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Extended Reality

First International Conference, XR Salento 2022
Lecce, Italy, July 6–8, 2022
Proceedings, Part II

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Preface

In recent years, there has been a huge research interest in virtual reality (VR), augmented reality (AR), and mixed reality (MR) technologies that now play a very important role in various fields of application such as medicine, industry, cultural heritage, and education. The boundary between the virtual and real worlds continues to blur, and the constant and rapid spread of applications of these technologies makes it possible to create shortcuts that facilitate the interaction between humans and their environment and to encourage and facilitate the process of recognition and learning.

Virtual reality technology enables the creation of realistic looking worlds and enables users to completely isolate themselves from the reality around them, entering a new digitally created world. User inputs are used to modify the digital environment in real time and this interactivity contributes to the feeling of being part of the virtual world.

Augmented reality and mixed reality technologies, on the other hand, allow the real-time fusion of digital content into the real world to enhance perception by visualizing information that users cannot directly detect with their senses. AR and MR complement reality rather than replacing it completely and the user has the impression that virtual and real objects coexist in the same space.

Extended reality (XR) is an umbrella term encapsulating virtual reality, augmented reality, and mixed reality technologies.

Thanks to the increase in features that allow us to extend our real world and combine it with virtual elements, extended reality is progressively expanding the boundaries of how we live, work, and relate.

The potential of XR technology is amazing and can transform consumers' everyday experiences and generate benefits in many market sectors, from industrial manufacturing to healthcare, education, and retail.

This book contains the contributions to the 1st International Conference on eXtended Reality (XR SALENTO 2022) held during July 6–8, 2022, in Lecce (Italy) and organized by the Augmented and Virtual Reality Laboratory (AVR Lab) at the University of Salento (Italy). To accommodate many situations, XR SALENTO 2022 was scheduled as a hybrid conference, giving participants the opportunity to attend in person or remotely.

The goal of XR SALENTO 2022 was to create a friendly environment leading to the creation or strengthening of scientific collaborations and exchanges between participants and, therefore, to solicit the submission of high-quality original research papers on any aspect and application of virtual reality, augmented reality, or mixed reality.

We received 84 submissions, out of which 58 papers were accepted for publication, 16 of which are short papers. Each submission was reviewed by at least two reviewers. We used the OCS-Unisalento Conferences system for managing the submission and review process. The Scientific Program Committee, with the help of external reviewers, carefully evaluated the contributions considering originality, significance, technical soundness, and clarity of exposition.

We are very grateful to the members of the Scientific Program Committee for their support and time spent in reviewing and discussing the submitted papers and doing so in a timely and professional manner.

We would like to sincerely thank the keynote speakers who gladly accepted our invitation and shared their expertise through enlightening speeches, helping us to fully meet the conference objectives. We were honored to have the following invited speakers:

- Vincenzo Ferrari – University of di Pisa, Italy
- Nicola Masini – CNR, Institute of Cultural Heritage Sciences, Italy
- Christian Sandor – Paris-Saclay University, France

We cordially invite you to visit the XR SALENTO 2022 website (www.xrsalento.it) where you can find all relevant information about this event.

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

July 2022

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Keynote Abstracts

Extend Human Performances with Augmented Reality

Vincenzo Ferrari

Università di Pisa, Italy

AR allows the integration of spatial relation between visible and invisible information under a natural naked eye view. Furthermore, the augmented information could guide the user's hand during precision tasks improving human efficiency and accuracy. This improvement could bring human performance closer to that of the robot with a higher level of flexibility and humanization of the task. For tasks unfeasible with the sole hands, AR becomes particularly useful in robotics applications where the humans are engaged for remote controlling or cooperative working. In current AR displays, the augmentation lacks geometrical coherence along the three dimensions between real and virtual information that determine perceptual issues as wrong spatial, focus, and depth cues for both eyes. These issues will be detailed during the talk and possible solutions will be explained.

Past and Coming 20 Years with Augmented Reality

Christian Sandor

Paris-Saclay University, France

Augmented Reality embeds spatially-registered computer graphics into a user's view of the real world. During the last 20 years, AR has progressed enormously from a niche technology to a widely investigated one. This keynote consists of two parts. First, I speak about how major challenges for AR have been solved over the last 20 years. Second, I speculate about what the next 20 years are going to bring. The goal is to present a Birdseye view of the AR domain, including the balance of power between the major AR forces US and China. In my view, Europe has a very big, possibly almost impossible, challenge ahead to catch up. I hope that my talk will contribute to laying the seeds of a major European AR initiative.

Remote and Close Range Sensing, Imaging and eXtended Reality for the Interpretation and Conservation of Cultural Heritage

Nicola Masini

CNR, Institute of Cultural Heritage Sciences, Italy

Cultural heritage is not only the legacy of tangible and intangible heritage assets of a community inherited from past generations, to be maintained and transmitted to future generations, but it is also a domain of study and research where multidisciplinary skills compare, combine and contaminate each other, stimulating the development of new technologies and methods of analysis and study that can be re-applied in other domains. The reason is due to the heterogeneity of data to be analysed (from historical sources to imaging), phenomena to be observed (from chemical degradation to structural risks), objectives (from safeguarding to conservation). Effective tools to enrich knowledge of Cultural properties are remote and close range sensing, for diagnostic purposes, which provide a number of data on biophysical parameters without any contact with the object/artefact/site to be investigated. However, the heterogeneity of the data and the difficulty of transforming them into useful information for knowledge and conservation of CH, makes it necessary to use tools aimed at facilitating their interpretation. To this end, a useful tool for this purpose is the creation of combined real and virtual environments, i.e. extended reality capable to cover the entire spectrum from “completely real” to “completely virtual” in the concept of reality-virtuality continuum. This approach allows to interrelate data and results of the different diagnostic imaging techniques (from thermal infrared to high frequency georadar) with the spatial and architectural contexts of reference, in its constructive components and materials, facilitating their interpretation to improve the knowledge and to support decisions for restoration.

Contents – Part II

eXtended Reality for Learning and Training

Mixed Reality Agents for Automated Mentoring Processes	3
<i>Benedikt Hensen, Danylo Bekhter, Dascha Blehm, Sebastian Meinberger, and Ralf Klamma</i>	
Asynchronous Manual Work in Mixed Reality Remote Collaboration	17
<i>Anjela Mayer, Théo Combe, Jean-Rémy Chardonnet, and Jivka Ovtcharova</i>	
A Virtual Reality Serious Game for Children with Dyslexia: DixGame	34
<i>Henar Guillen-Sanz, Bruno Rodríguez-Garcia, Kim Martinez, and María Consuelo Saiz Manzanares</i>	
Processing Physiological Sensor Data in Near Real-Time as Social Signals for Their Use on Social Virtual Reality Platforms	44
<i>Fabio Genz, Clemens Hufeld, and Dieter Kranzlmüller</i>	
Developing a Tutorial for Improving Usability and User Skills in an Immersive Virtual Reality Experience	63
<i>Ines Miguel-Alonso, Bruno Rodriguez-Garcia, David Checa, and Lucio Tommaso De Paolis</i>	
Challenges in Virtual Reality Training for CRBN Events	79
<i>Georg Regal, Helmut Schrom-Feiertag, Massimo Migliorini, Massimiliano Guarneri, Daniele Di Giovanni, Andrea D’Angelo, and Markus Murtinger</i>	
A Preliminary Study on the Teaching Mode of Interactive VR Painting Ability Cultivation	89
<i>YanXiang Zhang and Yang Chen</i>	

eXtended Reality in Education

Factors in the Cognitive-Emotional Impact of Educational Environmental Narrative Videogames	101
<i>Sofia Pescarin and Delfina S. M. Pandiani</i>	
Instinct-Based Decision-Making in Interactive Narratives	109
<i>Tobías Palma Stade</i>	

The Application of Immersive Virtual Reality for Children’s Road
Education: Validation of a Pedestrian Crossing Scenario 128
*Giulia De Cet, Andrea Baldassa, Mariaelena Tagliabue,
Riccardo Rossi, Chiara Vianello, and Massimiliano Gastaldi*

Collaborative VR Scene Broadcasting for Geometry Education 141
YanXiang Zhang and JiaYu Wang

Collaborative Mixed Reality Annotations System for Science and History
Education Based on UWB Positioning and Low-Cost AR Glasses 150
YanXiang Zhang and LiTing Tang

Artificial Intelligence and Machine Learning for eXtended Reality

Can AI Replace Conventional Markerless Tracking? A Comparative
Performance Study for Mobile Augmented Reality Based on Artificial
Intelligence 161
*Roberto Pierdicca, Flavio Tonetto, Marco Mameli, Riccardo Rosati,
and Primo Zingaretti*

Find, Fuse, Fight: Genetic Algorithms to Provide Engaging Content
for Multiplayer Augmented Reality Games 178
*Federico Aliprandi, Renato Avellar Nobre, Laura Anna Ripamonti,
Davide Gadia, and Dario Maggiorini*

Synthetic Data Generation for Surface Defect Detection 198
*Déborah Lebert, Jérémy Plouzeau, Jean-Philippe Farrugia,
Florence Danglade, and Frédéric Merienne*

eXtended Reality in Geo-information Sciences

ARtefact: A Conceptual Framework for the Integrated Information
Management of Archaeological Excavations 211
*Damianos Gavalas, Vlasios Kasapakis, Evangelia Kavakli,
Panayiotis Koutsabasis, Despina Catapoti, and Spyros Vosinakis*

Geomatics Meets XR: A Brief Overview of the Synergy Between
Geospatial Data and Augmented Visualization 224
*Roberto Pierdicca, Maurizio Mulliri, Matteo Lucesoli, Fabio Piccinini,
and Eva Savina Malinverni*

Utilization of Geographic Data for the Creation of Occlusion Models
in the Context of Mixed Reality Applications 236
Christoph Praschl, Erik Thiele, and Oliver Krauss

Development of an Open-Source 3D WebGIS Framework to Promote Cultural Heritage Dissemination	254
<i>Alessandra Capolupo, Cristina Monterisi, and Eufemia Tarantino</i>	

Industrial eXtended Reality

A Framework for Developing XR Applications Including Multiple Sensorial Media	271
<i>M. Bordegoni, M. Carulli, and E. Spadoni</i>	
Augmented Reality Remote Maintenance in Industry: A Systematic Literature Review	287
<i>David Breitkreuz, Maike Müller, Dirk Stegelmeyer, and Rakesh Mishra</i>	
Virtual Teleoperation Setup for a Bimanual Bartending Robot	306
<i>Sara Buonocore, Stanislaw Grazioso, and Giuseppe Di Gironimo</i>	

eXtended Reality in the Digital Transformation of Museums

Virtualization and Vice Versa: A New Procedural Model of the Reverse Virtualization for the User Behavior Tracking in the Virtual Museums	329
<i>Iva Vasic, Aleksandra Pauls, Adriano Mancini, Ramona Quattrini, Roberto Pierdicca, Renato Angeloni, Eva S. Malinverni, Emanuele Frontoni, Paolo Clini, and Bata Vasic</i>	
“You Can Tell a Man by the Emotion He Feels”: How Emotions Influence Visual Inspection of Abstract Art in Immersive Virtual Reality	341
<i>Marta Pizzolante and Alice Chirico</i>	
Augmented Reality and 3D Printing for Archaeological Heritage: Evaluation of Visitor Experience	360
<i>Valeria Garro and Veronica Sundstedt</i>	
Building Blocks for Multi-dimensional WebXR Inspection Tools Targeting Cultural Heritage	373
<i>Bruno Fanini, Emanuel Demetrescu, Alberto Bucciario, Alessandra Chirivi, Francesco Giuri, Ivan Ferrari, and Nicola Delbarba</i>	
Comparing the Impact of Low-Cost 360° Cultural Heritage Videos Displayed in 2D Screens Versus Virtual Reality Headsets	391
<i>Bruno Rodriguez-Garcia, Mario Alaguero, Henar Guillen-Sanz, and Ines Miguel-Alonso</i>	

eXtended Reality Beyond the Five Senses

Non-immersive Versus Immersive Extended Reality for Motor Imagery Neurofeedback Within a Brain-Computer Interfaces	407
<i>Pasquale Arpaia, Damien Coyle, Francesco Donnarumma, Antonio Esposito, Angela Natalizio, and Marco Parvis</i>	
Virtual Reality Enhances EEG-Based Neurofeedback for Emotional Self-regulation	420
<i>Pasquale Arpaia, Damien Coyle, Giovanni D’Errico, Egidio De Benedetto, Lucio Tommaso De Paolis, Naomi du Bois, Sabrina Grassini, Giovanna Mastrati, Nicola Moccaldi, and Ersilia Vallefuooco</i>	
Psychological and Educational Interventions Among Cancer Patients: A Systematic Review to Analyze the Role of Immersive Virtual Reality for Improving Patients’ Well-Being	432
<i>Maria Sansoni, Clelia Malighetti, and Giuseppe Riva</i>	
Author Index	455

Contents – Part I

Virtual Reality

Rehabilitation of Post-COVID Patients: A Virtual Reality Home-Based Intervention Including Cardio-Respiratory Fitness Training	3
<i>Vera Colombo, Marta Mondellini, Giovanni Tauro, Giovanna Palumbo, Mauro Rossini, Emilia Biffi, Roberta Nossa, Alessia Fumagalli, Emilia Ambrosini, Alessandra Pedrocchi, Franco Molteni, Daniele Colombo, Gianluigi Reni, Marco Sacco, and Sara Arlati</i>	
Comparison of the Effect of Exposing Users for Height While Being Active Versus Passive in a Virtual Environment - A Pilot Study	18
<i>Günter Alce, Felicia Hanserup, and Kornelia Palm</i>	
A Proposal for a Computational Framework Architecture and Design for Massive Virtual World Generation and Simulation	37
<i>Zintis Erics and Arnis Cirulis</i>	
Evaluating Forms of User Interaction with a Virtual Exhibition of Household Appliances	48
<i>Mikołaj Maik, Paweł Sobociński, Krzysztof Walczak, and Tomasz Jenek</i>	
TryItOn: A Virtual Dressing Room with Motion Tracking and Physically Based Garment Simulation	63
<i>Gilda Manfredi, Nicola Capece, Ugo Erra, Gabriele Gilio, Vincenzo Baldi, and Simone Gerardo Di Domenico</i>	
Automatic Generation of 3D Animations from Text and Images	77
<i>Alberto Cannavò, Valentina Gatteschi, Luca Macis, and Fabrizio Lamberti</i>	
Design Process of a Ceramic Modeling Application for Virtual Reality Art Therapy	92
<i>Carola Gatto, Kim Martinez, and Lucio Tommaso De Paolis</i>	
Computer Simulation of a Spectrum Analyzer Based on the Unity Game Engine	104
<i>Ye. A. Daineko, A. Z. Aitmagambetov, D. D. Tsoy, A. E. Kulakayeva, and M. T. Ipalakova</i>	

The Influence of Method of Control and Visual Aspects on Exploratory Decisions in 3D Video Games Environments	113
<i>Aneta Wiśniewska, Jędrzej Kotecki, Adam Wojciechowski, and Rafał Szrajber</i>	
Collaborative Virtual Reality Environment for Training Load Movement with Overhead Bridge Cranes	121
<i>David Checa, Ines Miguel-Alonso, Henar Guillen-Sanz, and Andres Bustillo</i>	
A VR Multiplayer Application for Fire Fighting Training Simulations	130
<i>Irene Capasso, Chiara Bassano, Fabrizio Bracco, Fabio Solari, Eros Viola, and Manuela Chessa</i>	
Effects of Head Rotation and Depth Enhancement in Virtual Reality User-Scene Interaction	139
<i>S. Livatino, A. Zocco, Y. Iqbal, P. Gainley, G. Morana, and G. M. Farinella</i>	
Are We Ready for Take-Off ? Learning Cockpit Actions with VR Headsets	147
<i>S. Livatino, M. Mohamed, G. Morana, P. Gainley, Y. Iqbal, T. H. Nguyen, K. Williams, and A. Zocco</i>	
Virtual Reality as a Collaborative Tool for Digitalised Crime Scene Examination	154
<i>Vincenzo Rinaldi, Lucina Hackman, and Niamh NicDaeid</i>	
A Virtual Reality Application for Stress Reduction: Design and First Implementation of ERMES Project	162
<i>Carola Gatto, Giovanni D’Errico, Fabiana Nuccetelli, Benito Luigi Nuzzo, Maria Cristina Barba, Giovanna Ilenia Paladini, and Lucio Tommaso De Paolis</i>	
Efficient and Secure Transmission of Digital Data in the 5G Era	174
<i>Bruno Carpentieri and Francesco Palmieri</i>	
Augmented Reality	
Hand Interaction Toolset for Augmented Reality Environments	185
<i>Ilias Logothetis, Konstantinos Karampidis, Nikolas Vidakis, and Giorgos Papadourakis</i>	
Assessing Visual Cues for Improving Awareness in Collaborative Augmented Reality	200
<i>Francesco Strada, Edoardo Battezzorre, Enrico Ameglio, Simone Turello, and Andrea Bottino</i>	

Human Augmentation: An Enactive Perspective	219
<i>Agnese Augello, Giuseppe Caggianese, and Luigi Gallo</i>	
XRShip: Augmented Reality for Ship Familiarizations	229
<i>Yogi Udjaja, Muhamad Fajar, Karen Etania Saputra, and Samsul Arifin</i>	
Coupling Mobile AR with a Virtual Agent for End-User Engagement	239
<i>Tina Katika, Ioannis Karaseitanidis, and Angelos Amditis</i>	
3D Audio + Augmented Reality + AI Chatbots + IoT: An Immersive Conversational Cultural Guide	249
<i>Michalis Tsepapadakis, Damianos Gavalas, and Panayiotis Koutsabasis</i>	
 eXtended Reality	
Regulating the Metaverse, a Blueprint for the Future	263
<i>Louis B. Rosenberg</i>	
Do Presence Questionnaires Actually Measure Presence? A Content Analysis of Presence Measurement Scales	273
<i>Olivier Nannipieri</i>	
Self Assessment Tool to Bridge the Gap Between XR Technology, SMEs, and HEIs	296
<i>Ahmet Köse, Aleksei Tepljakov, Saleh Alsaleh, and Eduard Petlenkov</i>	
An Overview on Technologies for the Distribution and Participation in Live Events	312
<i>Vito Del Vecchio, Mariangela Lazoi, and Marianna Lezzi</i>	
How to Improve Vehicle Lateral Control: The Effect of Visual Feedback Luminance	324
<i>Riccardo Rossi, Giulia De Cet, and Federico Orsini</i>	
Extended Reality Technologies and Social Inclusion: The Role of Virtual Reality in Includiamoci Project	335
<i>Carola Gatto, Silvia Liaci, Laura Corchia, Sofia Chiarello, Federica Faggiano, Giada Sumerano, and Lucio Tommaso De Paolis</i>	
Author Index	347