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INTRODUCTION

Speaking about emerging technologies for digital preservation and information modeling means penetrating the most dynamic fields of research, particularly because of the intimate connection that links the discipline with the technological development. It’s the relationship between software and hardware devices that helps us record the undergoing changes of the survey in an important moment of revision, from a traditional approach to one intimately connected with the huge potential provided by digital technologies. The continuous technological advancement and in particular the great digital revolution offer new research tools that are easily applied to science and especially on Cultural Heritage.

Cultural Heritage is an expression of the entire corpus of artistic or symbolic material signs of human kind.

Cultural Heritage includes tangible and intangible heritage, with several categories: movable cultural heritage (paintings, sculptures and manuscripts); immovable cultural heritage (monuments, buildings, archaeological sites, etc.); intangible cultural heritage (such as traditions and rituals); and natural heritage (such as landscapes, physical, biological or geological formations).

As the notion of Cultural Heritage evolved from that of “art object” or of “antiques and fine arts,” likewise the notion of Architectural Heritage has evolved from that of “monument”; by this word (from the Latin “monere”: admonish, remind, teach) focus was given to the architectural prominences that were considered relevant because of their artistic and/or historical references. Over the years, the notion has shifted to that of widespread heritage, which recognizes the value of the so-called minor architecture, and of the links between individual pieces of architectural heritage and their contexts.

This new conception of Cultural Heritage developed in parallel with a new vision of history, which is no longer seen in an idealistic sense referring only to crucial events, but is perceived in a more articulate manner, one open to the study of society as a whole and which is also mindful of material culture aspects. A considerable part of this heritage has now been declared as world heritage by UNESCO. We could think about a lot of small urban sites spread in the world “survive” that have resisted for centuries to the transformations caused by industrialization processes, sometimes keeping their morphology unchanged. The originality and the homogeneity of the urban composition and the value of associational life that characterizes these nucleus make them authentic monuments that must be valued.

These considerations are strictly linked by reflections on the protection, conservation, management and valorization of historic centers; these reflections have developed as a result of the recognition of the general value of the contextualization of the individual pieces of heritage or groups of pieces of
heritage, as part of their own history and that of their surroundings, of which historic centers are the highest expression.

For this reason evaluation and preservation of cultural heritage is inextricably connected with the innovative processes of gaining, managing and using knowledge.

Tangible Cultural Heritage is strictly linked with survey and representation, like in many other disciplines such as those used for data gathering, the introduction of new information technologies has quickly revolutionized the way we understand and address the matter. Even though the fundamentals of the existing disciplines haven’t changed, they have been interacting with new tools and applications for a long time now.

But Cultural Heritage can be understood also as the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations. However, what is considered cultural heritage for one generation is often not considered such valuable by next generations and can be even rejected if it is not fully maintained and appreciated in a historical evolution. Cultural Heritage attention can be addressed to objects and facts at very different level of scale from the very small to a very huge as well as in term of time duration. Small objects such as artworks and other cultural masterpieces are in general collected in museums, art galleries and exhibition sites as well as in archive for storage. Significance of artworks and other cultural masterpieces can be understood against interpretation of socioeconomic, political, ethnic, religious, and philosophical values of a particular or wide group of people, beside an appreciation of pure artistic views.

For the knowledge of tangible Cultural Heritage, only in the discipline of survey lead the technological advancements to the development of three different areas of research: the first works around the problem of data acquisition (nowadays they are able to provide, in a short time, a large amount of information with a great level of detail); the second area is more restricted because it studies and suggests new low cost solutions; the third concerns the traditional methods and their integration with the former two. The survey operation, as a process involving deep knowledge, aims at the accurate representation of the analyzed subject and its goal goes beyond the consideration of the technique and the specific instrument, making the ultimate result of this process broader and more amplified.

It is not appropriate to focus the attention on a specific technique only for in order to achieve the objective it’s important to consider the integration of the techniques, tools and methodologies, necessary to understand the analyzed subject. For this reason drafting a procedure for the elaboration and the realization of 2D and 3D models would be a topic of great interest.

Keeping cultural heritage from the present for the future is connected with actions such as identification, analysis, preservation and restoration with specific technical meaning. Each of this area of intervention includes not only technical actions and expertise but require also of more cultural evaluations as in respect of the concept of cultural heritage. Indeed preservation means understanding the value and therefore a proper intervention requires a deep knowledge of the object or fact that is addressed for Cultural Heritage by looking at all the above mentioned aspects with a wide interdisciplinary approach. Fundamental can be understood a proper recognition of the object or fact with its essential parts and compositions in order to judge on its consistency and originality. This activity of survey is not only pure observation but requires also investigations on historical aspects both in terms of society evolution and technological developments that made possible the achievements for the creation of the fact or the production of the artwork.
Summarizing in short, Cultural Heritage, tangible and intangible, can be also understood as a complexity of activities in a very wide range of disciplines whose aim is to identify, evaluate, and preserve past achievements for the benefit of next generation in having memory of the past and inspiration from it for future enhancements and appreciation of current results.

**ORGANIZATION OF THE BOOK**

The book is organized into twenty-one chapters investigating on surveying and knowledge of Architectural-Archaeological Heritage (AAH). The themes can be identified within three main group of Tangible and Untangible Cultural Heritage: Theoric Cultural Heritage; Architectural Heritage; Archaeological Heritage; Augumentid Reality; Sharing Cultural Humanities.

A brief description of each of the chapters follows:

Chapter 1, *Communicating Architectural Heritage – CAH*, describes the research addresses the strongly felt need associated with Cultural Heritage objects, particularly with architecttura di Tomaso Buzzi, which in the process of concrete research opened up and imposed an interesting vista of methodological and practical enquiry. In fact, the research confronts the problem of how to communicate – through virtual means, which happen to be the only workable ones - of unbuilt projects or complex architectures. The objective of this is to effectuate a Virtual Comeback of the architectural object through digital means. This study aims at a hyper-medial acquisition, composed of digital objects recreated by means of more advanced techniques of ICT communication.

Chapter 2, *Fasti Congressuum: A Useful Online Tool for Congress and Call for Papers*, discusses about hundreds of calls for papers submitted and about hundreds of congresses devoted to some aspect of antiquity. With such an enormous amount of international activity, it is rather difficult, if not impossible, for an individual researcher, or a researching group, to keep in track of every single academic activity related to their speciality, not to say of general academic activities at international scale. The members of this project have checked this experience, even personally, happening in different countries, always talking about classics and antiquity studies. Fasti Congressuum was born by and for students and researchers on Antiquity as an independent project and a tool against this situation.

Chapter 3, *The MuseBot Project: Robotics, Informatic, and Economics Strategies for Museums*, intends to present the MuseBot system as the result of multidisciplinary research, underway at the University of Cassino and Southern Latium, which focuses on the use of robots for visiting a museum during closing time. During the visit the visitor, connected to the robot through a home computer, smartphone or tablet can control and “drive” the device through the halls of the museum. During the virtual tour the visitor, focusing and viewing the various works on display can get a simple view or an extended examination of the work that he/she is looking at, through a specially prepared multimedia database.

Chapter 4, *Building Information Modeling(BIM) Processes: Great MisunderstandingorPotential OpportunitiesforDesignDisciplines?* describes how design software changed the way to create a project. There are two different approaches to the representation and the project. On the one hand, the tradition of a “unique” sum with a speed linked to simple deletion of a physical support (the simple copy, paste, move and delete constitutes, for those who work by hand, an absolute innovation). On the other hand it was a real innovative design system from potential still under development that significantly increased productivity by working on the basis of very strict standards, which is very beneficial in terms of productivity and control of the project.
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Today this second approach is possible thanks to the software advance that lead to the integration of complex information as well as in terms of the development of digital imaging software, more for marketing purposes than for real differences compared to the past, have found a new place in the market and therefore in the collective imagination, with a new name Indeed, with the acronym, BIM Building Information Modeling.

Chapter 5, Thermographic Survey for the Preservation and Restoration of Architectural Cultural Heritage, provides technical information and physics background to the use of thermographic cameras in the field of preservation and restoration of architectural cultural heritage. After an overview on how IR cameras work, both applications and common cases will be presented so that the operator may easily deal and recognize building pathologies and masonry anomalies. These, described in detail, range from water moist problems to structural gaps. As moisture and humidity related problems represent the majority of IR surveying cases in the field of architecture, they will be handled in a comprehensive way so that both the operator and the scholar are well prepared to understand and treat the pathologies these may cause.

Chapter 6, Digital Surveying in Cultural Heritage: The Image-Based Recording and Documentation Approaches, describes the methodological and technological aspects of image-based recording and documentation approaches acting as the vehicle for the digital surveying of cultural heritage. The chapter not only describes the different technologies and techniques used but also goes to the extent of clarifying several applied implementation issues. Three different examples and application case studies from a small, a medium and a large-scale cultural heritage objects are provided to demonstrate the developments.

Chapter 7, From Control and Development to Posthumous Verification: The Decreasing Fortune of Drawing in Contemporary Architectural Processes, discusses on architecture survey and the architecture design. The survey is concerning the knowledge of an existing architecture while the design is defining a whole building from a single original mental image. Both the processes historically adopted the drawing as the main instrument to control and develop the key actions and transmit the final product. The introduction of innovative technologies such as laser scanner and BIM has broken this practice and drawing seems today relegated to a secondary posthumous verification role while assemblage and data-base logics are threatening the continuous flow between mind, eyes and hand the drawing had been assuring for centuries. This chapter analyzes current practices of both survey and design to highlight their limits, equivoques, and risks.

Chapter 8, Going Further: (Re)Discovering Rock Art Carvings with Photogrammetric Techniques in Galicia (North-West Iberian Peninsula), presents a revision of the traditional tracing methods over petroglyphs through the employment of three dimensional models is proposed. The different techniques suggested here are: Radiance Scaling and Algebraic Point Set Surfaces (APSS). These methods applied to 3D models allow a better visualisation, comprehension, and objectification of the open-air rock art carvings, improving the researches over a more reliable database, but also for issues, related to management and conservation.

Chapter 9, Real/Not Real: Pseudo-Holography and Augmented Reality Applications for Cultural Heritage, outlines best practices for the correct visualization of the 3D reconstructions of architectural and cultural heritage, especially for Mobile Augmented Reality and Holographic applications. A complete methodology is presented, ranging from data acquisition, simplification and visualization, underlining the importance of fostering architectural values in a compelling way. Authors also provide state of art challenges, limitations and opportunities, arguing the dissertation through a set of ad-hoc applications developed for different case studies.
Chapter 10, *The past is never dead. It’s not even past*. Virtual Archaeological Promenade, Propose how, in the virtual space-time of a webGIS, it is possible to provide specific paths, that accompany any user, even if he doesn’t have specific skills, to discover the immanent remote past of the city, described by an appropriate display of its cartographic and iconographic heritage.

Chapter 11, *Expanded Cultural Heritage Representation: Digital Applications for Mixed Reality Experiences*, investigates some of the opportunities offered by technological innovations, in particular referring the specific application areas of Augmented Reality and Augmented Virtuality. The contribution presents a series of applications based on effective tests of innovative communication, which are characterized by different levels of interactivity and immersion. The general subject of interest is the city of Ascoli Piceno considering both the city as a whole and particular places/buildings of value.

Chapter 12, *Virtuality and Multimedia for Digital Heritage: Schifanoia Palace and Its Hall of Months*, concerns the multimedia products related to Schifanoia Palace and its famous Hall of Months, some already completed and others still in the design phase. The building, fulfilling the role of museum, is almost entirely closed to the public following the earthquakes of 2012. The research project is split in stages, half of which have already been completed to date. Its objective is to provide support to visitors in this period of reduced use of space and to be one of the leading tools of communication for the new Schifanoia Civic Museum.

Chapter 13, *Enhancing the Cultural Heritage: Between Visual Technologies and Virtual Restoration – Case Studies to Experiment with Models for Visual Communication*, presents the application to exploring projects for the Casa del Fascio (Fascist Party Office) and the building complex of Foro Mussolini in Littoria (now Latina), by the architect Oriolo Frezzotti. Starting with consistent iconographic documentation integrated with bibliographic research and comparison with similar cases, the historical process was retraced and interpreted, reconstructed three-dimensional hypotheses of the figural unity were formulated, and interactive application was created. The application refers to the area of “virtual restoration”, the only possibility for non-material histories and works, a field in which visual technologies can prolong the critical “eye” to which recomposition of the figural combination is entrusted.

Chapter 14, *Interpretation, Communication, Sharing, and Fruition of 20th Century Architectural Design Archives through the Digital Representation Tools and Techniques: 3D Modeling, Animation, Real-Time Visualization, and Augmented Reality*. In 20th c. Architectural Archives are probably the latest and hugest collections of architectural documents on paper. Today design documents produced by contemporary masters of Architecture, especially original drawings, are usually digitized and shared in the Web at scholars’ disposal. The fate of the Archives that preserve the design drawings of minor architectures is completely different, so that the main motive of their safeguard has to be found in the recognition of their value as the testimony of a diffused architecture, significant to trace a framework of the building activity of their time. This is the case of the Archive of Industrial Architecture produced by Nino and Paolo Rosani, active in Turin up to 2010, for which a series of digital devices designed to enhance and communicate its most relevant content are being hypothesized.

Chapter 15, *Representation and Elaboration of Examples of Painted Architecture*, presents research on the Winter Room of Palazzo Brignole-Sale (Palazzo Rosso) in Genoa, Italy, which is part of the decorative cycle of the Seasons. The cycle displays the peculiar characteristics of the seventeenth-century Genoese decorative style, where architecture, painting, furniture and stuccos are highly interconnected. The research was carried out using the data collected with nodal-photography techniques. Thanks to these techniques, it was to possible to obtain an interactive panoramic spherical photo and high-resolution scaled photos of planar projections of the architectural perspective, in order to identify the real and illusory space.
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Chapter 16, *Trompe l’oeil Architectures in Palazzo Arese Borromeo, Cesano Maderno (MB): The Integrated Survey of “Quadrature” and Vaults Aimed at the Graphical Analysis of the Painted Perspective*, aims at presenting some results of a survey realized following an approach that mix direct, laser and photographic techniques to obtain high quality orthophotos of the painted surfaces, useful to be the basis for the graphical analysis of the trompe l’oeil perspective. The experimentation is on a concrete case study, one of the numerous frescoed rooms belonging to the rich iconography of Palazzo Arese Borromeo in Cesano Maderno (MB, Italy), a building that is an actual unicum in its kind.

Chapter 17, *U.I.R.D.A. – Unbuilt Italian Rationalism Digital Archive: Piero Bottoni and Luigi Vietti*, presents how the construction of a model is not the construction of a simple image, operation, which is often carried out for the representation of the project, but it is the hermeneutic and critical result of the drawing tending to the analysis of the form, which is the true object of ‘imitation’. This study wants to contribute to the construction of a digital archive on the topic of the unifamiliar house investigated by Piero Bottoni and Luigi Vietti.

Chapter 18, *Palatium Vetus: From Tradition to Digital History*, presents the book “Palatium Vetus. The broletto recovered in the heart of Alessandria” is the theoretical, scientific and cognitive achievement of the complex restoration and enhancement, that have returned to the building its role of town prominent features, one of the main focal points of its architectural and urban history. The volume is presented as a result of a large-scale cultural relationship, created and programmed between the ‘Palazzo del governatore’ of Alessandria and the Politecnico di Torino.

Chapter 19, *Digital Technologies for Knowledge of “Minor” Cultural Landscapes*, aims to point out the most recently emerging technologies in analyzing and sharing knowledge about ‘not outstanding’ cultural landscapes. The goal of the chapter is to show how digital technologies can support knowledge and share of values about ‘minor’ cultural landscapes both through inhabitants and potential tourists to be attracted to.

Chapter 20, *Città Invisibili of Teatro Potlach: A Journey to Rediscover Our Cultural Heritage through Videomapping, Architecture, Theatre, Music, and Visual Arts*, describes Città Invisibili which is a multidisciplinary art project made by the Italian company Teatro Potlach. Compared to the canonical theatrical performances, Città Invisibili, being in its essence a site-specific performance, interacts with the place where it grows. With the project, the Italian group builds next to the existing space of the place (physical space and memory space) other two spaces, the space of the staging and the space of the performer, using different materials, in particular cloths and video projections.

Chapter 21, *Model 3D in Service of Preservation, Restoration, Structural Analyses of the Architectural Heritage*, aims to explore 3D modelling and its practical applications investigating scales of representation and scales of contents from architecture to landscape. The goal of this approach is to test the flexibility of modelling tools to different fields of application and to draw shared methods, even if they are applied in so different context. Changing the scale, is obvious, the language changes – because it is necessary to recompose symbolic and iconographic elements – themes and scales of representation change. So is possible to pave the way to strictly disciplinary thinking on outcomes and on instrumental and methodological guidelines for further research. The topic focuses on developing guidelines and creating a simple three-dimensional model designed to represent both the complexity of the “cultural heritage” morphology, as well as the need to manage the process of restoration in all its phases: from first findings to the restored final output.

Although partial, this works have clearly enlightened the possibility (and maybe the need) of establishing general operative guidelines for archaeological surveying in order to unify and regulate the
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procedures of data collection, elaboration and representation that will make the final result scientific in character, i.e. more objective and correct.

The comparison with other experiences in this field, the test of different methodologies on different scale objects will lead to the establishment of flexible modus operandi, which lends itself to adaptation in specific, concrete cases or to the needs of surveying maintaining, at the same time, the versatile character of the survey.

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ENDNOTES

1 The expression Architectural Heritage, over the years, has replaced the word Monument in the classification used by offices for local Heritage: 1897 establishment of the “Special Superintendency for Monuments” of Ravenna; 1907 (Law 386/1907) other 18 “Superintendency of Monuments” are established on the national soil; 1974 with the setting up of the Ministry for Cultural and Environmental Heritage, the “Environmental and Architectural Superintendencies” are established; 1998 the “Superintendencies for Architectural and Landscape Heritage” are established.

2 An initial recognition of value being given to so-called ‘minor’ architecture is to be found in Law 1497 of 29 June 1939 for the ‘Protection of natural beauty “or of what we now commonly call ‘landscape heritage’; in Article 1 in fact we find indicated as subjected to this law ‘the complexes of buildings that make up a characteristic feature having aesthetic and traditional value’. The inclusion of the instrument of ‘indirect constraint’ in the 1939 law (Article. 21 of law no. 1089 of June 1, 1939) can be considered as a recognition of the importance of the environmental context and the link that is established between prominent architecture, recognised for its art history qualities, and the buildings and spaces that surround it.

3 The World Heritage list includes 981 sites that form part of the cultural and natural heritage. The World Heritage Committee considers these sites as having a universal value. The UNESCO has so far acknowledged 981 sites (759 cultural, 193 natural and 29 mixed) present in 160 countries around the world. Currently Italy is the country that has the largest number of sites (49) included in the list of UNESCO World Heritage.