

Events

REACH-ID Symposium *Representation for Augmented Reality and Artificial Intelligence*

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The REACH-ID symposium (Representation for Enhancement and management through Augmented reality and Artificial Intelligence: Cultural Heritage and Innovative Design), originally scheduled in Turin on 26 and 27 May 2020, took place in virtual form (13 and 14 October 2020), to which events are converting due to the known needs produced by the pandemic. The formulation was particularly effective and compatible with the topics covered, allowing more immediate transitions between the different forms of digital content presented by the speakers, without preventing the sharing of analysis and critical considerations.

At the beginning, the president of the UID Francesca Fatta underlined the transdisciplinarity that characterizes the applications of Augmented Reality and Artificial Intelligence and the ability of the Drawing field to respond to this challenge, through the sharing and development of knowledge and of the methodologies that are its own.

The need for the contribution of representation is recognized by the first keynote speaker, Mario Rasetti, professor emeritus of Theoretical Physics, who emphasized the essentiality for the pursuit of one of the main purposes of Augmented Reality: achieving maximum effectiveness in communication.

Images make up about 70% of the volume of digital data which, as we know, is increasing exponentially. Mario Rasetti underlines how each representation filters reality through creativity: a selection that on the one hand subtracts elements from reality in order to add meanings through interpretation. Reality, inherently indefinable, allows the image to preserve the centrality of its role in identifying the essence and foundations of the content to be communicated.

The symposium was attended by six other keynote speakers who provided a vast panorama of the opportunities currently offered by Augmented Reality and Artificial Intelligence in various fields of knowledge and contemporary life, thanks also to further developments in technologies and processes.

The second session was inaugurated by Claudio Casetti, Computer Science teacher at Politecnico di Torino, who illustrated the progress of the various generations of the mobile network up to 5G, whose evolution is not limited to greater speed, but presents new potential through the collection of data of individual users. Casetti described a new generation application that establishes a renewed relationship with the monuments of the city of Turin, favoring virtual tourism, but also the detection of people's flows with the aid of sen-

sors: one of its applications, aimed at collecting data on the museum attendance, resulted from a collaboration with a research group in the drawing area.

Michele Bonino, Composition teacher at Politecnico di Torino, inaugurating the third session, presented *Eyes of the City* (Hong Kong and Shenzhen Biennial of Urbanism/Architecture, 2019), an exhibition experience capable of representing the potential of Artificial Intelligence applications. An overview of the installations reveals a great interest in the logic of Design Intelligence, aimed at incorporating the transposition of data flows into the design process. Within the exhibition, a platform for facial recognition and identification of visitors' movements suggested elements of critical discussion on the impact of new technologies on architecture and urban planning. Bonino concluded with the presentation of some works by Philip F. Yuan that exemplify the orientation towards a use of technologies that does not overshadow creative freedom.

Simone Milani, Computer Science teacher at University of Padova, opens the fourth session describing recent solutions and open problems in Mixed Reality for Cultural Heritage and Building Information Modeling. Milani stressed that MR is spreading in many sectors because the interaction estab-

lished with the user; thanks to the mixture of virtual and real elements, makes it effective for the knowledge of Cultural Heritage, but also for the simulation of emergency situations. In this regard, the virtual reality helmet designed with the Politecnico di Torino is mentioned, which allows any rescuers to view virtual dangers in a real context. Milani also highlighted how the solutions offered by Machine Learning technology largely depend on the quality and quantity of the data provided. The problems encountered are those that are commonly generated in images, as happens for photographs of the same subject which, if strongly differentiated in light exposure, make automatic recognition difficult. An implementation can be provided by Deep Learning technology, which can lead to the identification of visual characteristics capable of allowing a more constant identification of the subject. The fifth session is opened by Fabrizio Lamberti, teacher and director of Grains (Graphics and Intelligent System Group)

at Politecnico di Torino, who offered an interpretation of the relationships between Computer Graphics, Computer Vision, Human-Machine Interface (HMI) and Artificial Intelligence. The convergence of CG, CV and AI technologies is described through the exemplification of different applications involving various sectors, from marketing to Virtual Care. Lamberti stressed that, for a better diffusion, technologies must become easier to approach even outside the specialized sectors and reduce processing times. One of the most challenging phases is the preparation of the images, which can derive from scans of reality or from creative processes. A significant case is that of the creation of animated characters and their use in AI technologies, which can rely on Body Tracking to capture the movements of a real character equipped with sensors. Lamberti presented research that focuses on the optimization of working times by eliminating the phases that show little influence on the final result or by selecting the actions to

be assigned to the character. The applications described also include those related to the assessment of learning, with the examination of some technical and perceptual aspects acquired by students in the creation of three-dimensional animated images. Other application fields involve Action Recognition to be used in sports training, proving how, through Computer Graphics, it is possible to create useful images for the training of machines in Artificial Intelligence modes. Eleonora Grilli inaugurated the sixth session and presented a shared contribution with Fabio Remondino on the state of the art and possible developments in the sector of 3D Modeling for Cultural Heritage. Grilli showed the applications of Machine Learning techniques to the interpretation of 3D representation, through a classification of architectural elements that should make use of procedures that are as automatic as possible. The difficulties obviously reside in the quality of the objects subjected to analysis, which are distinguished precisely by their uniqueness and which, therefore, are not easily assimilable to each other, without careful critical examination. The techniques were subjected to validation in the comparison between the results obtained with the tools and through visual examination. Furthermore, methodologies that can be extended to stylistically similar cases have been identified, specifying new perspectives offered by Deep Learning in preparing datasets of architectural elements.

The seventh session is opened by the designer Alberto Tono with a variety of experiences in the application of Augmented Reality and Deep Learning techniques for the definition of architectural design solutions. Tono compares the analogical methods with softwares that integrate the sketches and photograph-

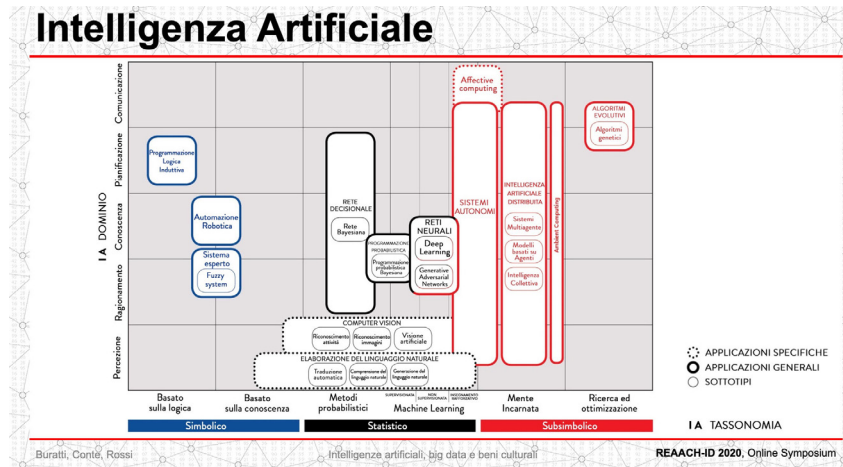


Fig. 1. Classification of AI application fields, logic and technologies (Giorgio Buratti, Sara Conte, Michela Rossi).



Fig. 2. Logo of the event.

ic shots present in the current widely used tools, and then illustrates possible specific implementations in architectural design, such as the possibility of carrying out formal Real Time modifications and analyzes in a parametric environment. Tono described the potential offered by virtual collaborative design, which allows the people involved in the process to be placed at the center; with their emotions and expressions, thanks to the visualization of the AR. It is also possible to eliminate interruptions in the design flow in the transition between the phase of formulating an idea sketch and its translation into a three-dimensional model, thanks to the interpretation of the first through an abacus of shared tools. The admixture of images with real elements can enter the service of inserting creative elements into the urban environment, using photographic image repertoires available on web and their use for the generation of 3D videos. Many solutions are taking shape within some of the most important software production houses, which make the design process more fluid and communicative.

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The heterogeneity of membership and scientific characterization of the symposium promoting committee (Andrea Giordano, University of Padua; Michele Russo, Sapienza University of Rome; Roberta Spallone, Polytechnic of Turin) and of the scientific committee (which counts, in addition to the promoter committee: Salvatore Barba, University of Salerno; Marco Giorgio Bevilacqua, University of Pisa; Stefano Brusaporci; University of L'Aquila; Francesca Fatta, University of Reggio Calabria; Alessandro Luigini, Free University of Bolzano; Cettina Santagati, University of Catania; Alberto Sdegno, University of Udine) contributed to articulating the formulation of the call and, consequently, of the contents presented at the event.

The vast response to the REAACH-ID symposium call, with thirty-six speeches and forty online videos, demonstrated the need for the drawing area to participate in a highly topical critical debate, which the event allowed to feed, also at transdisciplinary level. It is not possible to mention all the interventions of the eight sessions and not

even all the universities to which the speakers belong; but as a whole it has been possible to recognize how the Drawing sector has shown not only the ability to understand the extent of technological innovations, but also to provide an important contribution in the fields of its own pertinence. There were innovations susceptible to further developments resulting from the traditional ability of the sector to dialogue with various disciplines that converge in studies related to the investigation and design of architecture, urban spaces and the environment, in addition to research on Cultural Heritage.

Augmented Reality has revealed various ways of its communicative power but also its ability to become a cognitive tool of three-dimensional elements, which can be better understood if contextualized in the context of Mixed Reality. Artificial Intelligence, in turn, has developed in the various sectors in which the application of automatisms allows the operator and researcher to reserve unreliable critical activities for the machines.