GCH 2022

Eurographics Workshop
on
Graphics and Cultural Heritage

28 – 30 September 2022
Delft, The Netherlands

General Chair
Ricardo Marroquim, TU Delft, The Netherlands

Programme Chairs
Federico Ponchio, ISTI-CNR, Italy
Ruggero Pintus, CRS4, Italy

Proceedings Production Editor
Dieter Fellner (TU Darmstadt & Fraunhofer IGD, Germany)

Sponsored by EUROGRAPHICS Association

DOI: 10.2312/gch.20222018

Dieter W. Fellner, Werner Hansmann, Werner Purgathofer, François Sillion
Series Editors

Published by the Eurographics Association
–Postfach 2926, 38629 Goslar, Germany–
in cooperation with
Institute of Computer Graphics & Knowledge Visualization at Graz University of Technology
and
Fraunhofer IGD (Fraunhofer Institute for Computer Graphics Research), Darmstadt

ISBN 978-3-03868-178-6
ISSN 2312-6124 (online)

The electronic version of the proceedings is available from the Eurographics Digital Library at `https://diglib.eg.org`

Table of Contents

Table of Contents

Preface

These are the proceedings of the 20th Eurographics Workshop on Graphics and Cultural Heritage (GCH 2022), held September 28-30 at the Delft University of Technology (TU Delft), The Netherlands. GCH provides an excellent scientific forum to exchange novel ideas and developments as well as to identify future research and application opportunities. In this scenario, its aim is to foster the engagement of practitioners and researchers across the world working at the interface of novel digital technologies and cultural heritage. Particularly for practitioners, GCH provides a unique opportunity to feed into technical developments as well as to identify new techniques and ideas which can be transferred into practice. For researchers, it is a great opportunity to present or to become aware of the new advances, projects and applications that demonstrate how computer graphics and other digital technologies are impacting cultural heritage research, preservation and dissemination and promoting sustainable cultural tourism. From this perspective, a series of specific sessions will be organized for active networking to seek new challenges and projects involving different stakeholders of the Heritage ecosystem. Hence, interdisciplinary and multidisciplinary approaches are particularly welcome to the event.

The technical programme received 30 submissions in the two tracks: full papers (10), short papers (20). Each contribution has been reviewed by at least three IPC members and international experts in the field for technical quality and novelty, selected by the chairs according to their preferences, expertise, and conflicts. The final decision has been made based on the reviewers' recommendations, the individual reviews, the online discussions, and after a thorough deliberation by the program co-chairs. After that process, this proceedings consists of 6 full papers (one full paper has been withdrawn), and 16 short papers (3 of them were initially submitted as full papers and proposed as short papers to authors).

This year the scientific program includes two high-class invited presentations, i.e., two keynote speeches given by Tim Weyrich (UCL, UK) and Karina Rodriguez Echavarria (University of Brighton) UK. Then, there are six sessions with the 6 full and 16 short paper presentations, and a special section entitled "eXtending Reality: Designing Future Cultural Heritage Experiences", which is an interactive session that puts together minds with different backgrounds around cultural heritage (both from GCH2022 attendees and invited experts from other, related areas), such as researchers and practitioners from the domains of computer science, design, psychophysics, art history, and museum studies.

This GCH would not have been possible without contributions by many persons. We would like to thank the following for all their efforts to make this exciting event possible: all the authors for submitting the results of their latest endeavors; the members of the programme committee, who provide high quality reviews and useful comments for authors to improve their contributions; the keynote speakers for their valuable contribution to the event; the session chairs for their help in organizing and steering the talks and discussions; local organizing team at Delft University for their commitment and determination; Delft University admin teams for their support; Karina for her guidance throughout the organization process. GCH 2022 would not have been possible without the great help of Stefanie Behnke of Eurographics, who tirelessly worked with the paper co-chairs on many logistical aspects and on the proceedings production.

We look forward to seeing you at EG GCH 2022, and we hope you will enjoy the conference.

Ruggero & Federico

International Programme Committee

Anderson, Eike - Bournemouth University
Bernstein, Mark - Eastgate Systems, Inc.
Brown, Benedict - Yale University
Catalano, Chiara Eva - CNR IMATI
Chalmers, Alan - University of Warwick
Gatzidis, Christos - Bournemouth University
Gobbetti, Enrico - CRS4
Happa, Jassim - Information Security Group, Royal Holloway
Hulusic, Vedad - Faculty of Science and Technology, Bournemouth University
Ippolito, Alfonso - Univ. Roma 1
James, Stuart - Istituto Italiano di Tecnologia
Jaspe, Alberto - KAUST
Kampel, Martin - Vienna University of Technology
Lerma, José Luis - Universidad Politécnica de Valencia
Marton, Fabio - CRS4
Medeiros, Asla - EMAp/FGV
Mortara, Michela - CNR IMATI
Pescarin, Sofia - CNR ISPC
Pintore, Giovanni - CRS4
Reuter, Patrick - University Bordeaux, Inria Bordeaux
Rizvic, Selma - University of Sarajevo, Faculty of Electrical Engineering
Rodriguez, Karina - University of Brighton
Rushmeier, Holly - Yale
Santos, Pedro - Fraunhofer Institute for Computer Graphics Research IGD
Schreck, Tobias - Graz University of Technology
Scopigno, Roberto - CNR-ISTI
Weinmann, Michael - TU Delft
Zambanini, Sebastian - Computer Vision Lab, TU Wien

Author Index

Author Index

Keynote

Computational Imaging For Cultural-Heritage Applications

Tim Weyrich

Abstract

Through the increasing availability of high-quality consumer hardware for advanced imaging tasks, digital imaging and scanning are gradually pervading general practice in cultural heritage preservation and archaeology. In most cases, however, imaging and scanning are predominantly means for documentation and archival, and digital processing too often ends with the creation of a digital image or 3D model. At the example of multiple projects, the speaker will demonstrate how careful analysis of the underlying cultural-heritage questions allows for bespoke solutions that – through joint development of imaging procedures, data analysis and visualisations – directly support conservators and humanities researchers in their work. Tim Weyrich will report on his experiences with fresco reconstruction at the Akrotiri Excavation, Santorini, and the reconstruction of fire-damaged parchment with London Metropolitan Archives, as well as other recent and ongoing projects that have not yet been publicly announced.

Biographical Sketch

Prof. Tim Weyrich holds the chair of Digital Reality at Friedrich-Alexander-Universität Erlangen-Nürnberg, as well as a part-time assignment as Professor of Visual Computing at University College London (UCL), a position he originally held until 2021, after coming to UCL in 2008. In an earlier life, he was a Postdoctoral Teaching Fellow of Princeton University, working in the Princeton Computer Graphics Group, a post he took after having received his PhD from ETH Zurich, Switzerland, in 2006. His research interests include content creation, computational photography, appearance modelling and fabrication, point-based graphics, cultural heritage analysis and digital humanities. He is a member of the executive committee of Eurographics; member of the steering board of the Eurographics Workshop on Graphics and Cultural Heritage and the steering committee EPSRC Doctoral Training Centre of Science and Engineering in Arts, Heritage and Archaeology (SEAHA). He serves as Associate Editor for IEEE Transactions of Visualization and Computer Graphics (TVCG) and is a member of the Association for Historical and Fine Art Photography (AHFAP), special interest group Libraries & Archives Imaging; member of EPSRC College, BCS, ACM SIGGRAPH, Eurographics and of Gesellschaft für Informatik. Past roles include co-founder and Associate, later Deputy Director of the UCL Centre for Digital Humanities (2014–2021); Associate Editor of Computer Graphics Forum and of Elsevier Computer & Graphics.

Keynote

Co-developing applied research with Cultural Heritage organisations

Karina Rodriguez Echavarria

Abstract

Our research is both interdisciplinary and applied, meaning it requires collaboration with practitioners in Cultural Heritage organisations and their audiences to be successful. In this talk, I will explore the processes, practical aspects, workflows and priorities when developing a research project with Cultural Heritage stakeholders. Covering the application of various areas of graphics including digitisation, visual analysis, immersive visualisation, and 3D printing, the talk will identify ongoing challenges and opportunities, both technical and non-technical. The talk will demonstrate that, despite several challenges, these technologies have great potential to support Cultural Heritage organisations to care for collections, while easing the task of involving wider audiences in the interpretation of the artefacts and their contexts. By sharing my experiences of being part of these projects, I hope attendees can get ideas on various ways to initiate and develop partnerships which can provide interesting opportunities for applied research.

Biographical Sketch

Karina is a Reader at the School of Architecture, Technology and Engineering, University of Brighton and Director for the Research Centre for Secure, Intelligent and Usable Systems which focuses on both theoretical and practical research in computer science challenges related to software systems, leading on the provision of digitisation and visualisation technologies. She chairs the Eurographics Workshops Board, and heads the Eurographics Steering Committee on Graphics and Cultural Heritage which organises yearly workshops in this area. She is an interdisciplinary researcher, with a background in Computer Science, a PhD in knowledge-based engineering systems for collaborative manufacturing and an MA in Histories and Cultures. Her research interests include the development and application of computing technologies for the digitisation of objects and environments; the information management, analysis, search/browse visualisation of visual representations, including 2D and 3D content; as well as their physical reproduction using digital fabrication. She currently leads the scoping of data infrastructure for multidimensional datasets in the Arts and Humanities in the UK. She has produced research outputs in interdisciplinary areas such as computer graphics, information and knowledge management as well as cultural heritage.