



**GCH 2016**  
Eurographics Workshop  
on  
Graphics and Cultural Heritage

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**Event Co-Chairs**

Bianca Falcidieno - Institute for Applied Mathematics and Information Technologies, CNR  
Dieter W. Fellner - TU Darmstadt/Fraunhofer IGD, Germany

**Program Co-Chairs**

Chiara Eva Catalano - Institute for Applied Mathematics and Information Technologies, CNR  
Livio De Luca - MAP (Models and simulations for Architecture and Cultural Heritage) Lab, CNRS

**Proceedings Production Editor**

Dieter Fellner (TU Darmstadt & Fraunhofer IGD, Germany)

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## Preface

The 14th EUROGRAPHICS Workshop on Graphics and Cultural Heritage (GCH 2016) aims to foster an international dialogue between ICT experts and CH scientists to have a better understanding of the critical requirements for processing, managing, and delivering cultural information to a broader audience. Indeed, the scientific themes of GCH16 are a relevant portrait of a cross-disciplinary community looking for innovative paths to bridge the gap between the processes of *CH documentation and digital processing*.

Initially, the community has focussed on the technologies for 3D digitization and visualisation introduced by computer scientists and used by human scientists. Today we can start identifying some results of a cross-fertilization process. On the one hand, archaeologists, architects, conservation scientists, and curators foster the use of digital tools within their every-day study of CH artefacts by renewing their methodological approaches; on the other hand, computer scientists propose computational methods to extract relevant information for the analysis and interpretation of cultural assets.

GCH is the premier venue of the EG Working Group on Graphics and Cultural Heritage, whose aim is to promote the discussion and exchange of information between researchers on Visual Media technologies and the Cultural Heritage community. In GCH 2016 we have particularly encouraged interdisciplinary approaches targeting analysis, classification and interpretation in order to explore the true potential of deploying ICT for advancing knowledge in the CH domain.

In the present 14th edition of the workshop, we compiled an exciting program with 29 technical papers, 8 project papers, 3 keynotes, a special session, and a panel session.

We received 41 submissions of scientific contributions, which have been revised by the 46 members of the Program Committee. Without their excellent and hard work, this workshop would have not been possible.

In addition to the technical paper presentations, we invited 8 international projects to share their developments and products with the audience.

GCH 2016 has the pleasure to invite Fabio Remondino (Bruno Kessler Foundation), Albert Gauthier (Data Applications and Creativity, DG CONNECT), and Ioannis Pratikakis (Democritus University of Thrace). Their keynotes cover recent technological progresses, suggesting novel approaches and inspiring research themes.

A special session on “3D Mass Digitization” and a panel session on “Computer Graphics in CH: what’s beyond digitization and plain visualisation?” give a unique opportunity for a lively discussion on the future research directions in the field.

The realization of this workshop is due to many people. We would like to thank the Event Chairs, Bianca Falcidieno and Dieter Fellner, for their guidance and continuous promotion of the event. We are also grateful to Roberto Scopigno and Michela Spagnuolo for their experienced scientific advice. We would like to thank Stefanie Behnke for her help in running the online review management system and producing these proceedings. Finally, our special thanks go to all the CNR IMATI staff for the efficient administrative and technical support, and the smooth organization.

Chiara Eva Catalano  
Livio De Luca  
GCH 2016 Program Chairs

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Organisers



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## Keynote

### **Inside a Bag of ICT Tools for Cultural Heritage: Predictive Digitization, Erosion Modeling, Reassembly and Word Spotting**

*Ioannis Pratikakis*

Democritus University of Thrace

#### **Abstract**

Current challenges in CH domain involve 3D artifacts as well as 2D documents and relate to the difficulty and inefficiency of the 3D digitisation process, the quantification of stone monument degradation, the reconstruction of objects from large numbers of constituent fragments that may be worn, immovable, dispersed or incomplete and finally, the difficulty to access historical collections. This talk will strive towards presenting a closer look to a bag of tools that constitute a response to the aforementioned challenges which although, at first sight, appear heterogeneous, they finally share a common base. These tools are outcomes from the EU projects PRESIOUS, TRANSCRIPTORIUM and READ.

#### **Biographical Sketch**

Ioannis Pratikakis is Associate Professor at the Department of Electrical and Computer Engineering at Democritus University of Thrace in Xanthi, Greece and Adjunct Researcher at 'ATHENA' Research and Innovation Center. He received the Ph.D. degree in 3D Image analysis from the Electronics engineering and Informatics department at Vrije Universiteit Brussel, Belgium, in January 1999. From March 1999 to March 2000, he joined IRISA in Rennes, France as an INRIA postdoctoral fellow. From January 2003 to June 2010, he was working as Adjunct Researcher at the Institute of Informatics and Telecommunications in the National Centre for Scientific Research "Demokritos", Athens, Greece. His research interests lie in visual computing addressing challenges in a broad range of application domains including Cultural Heritage, Medicine and Automotive industry. He has published more than 160 papers in journals, book chapters and conference proceedings in the above areas. He has participated in more than 20 national and international R&D projects. He has served as co-organizer of the 14th International Conference on Frontiers in Handwriting Recognition (ICFHR 2014) as well as the Eurographics Workshop on 3D object retrieval (3DOR) in 2008, 2009 and 2015. He has also served as Guest Editor for the Special issue on 3D object retrieval at the International Journal of Computer Vision (IJCV) as well as Special issues at the Visual Computer Journal (TVC). He has been member of the Board of the Hellenic Artificial Intelligence Society for the period 2010-2014. He is Senior Member of the IEEE and member of the European Association for Computer Graphics (Eurographics).

## Keynote

### **H2020 and Cultural Heritage**

*Albert Gauthier*

Policy Officer, Data Applications and Creativity, DG CONNECT

### **Abstract**

For decades the European Commission is funding research projects dealing with Cultural Heritage activities. This was also the case in the actual H2020 work programme with activities in areas like 3D, Virtual Museum, access to content. The presentation will summarise our past activities but more importantly will focus on our future activities.

### **Biographical Sketch**

Albert Gauthier works at the European Commission in Luxembourg, at Directorate General Connect. The 'Data Applications and Creativity' unit covers a range of activities from funding leading-edge ICT research to innovation and policy support. Research under the ICT programme will explore the potential of information and communication technologies to enhance creative processes in general and in cultural and educational contexts in particular; it will also enhance user experiences with digital cultural resources, including keeping those resources useable at long-term (digital preservation); innovation activities aim at stimulating the uptake of research results in the creative industry; policy support activities - follow-up of the Commission's recommendations on digitisation and digital preservation.

## Keynote

### 3D Imaging and Cultural Heritage - Where do we Stand?

*Fabio Remondino*

Bruno Kessler Foundation

#### Abstract

The recent technological developments in 3D surveying and modeling are offering many opportunities also in the heritage field, which is more and more in need of innovative and reliable documentation and conservation solutions. Such solutions should fit for various purposes, from a simple visualization to a very accurate and detailed 3D digital replica. Bottlenecks and open research issues are still present but 3D imaging and graphics solutions are for sure wide-spreading the potential of 3D technologies for heritage documentation, preservation, valorization and communication. The talk will review the latest sensors and software developments for heritage 3D modeling, including visualization and web-based data sharing. Examples from outstanding projects will be shown too.

#### Biographical Sketch

Fabio Remondino received his PhD in Photogrammetry in 2006 from ETH Zurich, Switzerland and now leads the 3D Optical Metrology Unit (<http://3dom.fbk.eu>) of the Bruno Kessler Foundation (<http://www.fbk.eu>), a public research center in Trento, Italy. His research interests include heritage documentation, 3D modeling, sensor and data integration, geospatial data collection and processing. He is the author of over 150 scientific publications in journals and presented at international conferences, he has written five books and edited eight Special Issues in journals. He has received 10 awards for best papers at conferences and organized 26 scientific events and 29 summer schools and tutorials. He is currently acting as President of ISPRS Technical Commission II "Photogrammetry", President of EuroSDR Commission I "Data Acquisition", and Vice-President of CIPA Heritage Documentation.