

**Lucio Tommaso De Paolis
Antonio Mongelli (Eds.)**

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Augmented and Virtual Reality

**Second International Conference, AVR 2015
Lecce, Italy, August 31 – September 3, 2015
Proceedings**



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Preface

This book contains the contributions to the Second International Conference on Augmented and Virtual Reality (SALENTO AVR 2015) that has held in Lecce (Italy) from August 31 to September 3, 2015. We cordially invite you to visit the SALENTO AVR website <http://www.salentoavr.it> where you can find all relevant information about this event.

The aim of SALENTO AVR 2015 was to bring a community of researchers from academia and industry, computer scientists, engineers, and physicians together in order to share points of views, knowledge, experiences, and scientific and technical results related to state-of-the-art solutions and technologies on virtual and augmented reality applications for medicine, cultural heritage, education, industrial sectors, as well as the demonstration of advanced products and technologies.

This edition of SALENTO AVR ranged over topics from virtual/augmented/mixed reality to 3D user interfaces and the technologies needed to develop applications in many areas such as medicine, entertainment, arts and cultural heritage, the military field, industry, and maintenance. These topics were addressed in paper sessions, demos, and poster sessions.

In this edition of SALENTO AVR, we were honored to have the following invited speakers:

- Monica Bordegoni, full Professor at the Department of Mechanical Engineering, School of Design of the Politecnico di Milano, Italy
- Patrick Bourdot, Research Director at the CNRS/LIMSI, Paris-Sud University, France
- Stéphane Cotin, Research Director at the Inria, France
- Fabrizio Funtò, Hyperreality Partner, Los Angeles, CA, USA
- Luigi Gallo, Research Scientist at the National Research Council of Italy (CNR), Institute for High-Performance Computing and Networking (ICAR), Italy
- Sofia Pescarin, Researcher at the Institute of Technologies applied to Cultural Heritage, National Research Council (CNR ITABC), Italy

We are very grateful to the Program Committee and local Organizing Committee members for their support and for the time spent to review and discuss the submitted papers and doing so in a timely and professional manner.

We would like to sincerely thank the keynote and tutorial speakers who willingly accepted our invitation and shared their expertise through illuminating talks, helping us to fully meet the conference objectives.

We extend our thanks to the University of Salento for the enthusiastic acceptance to host the conference and the sponsors for providing support in the organization of the event.

Last but not least, we would like to thank all authors for submitting their papers and presenting their works at the conference and all the conference attendees for making

SALENTO AVR an excellent forum on virtual and augmented reality, facilitating the exchange of ideas, fostering new collaborations, and shaping the future of this exciting research field.

For greater readability of the volume, the presented paper are classified into seven main parts that include contributions on:

- Applications in Cultural Heritage
- Augmented and Mixed Reality
- Applications in Medicine
- Applications in Industry
- Interfaces
- Short Papers

We hope the readers will find in these pages interesting material and fruitful ideas for their future work.

September 2015

Lucio Tommaso De Paolis
Antonio Mongelli

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Tutorials

Research, Prototyping, and Product Development of Medical Simulation Applications Using the SOFA Framework

Stéphane Cotin

Inria, France

Stephane Cotin joined Inria in 2007 as Research Director. Since January 2010, he has lead the SHACRA group, a multidisciplinary team of scientists involved in the field on medical simulation. Stephane also manages the development of a large-scale initiative on medical simulation.

Stephane is a senior research scientist with experience in biomechanical modeling, real-time simulation, and physics-based modeling. He is specialized in medical applications, from training to planning of complex medical procedures, and manages several projects and teams.

Stephane is currently responsible for the development of a national initiative on medical simulation using the SOFA framework as a common platform for research, integration, and validation of new algorithms.

From 1999 to 2007, Stephane was the research lead for the Sim Group at CIMIT in Boston where he was responsible for defining research directions and technical infrastructures for several simulation projects, including a chest trauma training system, a computer-enhanced laparoscopic training system, and an interventional radiology training system.

Cultural Heritage Innovation Design: What Caught My Eye

Fabrizio Funtò

Hyperreality Partner, Los Angeles, CA, USA

Fabrizio Funtò received the Italian “Laurea” in Philosophy of Language in 1984. After some collaborations with Enidata as teacher of Network Technologies and C Language programming, he joined Infobyte Spa as Programmers Team Leader, and after a couple of year as Managing Director. During his appointment, Infobyte has produced 30+ interactive CD-ROM titles and probably the most famous virtual reality attractions ever published in that pioneer age.

Fabrizio won the Perseo d’Oro (Mediartech, Florence, 1996) in the category of Best Interactive CD (“Galleria Giulia”) and, together with Silicon Graphic, the TiLE Award 1997 with “In Searching for the Holy Grail” – first ever multiplayer real-time virtual reality game. He then created the first virtual set for the Italian State Broadcast company (RAI) for two programs, Mixer and SuperQuark.

In 1998 he teamed up with ACS Studio, continuing to produce worldwide level virtual reality titles like The Nero’s Domus Aurea, The Mistery City, The Rollercoaster for “The Tech Museum” in San Jose (CA), and some experiences for ESA (EU Space Agency).

In the 2000 he founded a new company, Softdesign, in partnership with Harold Production, and followed two different production directions: real-time attractions for videogames and virtual reality immersive experiences and 3D off-line animations and visual effects.

He was also involved in the launch of the Virtuality Conference (2000–2004, now View Conference) as Artistic Director, and he was asked by the most famous Italian encyclopedia, the “*Treccani*” to edit the entries for visual effects.

After some productions for the Rome Film Fest and participation in an international project for distributing digital movies through satellites (ISIDE for the European Space Agency) as Digital Pictures, he became R&D consultant for Advanced Projects in Activision Blizzard, the USA giant videogames corporate of Vivendi/Universal Group.

He is now involved in the design of large cultural heritage attractions.

Keynote Speakers

Virtual Museums Interacting and Augmenting Cultural Heritage: a European Perspective

Sofia Pescarin

CNR ITABC, Italy

Sofia Pescarin, Archaeologist, Degree in Topography of Ancient Italy, PhD in History and Computing, Master in “Technology of Museums,” is a specialist in 3D survey, GIS, landscape reconstruction, virtual museums, as well as Open Source applied to cultural heritage and virtual archaeology.

She works as a researcher at the Institute of Technologies Applied to Cultural Heritage of the National Council of Researches in Rome (CNR ITABC), in the Virtual Heritage Lab. Here she coordinates a research project dedicated to “Virtual Heritage” and was the project coordinator of V-MUST.NET, FP7 ICT Network of Excellence, focused on virtual museums (2011–2015).

She is the chair of the Italian School of Virtual Archaeology (www.archeologiavirtuale.it) and the scientific director of Archeovirtual (www.archeovirtuale.it). She was the co-chair of the Digital Heritage 2013 international congress (Marseille, October 28 to November 1, 2013) and of the international school “drones in archaeology and cultural heritage” (Certosa di Pontignano, September 17–27, 2013).

Within V-MUST, she has recently coordinated the exhibition “Keys to Rome” in four museums and co-directed the Italian chapter of the exhibition: “Le chiavi di Roma. La città di Augusto” (Museo dei Fori Imperiali, September 23, 2014, to May 10, 2015).

How Touch and Smell Enhance the Realism of Our Virtual Experiences

Monica Bordegoni

Politecnico di Milano, Italy

Virtual reality experiences are based on an integration of immersion, interaction, and imagination. Users experience the virtual world through their senses, which in most applications are vision and hearing. Technological developments are proposing new devices that can also simulate signals eliciting the sense of touch and smell, which can be integrated with vision and sounds. Specifically, haptics and olfactory displays can be integrated with head-mounted displays and headsets to allow users to live more engaging multisensory experiences, where immersion, interaction, and imagination reach higher levels and are more engaging.

Monica Bordegoni is Full Professor at the Department of Mechanical Engineering, School of Design, at Politecnico di Milano. She teaches Virtual Prototyping at the School of Design and at the School of Industrial Engineering, and is coordinator of the Virtual Prototyping Lab.

Her research interest includes interactive virtual prototyping, virtual/augmented technology for industrial applications, haptic technology and haptic interaction, product experience, and emotional engineering. She is a member of the executive committee board of ASME Society – Computers and Information in Engineering, and co-chair of the Design Society SIG on Emotional Engineering.

Touchless Interaction in Surgery: The Medical Imaging Toolkit Experience

Luigi Gallo

Institute for High Performance Computing and Networking (ICAR-CNR), Italy

During the last few years, we have been witnessing a widespread interest on touchless technologies in the context of surgical procedures. The main reason is that surgeons often need to visualize medical images in operating rooms, but checking a computer through keyboard or mouse would result in bacterial contamination. Touchless interfaces that exploit sensor technologies and machine learning techniques for tracking and analyzing body movements are advantageous in that they can preserve a sterile environment around the patient. In fact, they allow surgeons to visualize medical images without having to physically touch any control or to rely on a proxy, who may not share the same level of professional vision. This talk aims to explore the main issues involved with the design of touchless user interfaces for intraoperative image control. It will overview state-of-the-art solutions, open challenges, and research agendas in this area. Moreover, the talk will present the results of the Medical Imaging Toolkit (MITO) project, which is focused on the design and implementation of a Kinect-based touchless user interface for pre- and intraoperative visualization of DICOM images.

Luigi Gallo received an MEng in Computer Engineering from the University of Naples “Federico II” in July 2006 and a PhD degree in Information Technology Engineering at the University of Naples “Parthenope” in April 2010. He is a research scientist at the National Research Council of Italy (CNR) – Institute for High-Performance Computing and Networking (ICAR), and a lecturer of informatics at the University of Naples “Federico II”.

Since January 2011, he has been a member of the iHealthLab – Intelligent Healthcare Laboratory. Since June 2007, he has been a member of the Advanced Medical Imaging and Computing Laboratory (AMICO), developed from a cooperation agreement between the IBB and ICAR institutes of the National Research Council of Italy.

His fields of interest include natural user interfaces and human interface aspects of virtual/augmented reality, specifically considering medical application scenarios.

Collaborative Interactions Within Immersive Environments: Advantages, Drawbacks and Current Research Issues on Multi-Stereoscopic CAVE-Like Setups

Patrick Bourdot

CNRS/LIMSI, Paris-Sud University, France

Collaborative immersive interactions are possible through many technological systems. CAVE-like systems, even if they generally do not provide stereoscopy for several users, are a powerful type of virtual environment with which to address collaborative tasks, because collaborators are not virtualized and thus collective interactions are more natural. Conversely, interconnected HMDs or interconnected one-user CAVEs can provide an exact 3D perception for each user, at the expense of physical coexistence and rich social interactions. In the last ten years, multi-stereoscopic technology has achieved significant progress, enabling a new generation of CAVE-like systems where collaborators may share the same physical space while each having exact 3D perception on the virtual world. Thus it is now possible to preserve a natural dialogue with other collaborators inside a CAVE, while providing at the same time a better immersive experience for each of them. However, some perceptive and cognitive issues remain regarding such collaborative immersive systems. This talk will demonstrate when they occur, and will present some research in progress to analyze and overcome these issues.

Patrick Bourdot is Research Director at CNRS and head of VENISE team (<http://www.limsi.fr/venise>), the virtual & augmented reality (V&AR) research group he has created in 2001 at CNRS/LIMSI Lab.

Patrick graduated as an architect in 1986, he received his PhD in Computer Sciences at the University of Aix-Marseille in 1992, and joined the CNRS/LIMSI lab in 1993. His main research focus includes multi-sensorimotor, multimodal, and collaborative V&AR interactions, and the related issues for users' perception and cognition.

He coordinated the scientific partnership of his lab and led a number of research projects that have been or are currently funded by the French government or by national and regional research institutes. He was the founding secretary of AFRV, the French association of V&AR.

At the international level, one of his actions has been to manage the CNRS Labs involved in INTUITION, the NoE of the 6th IST framework focused on V&AR, where he was member of the Core Group. He is founding member of EuroVR (www.eurovr-association.org), and was re-elected last year to its executive board.

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