Horst, Sebastian Alberternst, Jan Sutter, Philipp Slusallek, Uwe Kloos and Ralf Dörner</i>	209
Photorealistic Reproduction with Anisotropic Reflection on Mobile Devices using Densely Sampled Images <i>Shoichiro Mihara, Haruhisa Kato and Masaru Sugano</i>	217
Combining Two-level Data Structures and Line Space Precomputations to Accelerate Indirect Illumination <i>K. Keul, T. Kofß, F. L. Schröder and S. Müller</i>	228
Using LSTM for Automatic Classification of Human Motion Capture Data <i>Rogério E. da Silva, Jan Ondřej and Aljosa Smolic</i>	236
CAD-driven Pattern Recognition in Reverse Engineered Models <i>S. Gauthier, W. Puech, R. Bénéière and G. Subsol</i>	244
Volumetric Video Capture using Unsynchronized, Low-cost Cameras <i>Andrea Bönsch, Andrew Feng, Parth Patel and Ari Shapiro</i>	255
Enhanced Waters 2D Muscle Model for Facial Expression Generation <i>Dinesh Kumar and Dharmendra Sharma</i>	262
A Content-aware Filtering for RGBD Faces <i>Leandro Dihl, Leandro Cruz, Nuno Monteiro and Nuno Gonçalves</i>	270
Analytic Surface Detection in CAD Exported Models <i>Pavel Šigut, Petr Vaněček and Libor Váša</i>	278
Sharp Feature Detection on Point Sets via Dictionary Learning and Sparse Coding <i>Esmeide Leal, John Branch and German Sanchez</i>	286

A Data-driven Approach for Adding Facade Details to Textured LoD2 CityGML Models <i>Xingzi Zhang, Franziska Lippoldt, Kan Chen, Henry Johan and Marius Erdt</i>	294
Real-time Automatic Tongue Contour Tracking in Ultrasound Video for Guided Pronunciation Training <i>M. Hamed Mozaffari, Shuangyue Wen, Nan Wang and WonSook Lee</i>	302
Automatic Recognition of Sport Events from Spatio-temporal Data: An Application for Virtual Reality-based Training in Basketball <i>Alberto Cannavò, Davide Calandra, Gianpaolo Basilicò and Fabrizio Lamberti</i>	310
Interactive Environment for Testing SfM Image Capture Configurations <i>Ivan Nikolov and Claus Madsen</i>	317
Anthropomorphic Virtual Assistant to Support Self-care of Type 2 Diabetes in Older People: A Perspective on the Role of Artificial Intelligence <i>Gergely Magyar, João Balsa, Ana Paula Cláudio, Maria Beatriz Carmo, Pedro Neves, Pedro Alves, Isa Brito Félix, Nuno Pimenta and Mara Pereira Guerreiro</i>	323
Acceleration Data Structures for Ray Tracing on Mobile Devices <i>Nuno Sousa, David Sena, Nikolaos Papadopoulos and João Pereira</i>	332
Towards the Modelling of Osseous Tissue <i>F. D. Pérez and J. J. Jiménez</i>	340
Web-based Interactive Visualization of Medical Images in a Distributed System <i>Thiago Moraes, Paulo Amorim, Jorge Silva and Helio Pedrini</i>	346
Automatic Detection of Distal Humerus Features: First Steps <i>José Negrillo-Cárdenas, Juan-Roberto Jiménez-Pérez and Francisco R. Feito</i>	354
Accurate Plant Modeling based on the Real Light Incidence <i>J. M. Jurado, J. L. Cárdenas, C. J. Ogayar, L. Ortega and F. R. Feito</i>	360
Reducing Computational Complexity of Real-Time Stereoscopic Ray Tracing with Spatiotemporal Sample Reprojection <i>Markku Mäkitalo, Petrus Kivi, Matias Koskela and Pekka Jääskeläinen</i>	367
Efficient Recognition and 6D Pose Tracking of Markerless Objects with RGB-D and Motion Sensors on Mobile Devices <i>Sheng-Chu Huang, Wei-Lun Huang, Yi-Cheng Lu, Ming-Han Tsai, I-Chen Lin, Yo-Chung Lau and Hsu-Hang Liu</i>	375
AUTHOR INDEX	383