

1st Various Innovative Technological Experiences (VITE I): Virtual Augmented Reality for Disseminating Science: New Frontiers and Challenges

CNR - Palermo, November 28 to December 2, 2022

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FOREWORD

In the last years, many researchers in Italy felt the urgency to meet and discuss the use of innovative technologies for the communication and dissemination of science and to share experiences, good practices, activities, ideas and projects not only among the scientific community, but also in schools, public and private institutions and companies.

The opportunity occurred at the end of November 2022, with the meeting “Various Innovative Technological Experiences (VITE I): Virtual and Augmented Reality For Disseminating Science: New Frontiers and Challenges”, held in Palermo and organized by INAF Palermo Astronomical Observatory, together with other structures of the Italian National Institute for Astrophysics, CNR ITD, CNR ICAR, CINECA VisitLab and IEMEST, within the project Prin INAF “Virtual Reality and Augmented Reality for Science, Education and Outreach”.

Technologies like augmented reality, virtual reality, robotics, holograms, digital twins, etc. are influencing every aspect of our social and working life. They have a vast field of application: as an example, 3D visualization of scientific data and processes is really important for researchers, because it conveys complex information in an immediate visual way, and it facilitates analysis and understanding of case studies.

New technologies, such as virtual, augmented, mixed reality, digital twins are appealing and easy to grasp for the public and can be used also for effective storytelling and to engage different audiences’ targets, therefore they are extremely useful for public engagement in science.

They are enormously effective when applied in the field of teaching, because in addition to being particularly engaging, they stimulate students’ enthusiasm and positive attitude towards science and related topics in general, increase their motivation and comprehension and, at the same, allow them time to acquire additional skills and capabilities – informatics, decision-making, logical method, creativity, memory, problem solving, critical thinking, team working, adaptability.

AR/VR and other innovative instruments can be successfully applied in the field of tourism, in particular for the fruition and enhancement of cultural heritage, allowing multi-sensorial experiences and access to insights and interactive contents; they enrich the user experience and allow to visit reconstructed environments that no longer exist, or to places that are not accessible or simply too far to be easily reached.

Innovative technologies can be successfully applied to benefit the territory and society: in the fields of engineering, architecture, astrophysics, in the medical-health field and for monitoring of the territory for example and in recovery from trauma, etc. Particularly in the years of the COVID-19 pandemic, when the rules of distancing did not allow meeting in the physical world, they made it possible to create interactive environments and recreate communications and personal relationships.

In the industrial field, the use of automation to improve the efficiency of industrial production lines and quality controls on products is a rapidly growing trend; moreover, tools such as digital twins allow to simulate interactions directly on the digital copy of an object or a process, guaranteeing enormous advantages such as minimization of costs, ease of control and maintenance, process optimization, reproducibility.

Innovative technologies, and in particular augmented and virtual reality and robotics, can represent not only support and therapy instruments for different types of disabilities, but also be effective tools for help people with disabilities of various kinds: e.g. allowing virtual access to environments where they otherwise could not enter, to people with motor disabilities, promoting a simpler man-machine interaction, facilitating accessibility of contents. Even visually impaired people can understand objects through touch, holding 3D prints, or through data sonification.

These technologies can also enhance inclusion, enabling impaired people to develop new skills and, in a certain way, to 'augment themselves'.

We are now accustomed to seeing the application of innovative technologies in the media, especially in the cinema, also for the spectacular effects that can be obtained. The use of innovative media and social media tools is extremely effective for communicating complex contents to a non-specialist audience and there is great experimentation in the creation of digital educational products and editorial proposals that use augmented and virtual reality for their appeal and to establish a better interaction with the public, to optimize content understanding and, above all, to involve young people.

From the Palermo meeting emerged a rich landscape of various innovative technological experiences, which are not exhaustive, but indicative of the fact that in Italy today innovation and science offer opportunities never seen before. Digitization, innovation, investment in new technologies and scientific culture are of strategic importance, have a considerable effect on the development of the territory and have a significant impact on the educational and economic system of our country. However, there is the need for a common vision that involves and unites the country system, - the government, the universities and research, the productive and technological companies and the schools.

We have to work together, put in common ideas, experiences and skills to start actions to boost an effective digital and technological transformation of our country, creating favorable conditions for innovation to be generated and training the new generation to use technology consciously, and providing them with the skills for "the jobs of the future". Workers, teachers, and students need to know how to use new technologies. Many schools today are equipped with incredible hardware and software, but remain locked up because no one is able to use these devices.

VR and AR can be incredibly engaging tools, but they must convey valuable contents, otherwise they can be considered as amusing video games only. New technologies must be easily accessible and simple to use and have to create authenticity and involvement. Experiences have to be emotional, fun, interactive, engaging and rich of information capable of adequately stimulating various perceptive channels. There are many solutions and possible new workflows that could also include artistic perspectives to the goal of opening up our knowledge to the community. Above all, the design of each experience must be user-centered and it is necessary to implement effective evaluating methods, in order to verify any usability problems that users could have encountered and accepting possible suggestions for improvement. The aim of the meeting was precisely to start building a network which, through a collaborative, open and dialogic approach with society, uses innovative technologies to support science, but also serves for communicating research and sharing knowledge, in order to drive an effective cultural, social and economic development. The main experiences presented during the meeting are reported in this volume.

We thank the Assistant Editors, Maria Teresa Menna, Marco Castellani and Rocco D'Agostino, for the help and support in the preparation of this volume.

