

Alessandro Luigini *Editor*

Proceedings of the
1st International
and Interdisciplinary
Conference on Digital
Environments for
Education, Arts and
Heritage

EARTH 2018

Advances in Intelligent Systems and Computing

Volume 919

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EARTH 2018

 Springer

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Preface

The book presents the proceedings of the homonymous conference organized at the Free University of Bozen-Bolzano on 5 and 6 July 2018. A few months before, in October 2017 a conference entitled *Ambienti digitali per l'educazione all'arte e al patrimonio*¹, organized at the Faculty of Education of Bressanone of the Free University of Bozen-Bolzano, anticipated what is documented here, laying the foundations for a long-term scientific and cultural project that is symmetrical to the interdisciplinary research *VAR.HEE. Virtual and Augmented Reality for Heritage Education in school and museum Experience* which will end in 2021. The main aim of the project as a whole is the strengthening and structuring of interdisciplinary links between scholars interested in heritage education.

In fact, on the one hand the scholars of graphic representation, which have always been largely involved in the documentation, survey and enhancement of heritage, and on the other hand the scholars of the art education and museum didactics seem to forge two sides of the same coin: the safeguarding of the value of the arts and of the heritage for the formation of individuals and, therefore, of a society able to develop itself starting from the memory of its own expressive capacity in the history.

In particular, it is a technology that seems to be the “mirror” in which scholars of representation and pedagogists reflect, look at each other and look alike: digital technology applied to the arts and heritage. In fact, the environments described in the volume are digital, and the experiences that a prevalent part of Western society makes every day become digital. We draw information, we build relationships, we buy services or products, and we spend our free time and leave a trace of our existence in digital environments, whether they are contained in a mobile device or in the physical space in which we find ourselves. In this context, where the individual is formed, acts and relates to the world, a primacy of representation emerges, which from digital technologies has received a significant increase in possible declinations. We speak through the representation of our voice and our interlocutor

¹Conference proceedings are available in open access here: http://ojs.francoangeli.it/_omp/index.php/oa/catalog/book/334.

on the phone, we watch entertainment contents via digital devices, we interact via social networks, we buy in online stores, and this list could be expanded to include a significant range, quantity and quality, of more or less daily activities.

The support for the interdisciplinary exchange has been favored not only by the meeting of scholars of representation and pedagogy of art, but also by the contribution, fundamental for us, of two other areas of research that greatly affect the good result of the practices that here propose: cognitive psychology, which shows us how our mind and our brain react and elaborate the experiences with art and heritage in digital environments, and the economy of culture, which shows us how the museum models have presented new paradigms able to fostering the flourishing of good practices in the art world.

Categorizing the contributions in this book is not simple due to the marked interdisciplinarity that most of the contributions pursue. However, as a result of the submission phase, we have been able to identify some sub-themes that would allow for the creation of environments for the discussion as homogeneous as possible. The ten sessions were: visual heritage, digital heritage 1 and 2, augmented reality, immersive, education, archaeology, territory and maps, museum ideas and museum life. All the contributions were selected through a double-blind peer review.

The International Scientific Committee followed and evaluated all parallel sessions, and awarded three prizes as Best Paper Award: one for senior section and two for junior section. The senior section consists of scholars from Italian and foreign universities or research centres. The junior section consists of grant researcher, Ph. D., Ph.D. students, and freelance researcher. Each member of the International Scientific Committee expressed a preference for each section.

For the senior section:

Fabrizio Gay, Irene Cazzaro, Università Iuav di Venezia

Venetian perspective boxes: when the images become environments. Low-tech, high-knowledge media for teaching the historical heritage of the interior/exterior environments.

For the junior section:

Silvia Calegari, Matteo Dominoni, Università di Milano-Bicocca

The Pollicina Project. A collaborative and educational social suite to build cultural itineraries.

Ramona Feriozzi e Alessandro Olivieri, Università di Camerino

Video game for learning the projective geometry. Analysis of virtual spaces through discipline of representation.

About 100 submissions, over 80 speeches, 10 keynote speakers in 2 plenary sessions, 34 members of the scientific committee, over 50 reviewers are the numbers that tell the conference. Thanks to all those who have allowed the proper development from preparation to the holding of the conference.

Alessandro Luigini
Demis Basso
Stefano Brusaporci
Massimiliano Lo Turco
Matteo Moretti
Chiara Panciroli
Monica Parricchi
Daniele Rossi
Federica Viganò
Franca Zuccoli

The original version of the book frontmatter was revised: Editor provided corrections has been incorporated. The correction to the book frontmatter is available at https://doi.org/10.1007/978-3-030-12240-9_77

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Foreword: Future Perspectives on Transdisciplinary Issues

I've come with a great pleasure at this conference which, as Alessandro Luigini remembered, the UID—(Italian Union for Drawing)—sponsored. As furthermore, the UID sponsored last year at the previous conference, *IMMAGINI?* held in Brixen in November.

We did this with conviction because of the interesting topic; it is one of that border issues that I like a lot, and a scientific society, like ours, has to deal with.

Like you can remember, last year the UID yearly conference was focused on the topic “Territories and frontiers of the Representation”. It was a chance to strongly reflect, because if scientific communities have to move on the borders (admitting that borders could be traced relating to scientific knowledge), making constant efforts in moving them upwards, overcoming them and going over to produce something new.

A work like this is not easy in big structures, without a great inertia to the change. And we are an enough big community, with more than 200 structured in the scientific disciplinary sector ICAR/17² and with at least more than the half of other not structured scholars. Also, big associations have the same difficulties, due to several reasons about academic policy that you know or can imagine, on which I will not deal with, but that we have to keep in mind. Likewise, bigger more consolidated and ancient universities have the same. The new, younger, smaller realities have less inertness to change because they do not have consolidated pre-existences, which often take the form of difficult-to-move boulders or mountains that can not be climbed: in spite of the declared choices to pursue innovation, which they want to do and are often able to do, having tools and skills that offer great chances of success. Instead, the chance to engage with the new is almost intrinsic in

²The scientific disciplinary contents of the Scientific Disciplinary Sector ICAR/17 concern the representation of architecture and the environment, in its broad sense of cognitive means of the laws that govern the formal structure, of a tool for the analysis of existing values, of expressive act and of visual communication of the design idea with different scalar dimensions. D.M. 4 ottobre 2000 – Settori scientifico-disciplinari Pubblicato su G.U. n. 249 del 24 ottobre 2000 – supplemento ordinario 175.

small groups and in those ones less historicized, which can operate as avant-garde because in them it is easier to find—and to give feasibility to—reckless people who, with few constraints, push themselves in exploration to see beyond the consolidated borders.

For conviction and personal experience, I believe in a lot on these dynamics, in great possibilities which offer less crystallized situations.

When from the historic Faculty of Engineering of Naples, the oldest in Italy and at the time still the only one in the city, I arrived at the University of Salerno, it was an obligatory passage waiting to be called to Naples, because Naples was able to announce competitions for professors in the ICAR sector¹⁷.

The Faculty of Engineering of Salerno was much smaller compared to that one of Naples and without history, since it could claim only 10 years as such and 20 ones as biennium of Engineering. I was convinced it had no reason to exist, like other small provincial universities. After some time, according to the allocations that were taking place, feasibility spaces available, I said to myself: «I'm fine here, I can build what I want, like I want, I don't have breaks and insurmountable obstacles that I would find elsewhere; I can stretch like I want, within fields and issues that I prefer. I will not go away from here». So, when the colleagues from Naples proposed me to come back home, I thanked them, but I refused.

This is the advantage, together with a lot of disadvantages, that offers situations like this, like that one now Luigini is living. He had to move not only about fifty kilometres but hundreds. In the origin place, already historically rooted, it would be more difficult, if not impossible, to have the same positive conditions.

We need things like these because, individually and like scientific community, we must open new ways, to make difficult and stimulating bets, which are a lot, as you can imagine. It is no longer just a matter of venturing into the field of infographics or digital representation, which we have been cultivating for many years; it is also a matter of meeting and dialogue, working together, with other scientific communities, including those outside architecture and engineering, which are our original and still privileged field of action.

We can not continue only (it may seem a contradiction but it is not, because we are a scientific community) with our specific and our well-known and well-established spaces for us, but outside, in the national and international academic context, they are most often completely unrecognizable from other scientific realities and communities; at best totally outdated.

We cannot cultivate transversal, multidisciplinary and interdisciplinary relationships, nor transdisciplinary ones, like I prefer to say: because we must not limit ourselves only to meet and dialogue with experts from other disciplinary sectors but also to make an individual effort to go beyond our borders. Without leading to the detrimental “all-purpose”, we must be able to deeply understand the specifics and the reasons of others, to move with them with ease.

Therefore, I follow with great interest the work that Luigini is doing in this young university, meeting and dialoguing with other scientific and academic realities. It is a fundamental work, in the interest and for the growth of all of us; I am convinced about this, and I have practiced it for a long time. When I became Dean

of the Faculty of Engineering in my university, relying on this power, I pushed myself to cultivate relationships and to conquer spaces in the other universities, different from ours, with which we could grow and mutually enrich ourselves. We started courses within the ICAR/17 sector at the faculties of Communication and Education. In the Faculty of Education we transferred a researcher, Carolina Carluccio, who later became an associate professor, who developed interesting initiatives for the growth of our entire local group and for our entire sector, at a national level.

It is therefore with great interest that I come here, as I am going elsewhere. Elena Ippoliti, highly efficient Secretary of our scientific society, told me that this year I went a lot more around, and I participated in conferences and seminars more than how many times I change. A little is because this year I'm pensioner, so there is more possibility to move. A little is because the initiatives that take place around Italy and abroad are now very many.

In recent years, especially with the management of the last Scientific Technical Committee, to be renewed in autumn, the UID has radically changed. We opened the windows, let in new air and brought young teachers to the government of the scientific society, by entrusting important assignments to many associate professors, carried out with commitment and excellent results. Because on certain innovative themes, to face and win new challenges, not only new energy is needed, but, as we Neapolitans say, "ci vuole la capa fresca", free from conditioning; we need young people who are curious, motivated and prepared, able to dialogue with determination with the experience and maturity of the elderly and who can reflect with coolness and detachment, renouncing if necessary to fascinating but naive and sudden falling in love.

It is evident that it was not enough to open the rooms, to let in new air and new people; it was also necessary to get out of those dark and asphyxiated rooms. This is why UID has sponsored many local scientific appointments, even abroad, and has progressively been transformed into a widespread scientific association, and not a vertical one; widespread in the academic environment and that also locally relates to other academic realities.

This path also favors the growth of the new all-round teaching class: made not only of exemplary professors from an educational point of view and exceptional researchers, often closed in their own restricted world and free from reality and academic dynamics, but of prepared and awared people, able to know and to intervene successfully in that complex reality. We absolutely need this.

I have been doing many jobs, in academia and outside; I prefer someone like teaching and researching than to others; I did someone better than others. For sure, I have been loving to be a talent scout: identifying talented people with strong motivations, seeing them grow in their own environment and, with discretion, helping them to mature, to give the best of themselves, even outside of that environment, in different, wider and more complex contexts.

For this reason, I willingly go around, even if with some difficulty, because I would prefer to do other things more, starting from the conclusion of many in progress studies, for which I believe that by now time is less and less. Also to see at

work, in various contexts, the generation of young teachers and members of the UID that is growing. Sometimes, I reflect myself in them, and I see myself or other older teachers who managed to establish themselves and to achieve something useful for our scientific community. Always, these sorties outside home are an opportunity not only to go and see what moves around but also to assess and verify the level of growth, evolution and maturation of these new levers. And I must say that the picture is certainly positive and comforting, that we can be proud of helping to grow an excellent generation of professors and researchers - here widely and significantly represented - that bode well for the future of our scientific society and our scientific-disciplinary sector; ready to give us the change, as it should be, as soon as possible.

Vitale Cardone
President of Unione Italiana per il Disegno (UID)

Foreword: Developing New Reading Keys in Media Studies

The EARTH conference was an interesting example of exploring hybrid spaces in which various themes are intertwined, generating analogies that favor the investigation in sectors in which the old schemes seem to no longer provide useful interpretative tools. At EARTH18 research on multimodal languages, on IT resources, on new approaches to heritage and on new perspectives in education have found an integration space. As stated in the call, the concept of an ecosystem emerged that focuses not on the individual disciplinary territories but on the interactions between them and the dialogue between old and new languages, between the analogue and the digital world, between presence and distance. A third space is created that eliminates past dichotomies between virtual and real and, more generally, between dualisms that are no longer generative. In this context, a term assumes the role of pivot and at the same time is at the centre of a profound reconciliation: design. Once the separation and the diachrony between design time, action time, and documentation time have passed, the digital links the artefact producer and product artefact transforming the latter into an event never ripe, an eternal beta that keeps its umbilical cord with artefacts and realities that produce it. This is the case for texts produced with a word processor, for images produced with a photograph-editing programme, or, more generally, for the creations of the current digital production. The project is not just an initial idea or the guideline to develop the product: many applications to design are an action space where the project idea and the realization of the same evolve together and continually refer to each other. Today, new interests in the educational field emerge from multiple perspectives around the concept of design. Laurillard (2014), but not only, defines teaching as “design science” and the teacher as a designer who knows how to build paths suitable for the situation in which he/she operates. At the same time, teaching as implementation of rigid schemes no longer seems effective in the complex current context that requires the ability to think of paths in which they intertwine with different combinatorial and interrelated situations, inter- and intra-personal processes. If design becomes a space of action, which dialogues with the interactive processes typical of the action, many perplexities fall on the possibility of common

reflections in different sectors and between hard and soft sectors while once the role that the event played in man science seemed to require a specific design model.

This scenario widens the possibility of dialogue between various research areas that impact with the same processes and with the same problems: the industrial design sector in which attention to creativity and to the relationship with innovation leads to watch with interest in training; the field of design that studies the impact and potential of new technologies on processing processes and productions; neurosciences that offer new interpretations on the processes connected to decision, creativity and emotions; the museology which, due to digital languages, on the one hand, and for new social needs linked to civil competences, on the other hand, revises both its role and its means of expression. This creates an intricate and intriguing plot that reifies the concept of ecosystem and places as central the relationships built between the practices generated by different disciplines and between the interpretative keys upstream of the same practices. SIREM, the Italian Society of Research on Medial Education, which has long been among its objectives to promote a dialogue and a common reflection among various subjects interested in the issues of media, training, and digital technologies, has found in EARTH2018 a fertile field to share practices and processes of interpretation with companies that, while moving in territories other than educational, can contribute to develop new keys to reading useful to operate in the worlds that the sociocultural context is unveiling.

Pier Giuseppe Rossi

President of Società Italiana per la Ricerca Educativa e Mediale (SIREM)

Welcome Speeches

Free University of Bozen Between Interdisciplinarity and Internationality

Paolo Lugli

Rektor of Free University of Bozen-Bolzano, Italy

We are a young University we just celebrated our 20th anniversary last year, a very small University of about 4,000 students the largest Faculty that we have is the Faculty of Education which is about 40–45% of our students. It is a trilingual university, we teach courses in English, in German and in Italian and we are the only Italian University which does that.

Recently, we got good news in a ranking that was the census ranking done together with Repubblica newspaper we have been classified the best between the small non-state Universities and actually we had valued that this is a very good evaluation also compared to larger mostly known university.

The topic of the Conference EARTH2018 actually fulfils very well what are the objective of our university. We are interdisciplinary, we are international, because of the language but also because of the percentage of students that come to study from abroad.

So, I hope you enjoy your time reading the proceedings of the EARTH 2018 conference in Bressanone.

Arrivederci, Alles gute, all the best for you.

EARTH: A Necessity Within the Realm of Liberty

Michael Gaidoschik

Vice-Dean of Faculty of Education, Free University of Bozen-Bolzano, Italy

In July 2018, the Faculty of Education within the Free University of Bozen – Bolzano was happy and proud to host EARTH 2018, the conference whose proceedings you now hold in your hands – or rather read on your screen. We as a Faculty of Education are, by definition, interested in education in all its aspects, and for all age groups. Arts, heritage, and digital tools to explore and conserve them, which have been the topics of EARTH 2018, are quite in the heart of education.

Nowadays it might be allowed again, and maybe important now and then, to quote Karl Marx, who wrote about the realm of liberty that starts only where the realm of necessity has its end.

Arts, in that distinction, would clearly form an important part of the realm of liberty. But of course that means nothing else than that art is a necessity for human beings; that to unfold our humanity we cannot do without art in all its forms.

Digital tools should help us to enhance our freedom – at least I would hope so; but of course, I myself, writing this as the Vice Dean of this Faculty, am just a mathematic educator and by far not an expert in digital tools. Therefore, my view and expectation may be deemed rather naïve by those who met for three days of intensive talks and lectures at EARTH 2018 that form the basis of what you can read in this volume.

I like to thank warmly Professor Luigini and his team for having organized this high ranked conference and now having edited these precious proceedings. Our Faculty is proud to be the only one in Italy to have in Alessandro Luigini a tenured professor in the field ICAR17. We do hope that this will serve as a model for other Italian universities, considering the fact that in the last years a new way of visual and graphic education has been developed here in Brixen – Bressanone, from the encounter of Italian and German-speaking tradition, a particular heritage of this splendid region we as a Faculty of Education feel obliged to make fruitful for the future.

The proceedings are, as the conference has been, an impressive collection of international expertise in the field. I am confident that the reader will find in these pages what a good conference, hence good proceedings are about: an inspiring mix of confirmation and provocation of thoughts. So let yourself be confirmed and provoked!

Towards a Future Still to Build

Peter Brunner

Major of Brixen-Bressanone, Italy

On behalf of the City of Brixen-Bressanone we thank the Free University of Bozen-Bolzano for this important work.

Over the centuries, the city has flourished as a cultural and educational centre of the region. Thanks to its geographical position, in the heart of Europe and on the hinge between the Latin and German-speaking worlds, Brixen-Bressanone has experienced a strong cultural and artistic vocation that is reflected in the streets of its old town, in its ancient buildings and the vibrant cultural scene. This aptitude must be preserved and encouraged.

With its ambitious project, the Free University of Bozen-Bolzano wants to put digital and visual technology at the service of cultural heritage in order to preserve and make it accessible to a wide audience. *Digital environment for education, arts and heritage*, projects us towards a future still to build. As administrators we are proud and grateful to be part of this initiative which opens new horizons for the profiling of Brixen-Bressanone as cultural city.

Therefore we extend our gratitude to the Free University of Bozen-Bolzano and to all those who have contributed to the project. We wish you all a good reading.

In the Circle of Art

Claudio Andolfo

Direttore Ripartizione Cultura Italiana - Provincia
Autonoma di Bolzano, Italy

In the Circle of Art is a multimedia exhibition held at the “Trevi” Cultural Centre of Bolzano, offering visitors the opportunity to take an innovative journey through the history of art and narrating its currents and tensions, styles and protagonists. A 360° projection and a variety of devices provide an insight into the visual content through the use of next generation technology (including 75” multitouch screens, virtual reality and a videogame for kids, free to download for smartphone and tablet), by means of which the approach can be adapted to suit age group of the visitor. The project was conceived by the *Ufficio Cultura italiana* (Office for Italian Culture) and developed in collaboration with the *Intendenza scolastica di lingua italiana* (Italian Language Educational Authority) of the Provincial Government of Bolzano and is aimed at a predominantly young target group. The educational aims of the exhibition are fostered by the resolve to draw students of all ages towards the languages of art, and focus on the relationships between art currents, styles and techniques from ancient to contemporary times. Advanced multimedia technology, in particular touch technology, offers a new approach and manner of interpreting the many and various languages of art.

Previous *Circle of Art* exhibitions addressed the following themes: the female figure in art (*Donne D’arte*, 2013), landscapes (*Paesaggio a Nordest*, 2014), wars of the 19th Century (*Conflitto*, 2015) and time and money (*tempo & denaro*, 2016/2017), the latter of which also saw the inauguration of a new virtual reality section.

During the exhibition, visitors had the exclusive opportunity to try out two VR visors, glasses or helmets designed to visualise and interact with virtual media. These visors are currently still in the development phase, and are the object of a great deal of curiosity amongst technology fans and in cultural and artistic circles. From graphic experience amongst archaeology, 3D reconstructions of places and works of art breathe life into a wide variety of paths, and “time & money” came up with an extremely effective means of tying in this new technology with the themes of the exhibition.

Visitors wearing the VR visors also had the opportunity to take a virtual tour of the exhibition *Dall'oggi al domani, 24 ore nell'arte contemporanea (From today to tomorrow, 24 hours in contemporary art)* organised by the Museo Macro in Rome.

The current *In the Circle of Art (2018/2019)* exhibition, the fifth, focuses on the theme of sports and athletic disciplines and offers a journey through the world of art, legend and prowess in athletics, games and sports, narrated in virtual imagery and material works of art.

Museums and Digital Environment

Antonio Lampis

Director-General of Museums at MIBACT

I am pleased to introduce this conference on the issue of digital technology in museums because it is the theme on which we are committed, as Director-General, in the creation of the national museum system. Networking museums today regardless of ownership - state, regional, municipal, diocesan, private, university, corporate museums - cannot happen without exactly as I said a “common digital home”, a digital network that allows the exchange of best practices, the constant meeting of data and the exchange and verification of these data, social budgets, reporting and many other needs that museums have to confront.

The national museum system is emerging at this time and the accreditation and liaison procedures that are extremely important will have to go through the digital platform, where we try to make a system of accreditation of the many museums that will enter the system with zero bureaucracy, without paper instances. In this case, the very recent approval of the minimum quality levels of 4 April is immediately transformed into a self-assessment questionnaire which, compiled online, will allow museums to have a vote on achieving minimum quality levels and improvement levels, a self-reading through the digital tool that will allow in order to have a vote and will allow the commission that evaluates and supervises the accreditation process, to work quickly and work through the comparison of data in real time.

Recently, the book edited by Alessandro Luigini and Chiara Panciroli for FrancoAngeli under a common license³, which deals with the educational potential of digital environments, deals with a subject that I have worked for twenty years in my previous work and which I use today in museums to stimulate them to think about the needs of young generations to approach museums through the use of digital tools in a story that is consistent with the changed minds, the minds completely changed the generations of millennials.

³Luigini A, Panciroli C (eds.) (2018) *Ambienti digitali per l'educazione all'arte e al patrimonio*. Milano: Franco Angeli. Available open access at: http://ojs.francoangeli.it/_omp/index.php/oa/catalog/book/334.

This is a fundamental challenge on which all the museums are called to discuss quickly, we are working within the General Directorate on the theme of 3D modeling as a tool for the temporary reconstruction of the evolution of the era for some great archaeological finds and in this I would like Italy to become among the world's leading countries in experimentation and research.

This is an extremely present theme in this 2018, European Year of Heritage, where the European Union in its decision underlined for the achievement of a better emergence of the role of heritage for the economy, for the employment of young people, for the people's well-being, more sustainable governance is needed and more sustainable governance is not achieved without a powerful digital link and more attention to younger generations. And even this second indication of the European Union is not obtained without extreme confidence with the potential of digital environments and their role in education.

Contents

Keynote Lectures

Four Dichotomies on Digital Environments Between Art, Heritage and Education: Opening Address	3
Alessandro Luigini	
Virtual Reality: The Use of Images for the Interpretation and Experience of Culture and Heritage	13
Eugene Ch'ng	
The Digital Museum as a Third Space: Giving Shape to Conceptualization	19
P. G. Rossi and C. Panciroli	
Visitor's Approaches, Personality Traits and Psycho-Physiological Well-Being in Different Art Style Museums	27
Stefano Mastandrea	
New Interoperable Tools to Communicate Knowledge of Historic Cities and Their Preservation and Innovation	34
Andrea Giordano	
New Media Exhibit at the Musée des Civilisations de L'Europe et de la Méditerranée	44
Franz Fischnaller	
Digital Technologies in Heritage Conservation. Methods of Teaching and Learning This M.Sc. Degree, Unique in Germany	53
M. Hess, C. Schlieder, A. Troi, O. Huth, M. Jagfeld, J. Hindmarch, and A. Henrich	

Visual Heritage

Structure from Motion Systems: Application Possibilities in Education and Cultural Heritage. New Approach Methods to Education and Preservation 67

Marco Felli

Video Games for Learning Projective Geometry: Analysis of Virtual Spaces Through the Disciplines of Representation 76

Ramona Feriozzi and Alessandro Olivieri

Disciplines of Representation and Photographic Culture. The Strategic Plan for Photography Development in Italy 2018–2022 86

Antonella Salucci

Venetian Perspective Boxes: When the Images Become Environments 95

Fabrizio Gay and Irene Cazzaro

Automatic Image Recognition. Applications to Architecture 106

Igor Todisco, Geovanna Esther Menendez Giglio, and Ornella Zerlenga

Kosmesis Design. Eco-nomica-logical Cultural 116

Maria Dolores Morelli

Communication

Communicating the Heritage, a Transmedia-Driven Approach 129

Matteo Moretti and Gianluca Camillini

Representing Heritage on the Web. A Survey of Online Platforms to Communicate Tangible Assets 138

Giovanni Caffio

Digital Exploration in Archival Heritage. Research for the Knowledge, Use and Communication of Architecture Archives Through Digital Representation 147

Caterina Palestini

PUDCAD Project. Towards a CAD-Based Game for the Implementation of Universal Design Principles in Design Education ... 154

Giorgio Buratti, Giuseppe Amoroso, Fiammetta Costa, Margherita Pillan, Michela Rossi, Ozge Cordan, and Demet Arslan Dincay

Digital Heritage 1

3D Printing Technology, Video Mapping and Immersive Audiovisual Scenography for Heritage Museum Exhibits 165

Franz Fischnaller and Francesca Fatta

Digital Survey and Parametric Representation. The Hypoglies of Civita di Bagnoregio 174
 A. Maiolatesi

A Journey of Valorisation from the Sacred to the Secular. The Oratory of Sant’Antonio Abate in the Village of Mele (Genoa-Italy) ... 184
 R. Vecchiattini and C. Battini

Project and Representation. A Dialogue for the Campania Hinterland 194
 Lorenzo Giordano

The Digital Platform of the *Gabinetto di Fisica* of the Gymnasium School Paolo Sarpi in Bergamo: A Case Study Between Research and Didactic 202
 Alessio Cardaci, Antonella Versaci, and Pietro Azzola

When the Future Is the Past. Digital Databases for the Virtualization of Museum Collection 212
 S. Parrinello, F. Picchio, and A. Dell’Amico

Education

The Pollicina Project: A Collaborative and Educational Social Suite to Build Cultural Itineraries 225
 S. Calegari and M. Dominoni

The District as a Heritage Asset to be Explored. Pathways to Discovery and Appropriation in Bicocca 235
 Franca Zuccoli and Alessandra De Nicola

Children’s Color Experience Across the Virtual and Material Dimensions. Reflections Based on Experimentation 243
 A. Poli and F. Zuccoli

Art-Based Methods. An Approach to Educational Research 249
 Elisabetta Biffi, Nancy Gerber, Jacelyn Biondo, and Franca Zuccoli

Using Cinema and Digital Technologies in the Classroom to Construct Spaces for Learning About Cultural Heritage 253
 A. Poli

Chromatic Dimensions as Heritage of the Project Culture. *Cromo: Interactive Teaching Manual* 261
 Federico O. Oppedisano

Semantic Models for Education. Representations, Between Research and Didactic, for Architecture and Design 271
 Maurizio Unali

European Digital Library for the Intercultural Dialogue. Interactive Environments for Education, Cultural Heritage and Civic Empowerment	279
Giuseppe Amoruso and Valentina Battista	
Visual Culture and Cultural Heritage: ViC-CH a Synthesis Between Digital Representation and Heritage Experience	288
A. Luigini, G. A. Massari, S. Vattano, C. Pellegatta, and F. Luce	
Augmented Reality	
Remediating the Historical City. Ubiquitous Augmented Reality for Cultural Heritage Enhancement	305
S. Brusaporci, F. Graziosi, F. Franchi, and P. Maiezza	
Digital Interactive Baroque Atria in Turin: A Project Aimed to Sharing and Enhancing Cultural Heritage	314
V. Palma, R. Spallone, and M. Vitali	
Representing and Communicating the Cultural Heritage Construction of Virtual Urban and Architectural Scale Places for Learning	326
Alessandra Meschini and Ramona Feriozzi	
The Augmented Reality as an Instrument for the Representation/ Visualization of Architecture	336
Mirco Cannella	
Digital Cultural Heritage: From Educational Experience to the Artefact in Augmented Reality	345
C. Panciroli, A. Macaуда, and L. Corazza	
SAR for Kids: Spatial Augmented Reality as Tool for Art Education	355
Daniele Rossi	
Art upon Art: The Spatial Augmented Reality as New Value for Contemporary Art and Educational Tool for Art History	364
Donato Maniello	
Augmented Cityscape: The GLOWFestival Case as Valuator of the Territory Cultural Heritage	374
Donato Maniello	
Digital Heritage 2	
Digital Museums, Digitized Museums	387
M. Lo Turco and M. Calvano	

Drawing and Project at the VChUTEMAS. Graphic Interpretations . . . 399
 Francesco Maggio and Starlight Vattano

Coherence of Visual and Epistemic Elements in Multimodal Artifacts for the Cultural Heritage Education. The Case Study of the Vitruvian Man by Leonardo da Vinci 411
 Giampiero Dalai, Berta Martini, and Luciano Perondi

Interactive Installations and Suggestive Experiences. A Project for the Home of M. Obellius Firmus in Pompeii 422
 M. Capone and D. Palomba

The Drawing and the Virtual Model of the Monastery of Archangels Michael and Gabriel in Kosovo. Survey and Modeling 432
 Luigi Corniello, Enrico Mirra, and Gëzim Hasko

Amazon Mechanical Turk 439
 Francesco Cervellini

Art Mistakes. 444
 Valeria Menchetelli

Museum Ideas

Inclusive Memory. Museum Education to Promote the Creation of a New Shared Memory 459
 Antonella Poce and Maria Rosaria Re

In Search for Recovered Object. Creative Heritage as the Aesthetic, Pedagogical and Desire-Related Outcome of “Fake” Museum Art 469
 Emanuela Mancino

Through the Museum. New Models of Communication 476
 Francesca Guadagnoli and Elena Ippoliti

Museums in the Era of Digital Revolution. Persuasive Communication and Multimodal Approaches for Overcoming the Digital Divide 485
 Francesco Gabellone and Maria Chiffi

The Professionalism of the Museum Educator Between Heritage Competences and Digital Competences. 496
 Chiara Pancioli, Manuela Fabbri, and Veronica Russo

Calculating the Social Impact of Culture. A SROI Application in a Museum 507
 Federica Viganó and Giovanni Lombardo