

## Events

# BIM, Augmented, Virtual and Mixed Reality. A Brainstorming at Politecnico di Milano

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Last autumn the Politecnico di Milano launched a new invitation to share reflections and experiences on the most advanced developments in virtual reality and parametric modeling. The congress entitled *2<sup>nd</sup> Brainstorming BIM, VR, AR, MR*, organized by Cecilia Bolognesi, Fausto Brevi and Daniele Villa under the patronage of the Unione Italiana per il Disegno (UID), was held on October 21st, 2019, thanks to the collaboration of three different departments of the Milanese university.

At the opening, in the context of the large conference room dedicated to Ernesto Nathan Rogers, Ilaria Valente, dean of the School of Architecture, Urban Planning and Construction Engineering (AUIC) and Francesca Fatta, president of UID, welcomed the over 200 participants, including teachers, PhD students, students and professionals. The institutional greetings were followed by an introduction to the topics of the conference and a focus on the importance of the development of advanced lines of research in the fields of parametric drawing, building design and management and digital modeling, highlighting their strategic role both in the scientific and educational context. During the day the dean of the University for the area of Drawing, Rossella Salerno, made an initial summary of

the results of the seminar. The scholar stressed the scientific interest of the initiative and the importance of serious theoretical reflection and constant graphic research in exploring the potential of digitization.

The conference is in continuity with the previous edition entitled *Brainstorming. The BIM model*, organized in 2016 by Cecilia Bolognesi on the same campus and focused on the role, critical issues and potential of *Building Information Modeling*. The meeting was designed to encourage debate and exchange of experiences between different Italian universities and explored the applications of BIM systems for the control and management of architectural design, in particular for new buildings. On that occasion, a poster session made it possible to draw a first census of research groups active on the territory in the exploration of boundaries in the field. The 2019 edition was held in continuity with the previous one, proposing a debate on the progress of research in the light of the new phase of development that BIM modeling is experiencing that looks beyond the construction of documentary databases and moves towards new uses and new goals. Then the new *Brainstorming VR AR MR* focused on the theme of modeling and interoperability of systems, combining the reflection

on BIM with an exchange of ideas on virtual, augmented and mixed realities and mutual interactions. Virtual reality, in this sense, is a space in which multiple dimensions coexist capable of integrating and enhancing information models, opening up to innovative forms of representation, knowledge, management, use and communication of reality. At the same time, an area specifically dedicated to direct experimentation allowed many students who daily pass through the exhibition space next to the conference room to test first-hand digital products and immersive experiences.

In recent years, virtual reality has become increasingly important in the communication and fruition of cultural heritage thanks to increasingly advanced experiments of interaction between real and virtual and sensory involvement.

The search for effective processes for the application of information systems and parametric modeling tools to the built heritage has advanced, in the direction of increasing automation, in order to integrate survey and modeling and to effectively manage the complexity of historical architecture. These lines of research have been witnessed by numerous and diversified interventions that testify to the plurality of experiences in progress.

In this framework, an important role is played by the so-called 'scan to BIM' processes that combine advanced survey campaigns with TLS (Terrestrial Laser Scanner) technologies, sometimes integrated by photogrammetric processes and the use of drones with the construction of strategic parametric models for the documentation of the historical phases of the building and the management of interventions. Numerous experiences have been presented that focus on the modeling of complex geometric shapes to be manipulated within virtual reality systems, such as the one described by Alberto Sdegno, Paola Cochelli and Veronica Riavis on the reconstruction of some environments of the Modern Movement for immersive experiences or those proposed by DAda-LAB of the University of Pavia (intervention of Anna dell'Amico and Sandro Parrinello).

The translation of a complex and articulated architectural organism into the rigid and serial language of parametric modeling notoriously poses the problem of the necessary segmentation of the body of the building, which can be helped by an accurate semantic analysis that allows to discretize the building into interacting composing elements, as shown by the work carried out by Carlo Bianchini and Giorgia Potestà on the

Baptistry of San Giovanni in Florence. The discussion also showed how the difficult task of creating information models on historical buildings and associating heterogeneous data sets to these models can be usefully supported by an integrated use of BIM and other forms of mathematical modeling based on algorithm generation. In this direction, the theme of interoperability between BIM systems and VPL (Visual Programming Language) systems has been addressed by two presentations (by Adriana Caldarone, Tommaso Empler and Maria Laura Rossi; and by Massimiliano Lo Turco, Michele Calvano, Elisabetta Caterina Giovannini and Andrea Tomalini).

The research in the field of immersive experiences related to the reconstructions of hypothetical or existing environments intended for an increasingly wide audience presented at the conference were different. These are crucial systems of immersive visits to document cultural heritage, for example in the field of archaeology, as evidenced by the case presented by Davide Borra of the 3D agency *No Real Interactive* of Turin, dedicated to the archaeological site of Augusta.

Besides, in the context of Italian design, Cecilia Bolognesi and Damiano Aiello proposed an experience developed

with funding from the Ministry of Economic Development for the dissemination of digital practices in small and medium industries. This is the translation of a museum space, the Achille Castiglioni Foundation's studio-museum, into an interactive virtual environment, designed to deliver the experience of an important cultural asset to a wider public. On the contrary, the *M.I.R.A. Morandini* (intervention by Gabriele Pitacco, Antonio Giacomini) was born as an exclusively virtual museum, proposing the Extended Reality (XR) not so much as an instrument to design and visualize physical spaces, but as a project of a new spatial experience and therefore as a product. In both cases it is about edu-games, i.e. experiences destined to spread culture in an experiential and involving way.

Always in a museum context, the Piranesi project "*beyond the real*" (presented by Simona Calvagna, Federica Grasso and Cettina Santagati) proposes the virtual experience as the result of an interpretative process and as a tool for the "fruition" and understanding of the drawn space, also offering an interaction between virtual models and *maquettes*.

A less frequented topic emerged from some experimentations aimed at the enhancement and communication of



Fig. 1. Flyer of the event.



Fig. 2. Work session of the conference.

cultural heritage in schools, between virtual paths, augmented reality and gamification. Among these is the project dedicated to rural life in the Pusteria valley (presented by Alessandro Luigini and Alessandro Basso) which proposes the serious game as an educational path in virtual immersive reality aimed at primary school children to foster effective learning experiences. Finally, the scientific debate has not lacked connections with the productive, industrial and telecommunications world. In this context, the case study

presented by Fausto Brevi in collaboration with the Q-id studio (represented by Lorenzo Naddei and Luigi Spinazzola) exemplified the applications of VR in design and decision-making processes in the automotive design sector. The research presented by Anna Osello and Daniela De Luca, on the other hand, showed a possible application of parametric digital modeling to the field of business management through the reproduction of an interactive virtual warehouse functional to the optimization of organizational and production processes.

The potential for development in the field of VR and AR connected to the 5G network was finally highlighted both in the field of storytelling for the enhancement of cultural heritage (intervention of Stefano Brusaporci, Pamela Maiezza and Alessandra Tata) and in the field of communication of the architectural project. The project presented by Daniele Villa and Lorenzo Ceccon, developed with the engineering firm Altran (represented by Ioannis Paraskevopoulos) proposed a workflow to realize advanced communication products starting from BIM systems. The

experimentation, made possible by the 5G network, was applied to the project by Renzo Piano and ODB Architects for Politecnico di Milano, translated into an AR application in a real urban con-

text. Many of the researches presented will be collected in a volume now being published by Springer edited by Cecilia Bolognesi and Daniele Villa. The book, entitled *From building information mode-*

*ling to x reality* which also includes new contributions, aims to offer a comparison between different experiences in order to give a further insight into the progress of research in the field.

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