Events

Digital & Documentation 2021 Palermo New Frontiers of Digital

Veronica Riavis

The Engineering Department of the University of Palermo organized and hosted the fourth edition of the itinerant study day Documentation & Digital [1]. The event, promoted by the Italian Union for Drawing, held in mixed mode on 20 September 2021 in the Steri Monumental Complex.
The initiative aims at cultural exchange in the areas of representation and at highlighting the theoretical-practical research carried out by young scholars in the sector. In fact, the intention is to update the state of the art on recent scientific documentation experiments for the protection and enhancement of cultural heritage. Dedicated to the "New Digital Borders", this year's event was an opportunity to highlight the fundamental technological developments that took place despite the pandemic period. Three thematic sessions structured the day, ranging from the use of new BIM techniques for buildings, through the digitization of archival drawings and ending with parameterization and video mapping procedures. By invitation, 16 speakers from 12 Italian institutions presented their innovative research.
Laura Inzerillo and Francesco Acuto, organizers of this edition, opened the meeting with Giovanni Perrone and Antonina Pirrotta, Director and Deputy Director of the Engineering Department of the University of Palermo, Francesca Fatta, president of the UID, and Sandro Parrinello of the founding committee of D&D.
Documentation is a transversal component in the work of architects, engineers and humanists. In a historical phase in which a digital transition is taking place, the language of representation is also changing. The amount of information takes the place of the thing itself, and digitization–as pointed out by Francesca Fatta at the beginning–proves to be a resource that multiplies the possibilities in space and time, constituting a complementary and necessary alternative to reality. Sandro Parrinello added that the technological integration of new protocols makes it possible to refine conservation practices and enhance the artifacts of historical importance. This happens thanks to the collection of heterogeneous data (geometric, structural, material, ethical) which, if correctly superimposed and organized, increase the methods of communication.
Alessandro Luigini and Cecilia Bolognesi introduced the first part by reflecting on the potential and implications of the integrated use of advanced survey and communication technologies, to make traditional practices and new places known to different target users. Research aimed at creating effective knowledge experiences: transversal educational paths from virtual reality videogame devices, advanced acquisition technologies for document analysis and geometric rendering of historical architecture, the different visualization approach offered by holographic applications.
However, there is an antinomy between the accuracy of a point cloud and the possible geometric and interpretative simplification of a digital model. The speakers of the session dedicated to BIM for cultural heritage addressed this issue, considering the criticality and potential of the recent interoperable methodology for modeling, data collection and information structuring.
Daniela Oreni talked about the qualities and characteristics that are indispensable for an HBIM model for restoration, about the need to focus on the limits fundable in the management of construction sites, regulations, graphic contents and heterogeneous professional skills. The conservation project must go beyond mere figuration, interrogating documentary and cataloging data to simulate design perspectives or historical evolutions. The level of accuracy of an information model strictly depends on the purposes for which it is created (documentation, conservation, management, intervention), and

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therefore on the reasoned scale of representation and relative geometric level established a priori.
Significant developments in the BIM field emerged from the introduction of automatic identification processes to reconstruct and classify building complexes or elements, as highlighted in the speech by Pierpaolo D'Agostino and Giuseppe Antuono. Specifically, the recognition of structural elements and typologies takes place thanks to pattern recognition algorithms and geometric shapes, as well as from thermal indices.
Marika Griffo discussed the question of the semantic structuring of point clouds and parametric digital twins of historical architectures. The inverse processes of prioritization of geometries and information of morphometric models (deriving from integrated SfM, laser scanner and topographic surveys) were compared with solid information ones (created on BIM authoring software). While the singularity of the artefact is evident, on the other there is a tendency to typify the elements by assigning each a specific structural and / or decorative function.
Furthermore, Anna Dell'Amico noted that, despite the recent implementations of the BIM system, the adoption of integrated survey methodological protocols (terrestrial and mobile laser scanners, photogrammetry, and drone acquisitions) is still necessary. In addition, the use of multiple software for data processing is essential for the collection and processing of geometric and chromatic information aimed at shared parametric modeling.
Still on BIM, Giorgia Potestà clarified how the specificity that makes a historic architecture distinctive should not base on the mere serial reproducibility of the elements that can easily defined with parametric procedures. If on the one hand, in fact, the system and loadable families for structural and functional elements guarantee "digital efficiency" in terms of time and standardization of the modeling, on the other hand the reconstruction of artifacts requires the uniqueness offered by local families or even better from polygon mesh objects. Created externally for their complexity, the latter derive from the processing, hybridization and interpretation of data from advanced SfM surveys, laser scanning, infrared thermography and georadar.
The digitization of archival drawings was the theme of the second session. The process of converting analog quantities into digital information can take different forms and uses, such as teaching, research and communication. In this regard, Mariateresa Galizia and Cettina Santagati presented the history and resources of the Museum of Representation of the University of Catania, through scientific research, training and the third mission.
The progress achieved by new tools and the functionalities offered by digital and data sharing platforms are making it possible to collect, consult and rework the precious graphic and textual contents of the documentary material.
Digitization is a procedure that makes it possible to disseminate and protect historical territories and architectures. We generally employ sophisticated methods for the most famous documentary heritage, but we often leave out the lesser known. Especially in the latter case, compromised conservation states that affect readability make digitization necessary. Sandra Mikolajewska clearly indicated that this is possible by resorting to quick and inexpensive acquisition methods, such as the use of cameras and reticular meshes on acetate sheets to check and correct lens distortions with software tool for straightening.

Fig. 1. Flyer of the event.

Recently, the demand for high definition acquisitions and cataloging for libraries accessible online is increasing. This happens above all for historical architecture whose digital documentation, supported by a structured organization of data, images and restitutions (spherical panoramas or 3D models), reintegrates the topographic and stratigraphic structure of the analogue drawing, thus becoming a reading aid. From the speech by Matteo Flavio Mancini it emerged that the use of 2D and 3D digital drawing is often linked to the study and implementation of unrealized architectural projects which, otherwise, would be "incomplete witnesses" confined to the paper support of the sources. In this case, as well,

we understand that we must create the three-dimensional models according to specific purposes: of mathematical-geometric study (continuous NURBS, symbolic models) or of visualization of the appearance of the form (discrete mesh, iconic models), with relative degrees of reliability and reconstruction.
Francesco di Paola and Graziano Mario Valenti introduced the last session on parametric representation and video mapping. Even in these sectors, the various digital construction processes lead to certain purposes and areas, ranging from the theoretical aspect, to applications on the landscape, passing through design, architecture and archeology.
Marco Filippucci dealt with the use of parametric modeling, especially in terms of overcoming geometric limits to obtain unique shapes and solutions. This is thanks to modifiable parameters and data that create infinite possibilities. In explaining the logic of modeling and digital representation with progressive geometric difficulties, it emerges how artificial intelligence contaminates a drawing concept with consequent validation of Computational Design.
From the intervention of Domenico D'Uva it emerges that a landscape can be represented by integrating parametric modeling and NURBS, managing the nodes of soft mobility or defining the energy flows of inhabited centers located in fragile territories, but also quantifying the quality of slow paths with programming codes.
Giorgio Buratti reported the drafting of algorithms in the field of design and digital fabrication. It is thanks to computer-assisted design, in fact, that we can create complex objects and then physically manufacture them, using machines that reproduce the prototypes, reducing time and costs.
Finally, as Mirco Cannella explained, we must consider the great technological revolution, especially with the growing applications of augmented reality, as a great resource for enhancing architectural contexts or archaeological sites. This is also thanks to the use of versatile applications that provide sometimes-complex procedures for the construction of models, based on point clouds or photogrammetry, and for localization.
The field of documentation and digital, therefore, has many dimensions and as many practicable paths, increasingly indispensable for the protection, knowledge and enhancement of heritage. Experimentation in this sector is extensive, not without errors that confirm research that is always ready to improve and reduce the margins of tolerance.

Notes

[1] The first edition held at the University of Pavia in 2018, the second, in 2019, at the Polytechnic of Turin and the third at the "Sapienza" University of Rome in 2020..

Author

Veronica Riavis, Polytechnic Department of Engineering and Architecture, University of Udine, veronica.riavis@uniud.it