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Panoramas, Keys to Unlock Complexity in Digital Humanities and Data Humanism
Methodological Analysis, Performance Assessment and Cataloguing of 31 Real Cases

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Abstract In the interdisciplinary landscape shaped by Digital Humanities (DH) and Data Humanism (DHu), panoramas represent immersive narratives and interactive environments that simplify access to complex, interdisciplinary content, serving as 'sensory forms of knowledge'. However, the lack of shared definitions hinders their integration into cultural sectors, where professionals often struggle with the rapid adoption of new technologies. Therefore, this study highlights 31 panorama case studies as examples of their triggering effect and as a foundation for broader collaborative theoretical work aimed at developing standardised definitions.

Keywords 360° panoramas. Immersive content. Human perception. Complex environment. Storytelling.

Summary 1 The Work Frame. – 2 Applications of Immersive Media in Phygital Environments. –3 Panoramas: "Sensory Forms of Knowledge". – 4 The 4th Dimension: Panoramas Immersive Playing. – 5 Conclusions.

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1 The Work Frame

In a scene currently characterised by the re-convergence of humanistic, technological, and scientific knowledge[1] into the Digital Humanities (DH)[2] and Data Humanism (DHu)[3] realms, panoramas are much more than one among many digital or visual instruments in accessing, exploring, and manipulating cultural data and content. Panoramas bring together visual narratives, immersion and – most of the time – interaction, which means they can provide a new physical and/or virtual environment in which senses are misplaced or questioned (Schnapp 2015; Flores, Martins 2023) and new points of attention are propose (Asisi 2018; Araújo 2021; Masiero Sgrinzatto 2023). Panoramas can be considered as a way to simplify the access to complexity[4]– generated by interdisciplinarity – and to enable an emotional rather than rational approach as an efficient entry point to the provided multi-layered content.[5] According to Whyte and Cardellino (2020) they can be considered a "sensory form of knowledge".

On the other hand, the convergence of disciplines which are characterised by their epistemology, specialistic vocabulary and sectorial understanding, together with the fact that the dialogue, exchange and crossing between different sectors is generating innovative tools, methodologies and questions, and with the awareness that the most

1 Until the Illuminism, knowledge was considered as a whole and it is no coincidence if Al-Kindi – known as the 'Philosopher of the Arabs' – made significant contributions both in the development of cryptography and the introduction of Indian numerals to the Islamic world; Aristotle excelled equally in Philosophy, Biology, Ethics, Politics, Rhetoric; Paracelsus and Giordano Bruno operated between Medicine, Philosophy, Theology, Alchemy, Astronomy; Johann Wolfgang von Goethe is renowned for his literary works, such as *Faust*, as well as his contributions to the study of plant morphology and colour theory; Leonardo because of its creations in the fields of arts, civil engineering, chemistry, geology, geometry, hydrodynamics, mathematics, mechanical engineering, optics, physics, pyrotechnics, and zoology. Today, technology is functioning as a catalyst for recombination and crossing different fields of knowledge (Barabási 2023; Weinberger 2019; McGonigal 2011; Johnson 2011).

2 A comprehensive definition and statement on the evolving scope and aims of Digital Humanities can be found in Schnapp, Presner 2019 and in Gold, Klein 2020. See also Ciotti 2023.

3 Data Humanism is a concept prominently championed by Giorgia Lupi (2017a; 2017b): she argues for a more human-centric approach to data visualisation that incorporates narrative, context, and aesthetics. The term appears for the first time in her manifesto "Data Humanism: The Revolution Will Be Visualised" published in 2017. According to Lupi, "Data Humanism" is about how we can make data more human and more engaging, transforming data into a medium that can convey complexity and humanity. See also: Ferreira, Nisi, Nunes 2023; Canossa 2022; Eberhard 2021.

4 Cf. Rittel, Webber 1973; Schon 1983; Heller, Landers 2014; Lupi, Posavec 2016; Weinberger 2019; Masud et al. 2020; Trocchianesi, Bollini 2023.

5 Cf. Arnheim 1969; Savela et al. 2020; Eberhard 2021; Canossa et al. 2022; Vallance, Towndrow 2022; Trocchianesi, Bollini 2023.

of epistemologies in DH and DHu come from Westernised and Anglophone contexts and assumptions, showing an evident lack from Global South perspective (Mahler 2017; Fiormonte et al. 2022), it is urgently required a new set of shared and formalised panoramas' definitions and a proper semantics which can improve/unify existing ones and goes beyond mere commercial-purpose glossaries as the ones proposed by Del Nero (2019) or Cheng et al. (2022).[6] Humanities need to describe products, services and data which come from or belong to alien domains; most professionals and decision makers from the cultural sectors are still not aware of technological/scientific nuances or deeper implications of the labels they use. It happens this ends up in inappropriate publications or speeches, adoption of tools which are not suitable for given content, and in challenging situations when they have to cope with standards (Szabo 2021), innovation, markets – and sometimes misleading providers, which they do not govern (Dobson 2019; Guiliano, Estill 2023). Moreover, the high-evolutive-speed and the strong and sudden impact which characterise technology move against the extreme slow-processes and medium/long-term impact of cultural actions – in the public (Museums, Cultural Institutions, etc.) and in the private sector (Creative and Cultural Industries) alike. This generates an unbalanced, out-of-control scenario and languages in which attractive tech devices/software multiply and update daily while cultural content is left behind. This is true also for panoramas.

Tens of panorama's typologies are already available on the market and each of them has different technological features and high potential to support DH and DHu in managing complex issues and content. They can help re-reading, in a critical way, the potential of the experience of knowledge and its forms of representation (Trocchianesi, Bollini 2023; Araújo 2021). However, the weak knowledge, the lack of a shared definition apparatus and the slow reaction of cultural players in respect to the fast technological advancement implies a minimal adoption of IT tools and products in the cultural sectors, the fact that new instruments are not necessarily adequate to solve the needs for which they were adopted, and are purchased at the 'right price'.

Over the years, the authors have carried out different works, matured through direct collaboration with research groups dealing with DH and DHu. Therefore, this paper presents 31 case studies (28 of them developed by the authors), each of which suggests how immersive panoramas can support to make DH and DHu complex content accessible through an emotional, relational and interactive approach. In parallel, the selection of cases is also functional to push researchers and professionals to proceed with a shared set of definitions in

6 Cheng, E. et al. (2022). "Immersive Media Glossary". 11 February. https://creator.oculus.com/getting-started/immersive-media-glossary/.

order to clarify panoramas' specificity and facilitate a more appropriate choice and application.

1.1 Focus and Methodology

This research investigates immersive media[7] and particularly it concerns 360º panoramas (e.g. panoramic photography, virtual tours (Jacobs 2004), 360º illustration and 360º videos), having several similar characteristics: (1) they depict the whole visible environment from a single point of view – 360º on the horizontal axis, 180º on the vertical one – allowing the user to explore the environment in all directions and having the feeling of being immersed in the scene; (2) they have 3 Degrees of Freedom (3DoF) – the viewer's eye, that is virtually located in the centre of a sphere, has the ability to look around – roll, pitch and yaw – but not to change his viewpoint, with the exception of 360° videos in which the camera that captured the scene is moving, drawing the viewer along.[8]

The work considers different typologies of panoramas developed for different purposes and addressing wide targets or specific audiences. The majority of selected cases are characterised by being 'hybrid' media which enhance experiences both in the physical and in the virtual world. These are 'digital doubles'[9] (Dixon 2005; Masiero Sgrinzatto, Vascon 2022)[10] rather than 'digital twins' or 'digital

7 Immersive media is a term with a broad meaning: it refers to a variety of media formats delivering digital narrative experiences that give the audience a strong sense of immersion or presence. They can be viewed on a computer or mobile device, or they can be used in virtual reality (VR) or mixed reality (MR) experiences. It is a rapidly developing field in which new techniques and applications are constantly emerging. Immersive media are powerful established tools in sectors such as industry and healthcare (Yeo et al 2020); tourism, real estate and cultural heritage (Walmsley, Kersten 2020; De Vincentis, Vascon 2020); gamification (McGonigal 2011; Bittanti, Zilio 2016); edutainment and education (Sucurado, Olivero 2019; Flores, Araújo 2021). Moreover, immersive media are considered an emerging Art form: in recent years, the field has made great progress thanks to new technological developments, both in terms of theoretical studies and practical applications. Many artists are working with 360° spherical content to create interactive immersive experiences, and the increasing number of festivals and events with a section dedicated to immersive projects testifies to the interest in experimenting with these media (Modena 2023).

8 Cheng, E. et al. (2022). "Immersive Media Glossary". 11 February. `https://creator.oculus.com/getting-started/immersive-media-glossary/`.

9 Digital double in this context is a term introduced in this field at the talk "Tribuna VR360 at Palazzo Grimani" held by C. Masiero Sgrinzatto and L. Vascon (15 July 2022) at the Seminar *From Digital Museography to Contemporary Artistic Practice: Venice, the Biennale and Beyond*. Venice Summer School in Digital and Public Humanities, Fondazione Querini Stampalia. `https://www.unive.it/pag/39288`.

10 C. Masiero Sgrinzatto and L. Vascon at the Seminar *From Digital Museography to Contemporary Artistic Practice: Venice, the Biennale and Beyond*, 15 July 2022. Venice

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replicas' (Semeraro et al. 2021) as the digital product is not a mere reproduction or translation of what is happening in the physical dimension, but a new content which adds information, parts of experience and enlarges the impact by involving different senses and opening the possibility to engage new targets (Carrozzino, Bergamasco 2010; Kersten et al. 2018; National Endowment for the Arts 2019).

A further common element which was considered in the selection of the panoramas was the application of the medium mainly to the cultural field with the purpose to empower it, to connect it to other knowledge fields, to give access to buildings and experiences which are not open to the public, to allow real life 'impossible' experiences, to create the opportunity to enjoy a situation (an exhibition, an installation, a special event, etc.) in the long run beyond its end or even before its start.

Part of the selected panoramas were implemented during COVID-19 time in atypical conditions such as no people around, possibility to have longer time for shooting or drawing, urgent necessity of the institutions to display their heritage in a new way because of the impossibility for the public to join it physically in lockdown periods. This gave the chance for more extended experimentations, observation and development of new approaches according to different needs, content and targets. Finally, a few panoramas can be considered still as open construction sites and labs in 2024, in which authors are exploring, applying, critically discussing and continuously learning from the hyper-fast evolution of technologies which include AI as a tool and the Metaverse as possible future environment.

2 Applications of Immersive Media in Phygital Environments

Thanks to the intrinsic nature of immersive illustrations, photographs and video, immersive media can bridge experiences between different disciplines by providing a visual representation of a situation that enhances, rather than replaces, the physical experience (Lupi, Posavec 2016; Tham et al. 2018; Canossa 2022). This can help players from the DH and the DHu to connect diverse audiences, making knowledge more engaging, accessible and understandable. Although the engaging value provided by the novel technology (Wu et al. 2020), studies highlight that in certain cases it can produce unexpected or even negative results which need to be explored more in depth (Savela et al. 2020).

Different visualisation modality produce various levels of immersion, and consequently different degrees of illusion and presence

Summer School in Digital and Public Humanities. Fondazione Querini Stampalia. https://www.unive.it/pag/39288.

(Milgram, Kishino 1994): from low-immersive interactions and displays like a computer screen "substituting the wholeness" (Naimark 1991); to an almost total-body experience, thanks to VR headsets, immersive audio technologies and haptics wearables. Furthermore, special environments like projection domes, and CAVEs can provide full immersive experiences even without wearing any further device.

According to Vallance and Towndrow, technology used is not directly related to the effectiveness of the message but it reflects personal narratives and emotions the participants are perceiving while living a virtual experience:

> embodiment and presence shift the perspective of the participants 'into' the story: storytelling becomes storyliving. (Vallance, Towndrow 2022)

Narrative 'storyliving' (de la Peña 2015, Papagiannis 2017) unfolds as participants experience the virtual content, adding their imaginary visions mediated also on their own living and knowledge. Even when users can decide to adopt low-tech solutions such as analogue images (Asisi 2018; Araújo 2021; Masiero Sgrinzatto 2023), immersive strong phygital experiences can result in meaningful and highly engaging, turning complex concepts into tangible and visible ones. The context itself, in which the content is experienced could also dramatically change the viewer's perception. For example, looking at a graphic representation of a known place makes that immediately recognisable and enables both the author and the user to add narrative layers/messages. According to Arnheim (1969), everything that we think of is based on pictures; concepts are perceptual images, thinking processes are the treatment of these images, and pictures are the main organisational devices in thinking processes.

The same mechanism works in 'time-travel' interactive experiences: these products create a narrative that provides the condition for the viewer to explore a location or event as that location was in the past or that does not exist yet and to compare/merge it with real elements/environments from the present. This can enhance the viewer's perception and understanding of the changes and of the evolution of the situation or event over time.

On the contrary, a narrative can sometimes require a disassociation between the real world and the virtual (depicted or imaginary) world to create a certain story or situation. Participants need to be puzzled and the image could take time to be fully understood. Geometrical distortions of the spherical projections and special techniques of representation could help achieve the expected effect.

It is also a matter of balance between storytelling and technology when used to display content, and the frame in which this content takes shape: this balance contributes to the effectiveness of the message conveyed.

3 Panoramas: "Sensory Forms of Knowledge"

3.1 Panoramas for the Big Audiences: Monumental Towers and Domes

The panoramic painters of the late eighteenth century embodied a unique blend of artist, scientist, and entrepreneur. Extensive research preceded their monumental works: for months on end, they meticulously divided an imagined mosaic into countless small squares and translated them into preliminary drawings. According to cultural historian Stephen Oettermann (1997), the panorama emerged as the art world's response to the revelation of the horizon, liberating common people from the narrow perspectives of their mediaeval ancestors. Today, approximately 30 historic panoramas are displayed worldwide. Yadegar Asisi is known for his monumental works, and likened to Christo and Jeanne-Claude, who transformed perspectives on art with their oversized, unconventional mix-reality installations. Asisi's artistic journey defies genre conventions, blending perspective painting, spatial simulation, stage design, and a profound understanding of human perception with a penchant for detail and grandeur. Flores and Martins (2023) define it as "immersion and expanded spectatorships". Asisi's panoramas place humans at the forefront of staged realities (e.g. Berlin Mauer, NY 9/11, etc.), revitalising and redefining the art of panorama in the twenty first century (Asisi 2018). With an audience penetration equal and even greater than that of XR technology, the immersive, fully analogue panoramas of Asisi contribute to historical understanding by reanimating past environments and experiences, while also addressing methodological challenges and ethical considerations (Oettermann 1997; Thompson 2015; Kersten et al. 2018).

The exhibition *Congo Panorama: Unveiling the Past with Virtual Reality* is the outcome of the research project CONGO VR – FilmEU RIT[11] that photographed and unrolled the Panorama of Congo **[fig. 2]**.[12] The project was aimed to reinterpret the local violent historical context through VR used by artists from the Congolese diaspora such as Kongo Astronauts (Eléonore Hellio and Michel Ekeba), Deogracias Kihalu, Lukah Katangila, Hadassa Ngamba and Castélie Yalombo. In this case, the Panorama of Congo has the function to provoke the

11 The research project *Congo VR – Decolonising the Panorama of Congo: A Virtual Heritage Artistic Research* is one of the projects funded by *FILMEU RIT – Research | Innovation | Transformation* project, European Union GRANT NUMBER: 101035820 H2020-IBA-SwafS-Support-2-2020. https://congopanorama.filmeu.eu/news.

12 The painting is part of the collection of the War Heritage Institute.

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debate on decolonisation and decolonial thinking, raising questions related to colonial heritage, memory and identity. In *Congo Panorama* as well as in Asisi's works the audience is offered a collective experience: visitors become part of the scene and the 1:1 ratio of the panoramas push the perception to be living real events in the real world, to be the protagonist in a "reanimated past" (Thompson 2015).

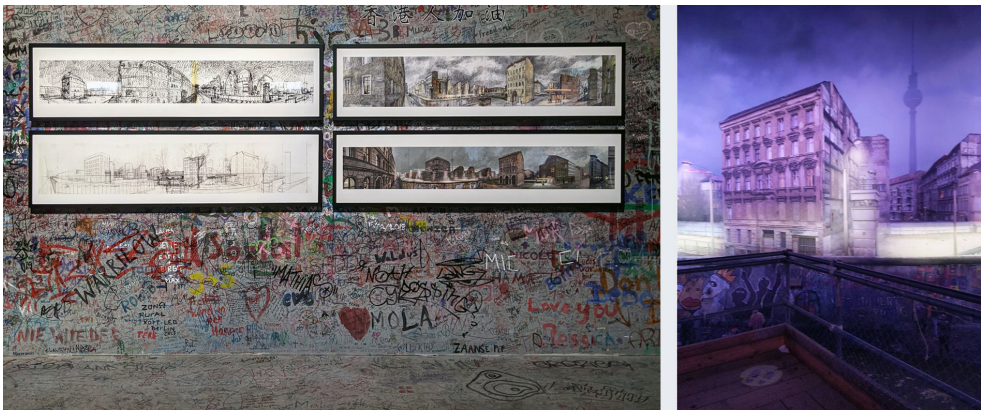

Figure 1 *Die Mauer*. Yadegar Asisi Panorama. Berlin. Preliminary Sketches by the Artist (left) and view of a detail of the panorama from the observation platform (right). © credits Author

Figure 2 Exhibition of the *Panorama of Congo: Unrolling the Past with Virtual Reality*. Museu Nacional de História Natural e da Ciência, Lisbon, 25 February-30 June 2024. Source: https://www.filmeu.eu/news/panorama-of-congo-unrolling-the-past-with-virtual-reality-exhibition © credits Tomas Vandecasteele

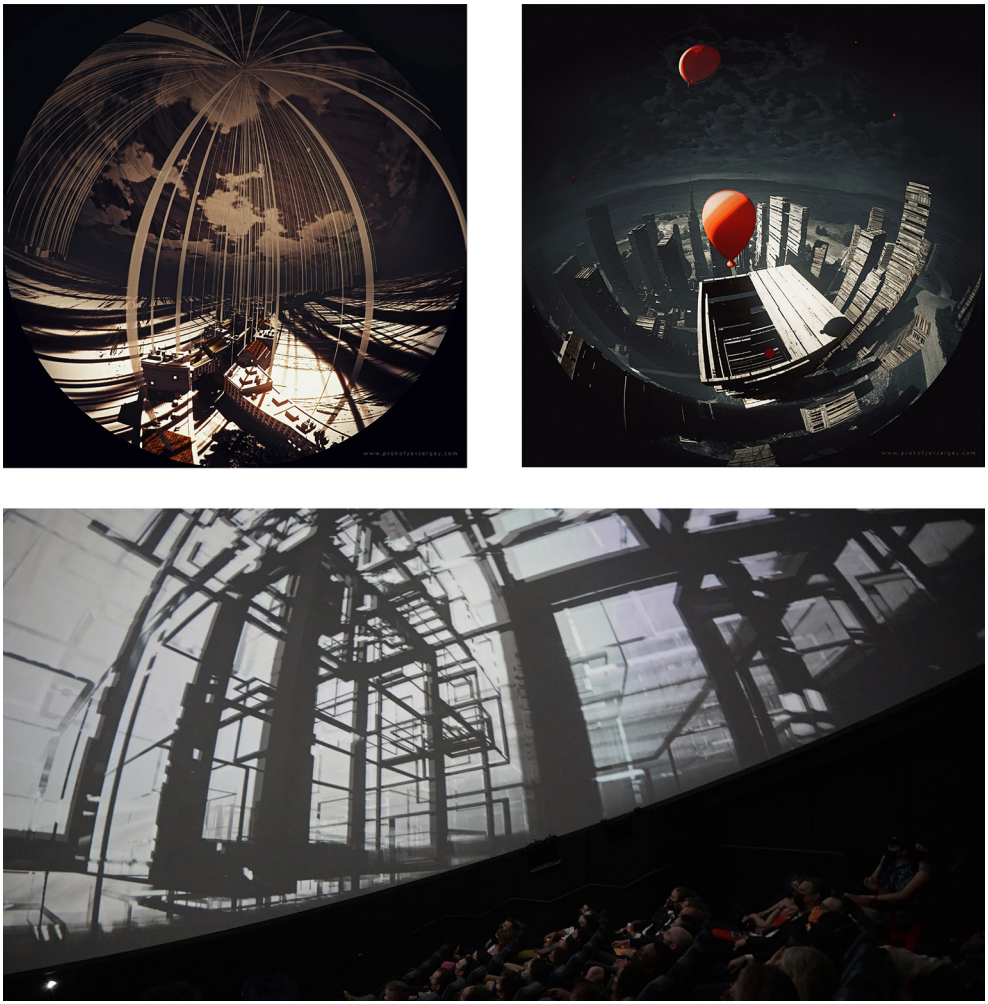

Figure 3 Sergey Prokofyev, from top left: *Local Dystopias in the Global Utopia* (2024). *Labyrinth* (2021) projected in a planetarium during Horsetooth International Film Festival. © Sergey Prokofyev

With Sergey Prokofyev, the exploration goes beyond History and opens new ways of architectural communications tools through immersive video in immersive dome screens and big-size planetaria (Dembski et al. 2019; Biggs, Desjardins 2020; Barabási 2023). In works such as *Local Dystopias in the Global Utopia* (2024) or *Labyrinth* (2021), the immersive environment becomes an important part of the message as it allows a collective experience into architectural

tales (Dembski et al 2019; Prokofyev 2024).[13] The first one is a journey through three dystopian worlds: *High Rise Cult*, a forsaken village where wooden skyscraper replicas are buoyed by balloons, symbolising fragile hopes; *The Doomed City* draws us into a city birthed in no man's land, influenced by a painting by Nicholas Roerich; a third architectural tale is *Phygital Limbo*. In these hemispherical panoramas the digital environment is continuously stimulated by synthetic engines based on human emotions with the artistic intention to make the audience experiencing a conscious collective dream. Therefore, this experience challenges users' perceptions, providing "metaphors as knowledge" (Elli et al. 2021), blurring the boundaries of architectural imagination and reality. *Labyrinth* instead proposes a space viewed from above in which we have an objectively distinguishable idea of a line, a pattern or an ornament. However, being a labyrinth, the audience falls under the visual impact of a particular configuration of space, which it is impossible to get out of, being stuck in the disorientation effect and it is finally pushed to switch to a subjective perception of life. As we move continuously, the perception of the labyrinth space changes every second, in a kind of walk through. squares, streets, passages, corridors, rooms and finally through time. These panoramas demonstrate how relevant the effects of visualisation can be on judgement and decision-making (Eberhard 2021).

3.2 Panoramas to Enable Multiple Experiences, Complex Content and Reach Multiple Targets

In October 2018, at the end of the Centenary of World War I, the Vaia storm eradicated a wide portion of forest in the Italian Alps and a piece of collective memory and imagination with it. The Veneto Region and the Italian Presidency of the Council of Ministers promoted a call for projects which had to be developed in the territories affected by Vaia and 100 years before by WWI. The two awarded projects: *La montagna nel cuore e nella penna* (Mountain in the Heart and in the Pen – MHP) and *Reborn. La montagna che rinasce* (Reborn. The Awakening Mountain – RAM) were both designed and developed in 2020-21 to document and interpret the impact of Vaia and the WWI in four pilot areas in North-East Italy, by changing the perspectives and calling individual and collective responsibility towards historical facts and environmental questions. MHP and RAM adopt a transmedia narrative approach, combining Art, History, Environment, Territorial Development, Literature, Panorama Drawing and Photography, and consider each media element as a puzzle piece. When the

13 https://www.prokofyevsergey.com.

pieces are put together, they form "the bigger picture of the story" (Hovious 2016).

> From the consumers' perspective, transmedia practices are based on and at the same time promote multiliteracy, which is the ability to interpret discourses from different media and languages. (Scolari 2009)

Actually, in the two projects, complex correlation of data, sources, stories, evidence, traces, immaterial and material cultural heritage, concur to build a combination of different languages and points of view.

3.2.1 Mountain in the Heart and in the Pen (MHP)

MHP[14] focuses on three pilot areas: Asiago Plateau, Belluno Dolomites and the Prealps. It is conceived as an edutainment story to be experienced through a series of artist residences, in-person actions, a graphic editorial product, but also in the digital dimension through mobile devices or VR headset. MHP developed a series of infrared 360º photos, a set of 360º illustration panoramas and a collection of collaborative panoramic drawings.

3.2.1.1 Infrared 360º Photos

Sometimes, to better understand our reality, it is necessary to change our point of view, put on different lenses, investigate levels of meaning and perception that have never been explored before (Walmsley, Kersten 2020). Nine infrared panoramas[15] are the result of a gaze pushed into the invisible world, beyond what the human eye can grasp, light beyond 700 nm. The effects are distinctive and fascinating: leaves reflect the light assuming a bright white appearance (wood effect), the colours of the landscape become surreal, living and dead matter emerge.

All panoramic images were taken with a Fujifilm X-A10 camera modified for near infrared, an adapted Nikon 10.5 mm Fisheye lens,

14 Designed and implemented by the Associazione Culturale Think, Say, Do (s.d.). "La Montagna nel cuore e nella penna [MCP]", with the involvement of 21 professionals. https://www.tsd-projectlab.it/progetti/mcp; MHP project © Associazione Think, Say, Do (2021). Curated by E. Zilio.

15 Associazione Culturale Think, Say, Do (s.d. b). "Oltre il visibile, dove distruzione e rinascita si incontrano". https://www.tsd-projectlab.it/onair/esp-1-infrarosso. MHP project © Associazione Culturale Think, Say, Do. 360º photographs © L. Vascon (2021). Curated by E. Zilio.

a special head and a tripod with levelling base. Each image is made up of a total of 25-30 shots, then merged together.

Figure 4 Luca Vascon, *Processore sulla strada dei Cippi*. 2021. Digital infrared 360° photograph, 13822 × 6911 px. Printed on Plexiglas, 30 × 60 cm. Asiago (VI) © Luca Vascon

The infrared photos were displayed in *Alberabilia* exhibition in Venice and in Ostana (IT) as equirectangular images (spherical format mapped on a plane surface) printed on a Plexiglas surface, so that visitors could get a different perception of the places depicted and question themselves about the photos' subject, because of the infrared technique but also because no VR navigation was induced and a native virtual 360° image regained its analogic dimension (Sucurado, Olivero 2019).

3.2.1.2 360° Illustration Panoramas

A collection of nine panoramic sketches[16] opened up the view of the Asiago plateau, the Dolomites and the Belluno Prealps on the plane surface, allowing users to grasp all the events that affected them 100

16 Associazione Culturale Think, Say, Do (s.d. c). "Zoom out, zoom in – conoscere, capire e agire". `https://www.tsd-projectlab.it/onair/esp-2-disegni`. MHP project ©

years ago and yesterday, and at the same time to explore them in detail. The images – real spherical visions of environments and scenes on paper – when navigated through a monitor, a smartphone or VR headsets, are transformed into explorable 3D environments, allowing the space to return to being real in the immersive dimension. The drawings were made in equirectangular projection, live on site, with ballpoint pen on paper.

The illustrated panoramas which depict places where events occurred and interpreted by the author after a dialogue with historians, writers, journalists, botanical-environmental experts, have also been displayed during *Alberabilia* exhibitions. This approach worked in line with Lupi's suggestion (2017a) that putting more effort in researching and translating data into visualisations allows users to more easily understand and relate to the stories, which analysts tell.

Figure 5 Chiara Masiero Sgrinzatto, *MHP 360º Sketches at the Exhibition Alberabilia, Original Artworks* (left), *interactive version* (right). 2021. Black ballpoint pen on A4 white paper. Virtual tour on a touch screen monitor. Ateneo Veneto, Venezia. © Chiara Masiero Sgrinzatto.

The drawings were done in a reverse perspective in respect to the infrared photos: drawings are generally perceived as analogical media, so their empowerment in the virtual dimension was this time underlined. A big screen allowed users to discover how paper illustrations could turn into VR worlds to be handled and discovered in detail. Sketches were finally collected and published in the phygital

Associazione Culturale Think, Say, Do. 360º drawings © C. Masiero Sgrinzatto (2021). Curated by E. Zilio.

illustrated book *SCHIANTI*:[17] through QR codes users were allowed to connect paper and bits. More than 600 visitors enjoyed the illustration panoramas on site and around 200 users got the volume containing the nine drawings.

3.2.1.3 Collaborative Panoramic Drawings

Illustration panoramas were the way to involve school students in the project and to explore, together, its uncomfortable content. Students were asked to work in teams and to combine photos from different places related to WW1 or Vaia effects, in order to build a collaborative sketch, an imaginary environment, fully navigable on a device or in VR mode.[18]

Around 130 students from all Veneto Region have been involved in these panoramic drawing workshops.

Figure 6 Chiara Masiero Sgrinzatto, Emanuela Zilio, *Collaborative Panoramic Drawing Workshop*. 2021. ITA Calvi, Belluno. © Chiara Masiero Sgrinzatto

17 Zilio, E. (a cura di) (2021). *SCHIANTI. Tracce panoramiche per raccordare i secoli*. Illustration by C. Masiero Sgrinzatto. `https://www.tsd-projectlab.it/onair/schianti`. MHP project © Associazione Culturale Think, Say, Do. 360º drawings © C. Masiero Sgrinzatto (2021). Curated by E. Zilio.

18 Associazione Culturale Think, Say, Do (s.d. c). "Workshop scuole". `https://www.tsd-projectlab.it/progetti/mcp/workshop`. MHP project © Associazione Culturale Think, Say, Do. Workshops by C. Masiero Sgrinzatto; E. Zilio (2021) in the following schools: LAS Guggenheim, Venezia; Istituto Canossiano, Feltre; ITE Calvi, Belluno.

The necessity to create a narrative-functioning image forced students to talk about content, analyse images in detail, decide the focus the representation had to keep, and agree on connection elements in order to get a working spherical image. Drawing allowed us to bring together heterogeneous disciplinary fields and activating a trans-disciplinary circulation of concepts, supported and reinforced by the ability both to make patterns visible and to take the points of view of different users (Trocchianesi, Bollini 2023). Visual prototypes became cognitive tools: students made their ideas visible, creating frameworks that give a visual meaning to complex information, and in doing so they can push beyond the direct mapping of quantitative data towards the visual narration of values and qualitative information that the humanities are seeking (Scagnetti et al. 2007).

3.2.2 Reborn. The Awakening Mountain (RAM)

RAM is a theatrical project addressed to citizens, students, tourists and the general audience who live in the area of Monte Grappa, the Venetian Prealps, the Brenta, Piave and Feltre valleys. The two drama pieces – which use the *Silent Play* technique by La Piccionaia,[19] are site-specific interactive performances based on the dramaturgy of places, and are performed in the same territories by adopting two viewpoints as the story is told "from the ground" (*Silent War* – while walking together, along some of the paths and across the forest, actors tell and users join a story through their Silent Play headphone) and "from the sky" (*Silent Fly* – while flying over the woods hit by Vaia in a tandem paraglider). RAM developed the virtual tour Virtual Silent War and the 360º/VR video Virtual Silent Fly.

3.2.2.1 Virtual Silent War (Virtual Tour)

In order to produce a digital double of the theatrical walking experience, fifteen spherical photos were captured on the paths through Col Fenilon and Col Moschin towards the Rifugio Alpe Madre, the hill where battles of the WWI were fought, destroyed again by Vaia.

The images were collected in a virtual tour[20] where the narrative aspect is highlighted by a navigation system having fifteen stops,

19 La Piccionaia; Centro di produzione teatrale La Piccionaia (2021). "Silent Play – Progetto". https://www.piccionaia.org/silentplay/progetto/.

20 Masiero Sgrinzatto, C.; Vascon, L. (s.d.). "Silent War Virtual Tour. • Reborn. La Montagna che rinasce". https://reborn.piccionaia.org/silentwar/index.html. RAM project © La Piccionaia scs. Virtual tour by C. Masiero Sgrinzatto; L. Vascon (2021). Curated by E. Zilio.

that accompanies the visitors through the story, told in voice over by the actors and dramatists Carlo Presotto and Paola Rossi. Each stop told the story about that scene. In respect to the in-presence experience some viewports slightly off the paths were added to the virtual experience to enrich the visualisation even by including angles the public was not allowed to access because of safety or technical reasons (e.g. headphones' radio signal).

Figure 7 *Virtual Silent War*. 2021. Screen of the Virtual Tour view on a desktop computer.

The possibility to experience a story by being an inner protagonist, as well as the chance to interact with other people sharing the same experience made the performance even more effective, participants reported positive feedback and had the opportunity to establish new relationships (Kwastek 2015; Ferreira, Nisi, Nunes 2023; Trocchianesi, Bollini 2023).

More than 180 people joined the Silent War/Silent Fly experience (80% young people), whereas around 5000 joined the Virtual Silent War. The emotional involvement and the unique relations the experience made possible, facilitate the spread of the project and its topics also among students and younger generations (Carrozzino, Bergamasco 2010; Argyriou et al. 2020).

Virtual Silent Fly (360°/VR video)

A ten minutes long 360º video was produced to allow all users to experience the silent play performance from the paraglide and to get

a second, unusual point of view on the territory and on the impact of human activity on the landscape. The flight, both the real-life experience and the virtual one, was introduced at a time in which participants stayed on the airfield while the actors and dramatists Carlo Presotto and Paola Rossi prepared them for the flying.

Concerning the videos, the 8k footage was shot in two takes, then combined in the post-production process. Two different points of view were chosen: the first one from the helmet and the second one from a photographic pole. Each flight was a unique experience: thanks to the excellent weather conditions, Alessandro Olin, the paraglider instructor, was able to make some special tricks and routes that were edited in an engaging experience.

The project soundtrack was produced by the Nik Nak band. The voice over tells of the legend of the *Benandanti*,[21] characters from the folk tradition of North-East Italy.

Figure 8 Chiara Masiero Sgrinzatto, Luca Vascon, *Virtual Silent Fly*. 2021. Frame from the 360° video in equirectangular projection, 8192 × 4096 px. © Chiara Masiero Sgrinzatto; Luca Vascon

The panoramic video taken during paragliding opens several interesting perspectives: (1) a unique and non-replicable experience for the panorama's maker as every flight is different and the scene is taken from a top-down point of view; (2) an unconventional purpose for the paraglider who needs to fly according to the dramaturgist's needs; (3) an unknown perspective on places and objects as part of the storytelling for the director and dramaturgist; (4) a double emotional experience for users who generally never flew before by paraglide and did it equipped with headphones to hear – and visualise through a mental

21 Ginzburg, C. (2020). *I benandanti*. 4a ed. Milano: Adelphi. https://www.adelphi.it/libro/9788845935206.

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transparent layer on top of the real landscape – the story while flying. The impact generated by this experience produced results above expectations: interviewed professionals and users (both adults and children) returned enthusiastic feedback and asked to repeat the experience; the possibility to join the experience collectively in some parts and individually in other moments (e.g. during the flight) facilitate new contacts, sharing and exchange between participants and it opens rooms for intimate emotional opportunities;[22] flying experiences which resulted different for each person and generated different derivative memories in users (Elli et al. 2021; Muangasame, Tan 2023) and stimulated a natural sharing and discussion about stories and emotions; the methodology of gamification (McGonigal 2011; Bittanti, Zilio 2016) interested both producers and users, and created the conditions to merge different complex multimedia content from the DH. All these elements pushed users to also enjoy the video-panorama which was published on Youtube and it could be viewed by a computer, a smart device or by wearing a VR headset.[23] Through the video they could live a second time, but in a new way the experience, explore more details, spend a longer time thinking about History, story and content (WW1 and Vaia Storm).

22 Arnheim 1969; Savela et al. 2020; Eberhard 2021; Canossa 2022; Vallance, Towndrow 2022; Trocchianesi, Bollini 2023.

23 Masiero Sgrinzatto, C.; Vascon, L. (2021). "Virtual Silent Fly". *La Piccionaia*. https://youtu.be/bZjTEQksckk. RAM project © La Piccionaia scs. 360º video by C. Masiero Sgrinzatto; L. Vascon (2021). Curated by E. Zilio.

4 The 4th Dimension: Panoramas Immersive Playing

4.1 Immersive Interactive Installations

Immersive interactive installations allow users to experience a 'living world' (Scolari 2009; Masiero Sgrinzatto 2023). An interesting example of these panoramas is *Canal View*. The experimental project was conceived as an interactive platform to explore non-accessible places. The pilot started with a high resolution 360° panoramic time lapse video (resolution 6k) made from a boat going across the Grand Canal of Venice with a custom rig made in collaboration with Nital.[24] From the core product several physical installations were implemented – *Canal View. Venice from the Water* (2009), *Canal View Mobile* (2009), *Canal Grande Memorie di Antichi Sapori* (2015)[25] as well as other content that was post-produced and published.[26]

In the original interactive installation *Canal View. Venice from the Water* **[fig. 9]**,[27] the possibility for users to enjoy Venice from the water side's unconventional point of view, looking around from the boat as if they were really travelling in person, having the possibility to discover and explore in detail cultural heritage motivated the nearly 500 visits and around 5000 interactions. The exclusivity of the experience also paved the way to present the installation in relevant

24 CanalView Venezia (2009). "Canal View Venezia dall'Acqua – il video". https://youtu.be/tqAX2jVFm_c. The experimental rig and workflow used to make the 360º footage for the project *Canal View* is explained in the article on the website *Nikonschool*. Masiero Sgrinzatto, C.; Vascon, L.-N. (a cura di) (2009). "Panoramiche one-shot da una barca: The Canal View… *eXperience*". https://www.nikonschool.it/experience/canal-view.php; more video explaining the process and the installation are available on the project's Vimeo channel (https://vimeo.com/canalview).

25 *Canal View. Venice from the Water* (Canal View. Venezia dall'Acqua) is the interactive installation that took place at the Telecom Italia Future Centre in Venice from 6 to 11 September 2009, featuring performative events by the writer Alberto Toso Fei on opening and closing nights. The same installation was awarded and shown in the collective exhibition *L'Italia degli Innovatori* at the Italian Pavilion of the Shanghai World Expo, in July 2010. *Canal View Mobile*, the portable version of the installation, has been used by Alberto Toso Fei in several presentations of his book *I Segreti del Canal Grande* (2009-ongoing) all around Europe. Canal View project © M. Luitprandi; C. Masiero Sgrinzatto; A. Rabitti; G. Rosa; L. Vascon; the video installation *Canal Grande, Memoria di Antichi Sapori* was presented and screened at Aquae Pavilion, collateral event of Milan World Expo 2015; Officine Panottiche + Nuovostudiofactory (2016). *Canal Grande, Memoria di Antichi Sapori | video installazione a 360°*. https://youtu.be/FhZ_crPVt7w; A project designed and realised by M. Luitprandi; C. Masiero Sgrinzatto; L. Vascon.

26 The 360º footage was edited for the use on the Italian TV show *Ulisse, Il piacere della scoperta, Rai 3* by Piero and Alberto Angela, episode "Venezia: viaggio tra i tesori del Canal Grande" (edition 2011, episode 12).

27 Timelapse videos of the installation. Canal View (2009). "CanalView Venezia dall'acqua_timelapse". https://vimeo.com/6718967.

events such as the Shanghai World Expo in 2010, involve well known artists and speakers, and call thousands of people to enjoy the virtual water tour in Venice.

Figure 9 *Canal View. Venezia dall'Acqua*. 2009. Photo documentation of the interactive installation. Venice, Telecom Future Centre. © Luca Vascon

4.2 Immersive Videotelling

These kinds of panoramas use immersive videos which tell stories that unfold in the place where they happened. Videos such as 360° book trailer "Misteri di Venezia",[28] the 360/VR documentaries *Omaha Beach VR. The Invasion of Normandy,*[29] *Hold at all Costs (The Siege of Bastogne) VR,*[30] *Tuskegee Airmen VR*[31] engage users in discovering commercial or cultural/historical content by 'playing' with the images.

Misteri di Venezia was designed as a promotion tool for the augmented book (QRCodes) by Alberto Toso Fei. The 360° video, shot with a DSLR camera mounted on a custom rig and edited with a special

28 Officine Panottiche + Nuovostudiofactory (2016). "'Misteri di Venezia' | 360° book-trailer". `https://youtu.be/TdlrvblKQ6Y`; Misteri di Venezia: making of. `https://vimeo.com/38165440`. Project © M. Luitprandi; C. Masiero Sgrinzatto; L. Vascon (2012).

29 The World War II Foundation (2021). *Omaha Beach VR D-day Main Featured Video*. `https://youtu.be/6QMvZ6QsCxY`. 360º drawings © C. Masiero Sgrinzatto (2021).

30 The World War II Foundation (2022). *Hold at All Costs (The Siege of Bastogne) VR*. `https://youtu.be/4y3TZpOvPpQ`. 360º drawings © C. Masiero Sgrinzatto (2022).

31 Futschick, U. (2023). *The Tuskegee Airmen VR*. The WWII Foundation. `https://youtu.be/-wxQ4_V0jC0` 360º drawings © C. Masiero Sgrinzatto (2023).

image stitching technique, allowed to obtain a high quality immersive video. The writer himself tells one of his famous mystery stories, appearing progressively in different points of the scene and pointing to elements and places of interest, from the middle of the Grand Canal. Users could enjoy a virtual guide and follow him to discover Venice minor history's secrets. The trailer increased book's sales and it also encouraged the Veneto Region to produce a series of events in the physical 'mysterious Venice'.[32]

The 360/VR documentaries dedicated to WWII *Omaha Beach VR* and *Hold at all Costs* directed by Uli Futschik, combine cinematic 360º 8k video footage and superimposition of archival photos and video (flat), infographics and a series of 360° illustrations drawn for the films. A voiceover tells the story and introduces the interviews with the voices of veterans of the US Army collected by the Foundation. The video game-like feeling the immersive panoramas transmit is the vehicle to engage young generations in complex content like historical issues: actually, WWII Foundation has been screening both in numerous schools in the USA. *Omaha Beach VR* was also presented and awarded at international documentaries film Festivals.[33] The videos reached the wider public also through Youtube (*Omaha Beach VR*, about 1600 views and *Hold at all Costs*, about 1000 views) and have featured on Oculus TV home-screen.

32 Veneto Spettacoli di Mistero. https://www.spettacolidimistero.it/.

33 FIVARS 2022, Festival International du film documentaire 2022, Melbourne Documentary Film Festival 2022, Chelsea Film Festival 2022, among others.

Figure 10 Marco Luitprandi, Chiara Masiero Sgrinzatto, Luca Vascon, *Misteri di Venezia*. 2012. Frame from the 360° video in equirectangular projection, 2880 × 1440 px. © Marco Luitprandi; Chiara Masiero Sgrinzatto; Luca Vascon

Figure 11 Chiara Masiero Sgrinzatto, *360° Drawing for the Scene 'Soldiers Loading Trucks'*. 2022. Frame from the 360° video in equirectangular projection, digital painting with archival picture REPLACEMENT TROOPS MOVE UP from USA National Archives. `https://catalog.archives.gov/id/24191/`. Adobe Fresco on the iPad Pro with Apple Pencil, 8192 × 4096 px. © Chiara Masiero Sgrinzatto

4.3 Virtual Environments – Indoor/Outdoor

Panoramas can also enable users to visit non-accessible or protected environments, creating interest and engagement concerning unknown cultural and natural heritage.[34] *Basso Piave virtuale*;[35] *N2Ktag*;[36] *La Grande Guerra +100Cal 1914/18-2014/18*; *What we Share, a Project for Cohousing*[37] are good examples of this approach: panoramas created a way to browse and visit water pumping plants and related buildings all along the territories of the River Piave; to explore the protected natural areas of the Lagoon of Venice (SCI and SPA Natura 2000 Network), almost inaccessible for tourists and travellers, using the AR based app and during in-person activities; to go back in History by entering military buildings and trenches through 360° photos of WWI relevant locations in Italy, France and Belgium; to virtually experience the exhibition of the co-housing project set up in the Nordic Pavilion at Giardini della Biennale, for those who could not visit it in person due to the COVID-19 travel restrictions and to keep memory of the exhibition and related activities. All these panoramas demonstrated how relevant experiences can be enabled for users who cannot join a physical location for personal or contingent impediments.

34 Cf. Carrozzino, Bergamasco 2010; Kersten et al. 2018; Argyriou et al. 2020; Muangasame, Tan 2023; Wen, Sotiriadis, Shen 2023; Ferreira, Nisi, Nunes 2023.

35 Two equirectangular panoramas from the corpus of over 100 360º photographs made for the project *Basso Piave Virtuale* were printed and exhibited at the exhibition *Il Parco del Brian e il Litorale delle Feste – Arte in corso* at MuPa – Museo del Paesaggio di Torre di Mosto (VE), Italy (25 September-24 October 2021), and published in the Catalogue; although the *Basso Piave virtuale* project website is still online, the 360º content is no longer available due to obsolete technology (Flash). Basso Piave Virtuale (s.d.). http://www.bassopiavevirtuale.it/. 360º photographs © C. Masiero Sgrinzatto; L. Vascon (2009).

36 *N2Ktag* (s.d.). https://vimeo.com/n2ktag; *N2ktag* project © SELC Soc. Coop. 360º photographs by C. Masiero Sgrinzatto; L. Vascon (2013).

37 Nasjionalmuseet (s.d.). "What We Share. A Model for Cohousing". https://www.nasjonalmuseet.no/en/exhibitions-and-events/other-locations/exhibitions/2020/the-nordic-participation-at-the-international-architecture-exhibition--la-biennale-di-venezia-2020/. The co-housing system and the related exhibition were designed by the architectural firm Helen & Hard and were curated by the Nasjonalmuseet (Norway), which in 2021 was responsible for the Nordic pavilion during the Venice Biennale of Architecture. 360º photographs and virtual tour © C. Masiero Sgrinzatto; L. Vascon (2021).

Figure 12 Chiara Masiero Sgrinzatto, Luca Vascon, *Termine Water Pumping Plant, Interior.* 2009. Digital 360° photograph / 10500×5250 px. Caorle (VE), Consorzio di Bonifica del Veneto Orientale. © Chiara Masiero Sgrinzatt; Luca Vascon

4.4 Gigapixel Panoramas

Both the Sala dell'Albergo for the project *Dynamic Light and Augmented Reality*[38] and *2000eyes. Spherical View of La Fenice*[39] were designed to enhance users' experience allowing them to get a very close view of fine details of art works or art places, regardless of their position (ceiling, dome, etc.), the degree of zoom desired or the excessive approach prohibited or prevented. Whereas the first one is a 360º photograph, the second one is a 360º painting of the opera house, both of them give access to gigapixel views in the virtual space.

The former was part of a site-specific experimental project at the Sala dell'Albergo for the Archconfraternity Scuola Grande di San Rocco in Venice, to enhance the museum experience, by integrating in one platform lighting system, home automation and multimedia communication. The Crucifixion by Jacopo Tintoretto became interactive

38 Vascon, L. (s.d.). "Dynamic Light and Augmented Reality". http://www.officinepanottiche.com/dynamic_light_and_augmented_reality/. Gigapixel 360º photograph © L. Vascon (2016).

39 Masiero Sgrinzatto, C. (s.d.). "Veduta sferica del Teatro La Fenice di Venezia, settembre 2020". https://www.chiaramasierosgrinzatto.com/2000eyes/; Gigapixel 360º drawing © C. Masiero Sgrinzatto (2020).

thanks to the gigapixel 360º photography-based AR system,[40] creating a bridge with the physical space, allowing light combinations to be directly selected, in order to explore every detail and access multimedia content, "capable of prompting new critical readings of artworks" (De Vincentis, Vascon 2020).

Figure 13 Marco Luitprandi, Chiara Masiero Sgrinzatto, Alberto Pasetti Bombardella, Matteo Tagliatti, Luca Vascon, *Dynamic Light and Augmented Reality – to Deepen Cultural Heritage*. 2016. A group explores the details of the *Crucifixion* by Tintoretto, by watching the gigapixel panorama on their device. Venice, Scuola Grande di San Rocco. © Luitprandi; Masiero Sgrinzatto; Pasetti Bombardella; Tagliatti; Vascon

The latter is a handmade spherical perspective drawn from observation in equirectangular projection, on the occasion of the special setup *Chiglia* (keel) designed by Massimo Checchetto during the COVID-19 pandemic. The setup that allowed artists to perform in the summer of 2020 reversed the hall's environment, giving the viewers a different perception. It was a unique occasion to capture the beauty and the complexity of the shape of the Theater from an unconventional point of view, in a specific time frame (Masiero Sgrinzatto 2023).

The artwork is exhibited in a permanent phygital installation at the Sale Apollinee, located at the first floor of La Fenice, consisting in the framed original equirectangular drawing, a touchscreen monitor displaying the interactive version and another monitor showing

40 Officine Panottiche + Nuovostudiofactory (2016). "Dynamic Light and Augmented Reality – to Deepen Cultural Heritage". https://vimeo.com/161486574. The AR based project was published on ADI design index 2017. It got the special mention at XXV ADI Compasso d'Oro, and it was published in the catalogue. Project © M. Luitprandi; C. Masiero Sgrinzatto; A. Pasetti Bombardella; M. Tagliatti; L. Vascon (2016).

the making of video.[41] The installation is included in the opera house guided tour, which in 2022 attracted around 150,000 visitors.

Figure 14 Chiara Masiero Sgrinzatto, *2000eyes. Sperical View of La Fenice*. 2020. 1 Gigapixel 360° drawing in equirectangular projection. Pencil, pastel and ink on ivory thick paper / 50x100 cm. Venice, Teatro La Fenice. © Chiara Masiero Sgrinzatto

4.5 Time-Travel Immersive Experiences, Where Present-Past Overlap

Sometimes a content cannot be accessed because it happened in the past and it does not exist anymore in the present time, or because it is something that will exist in the near future, so again not visible today in real life. This is why time-travel immersive experiences such as *Donne Si Fa Storia*[42] and *Ora Tocca a noi*[43] are key products to get

41 Masiero Sgrinzatto, C. (2021). *2000EYES | the Making of*. https://youtu.be/bVRCAO2d9Js.

42 Grillo, N. (s.d.). "Antonia Verocai Zardini. Immersione a 360º". http://www.donnesifastoria.it/donne/antonia-verocai-zardini. Project © M. Luitprandi; C. Masiero Sgrinzatto; L. Vascon – Associazione WW1 – Dentro la Grande Guerra (2015). Curated by E. Zilio.

43 The website of the project is not longer published, the 360º experiences are available at the following links: Cima Echar (s.d.). http://www.officinepanottiche.com/test/404/otan/echar/; Cima Grappa (s.d.). http://www.officinepanottiche.com/test/404/otan/grappa/; Monte Palon (s.d.). Officinepanottiche.com. http://www.officinepanottiche.com/test/404/otan/palon/; Cornuda (s.d.). http://www.officinepanottiche.com/test/404/otan/cornuda/; Bassano del Grappa. (s.d.). http://www.officinepanottiche.com/test/404/otan/bassano/. Project

knowledge, and to enable vision. Both of them worked by overlapping historical 360° photos, the first one from women's stories to relevant locations from the Great War and the second one to the Pedemontana Veneta. On one hand, the perfect connection between present and past images arouses the interest of users who could discover unknown memories concerning their area. On the other hand, the possibility to see what still is not there – for example the conversion of a fort into a cultural centre or the new building coming out from ruins, also contributes to attracting investors and to motivate public administration to consider possible improvement and upgrade of their cultural heritage in a longer perspective.

Figure 15 Marco Luitprandi, Chiara Masiero Sgrinzatto, Luca Vascon, *Donne Si Fa Storia. -100/+100: Antonia Verocai Zardini.* 2015. Screen of the Virtual Tour view on a desktop computer. Archival Picture *Austriaci dopo Caporetto tornano a Cortina per l'ultima volta*, Archivio storico Foto Zardini. Cortina d'Ampezzo (BL) © Marco Luitprandi; Chiara Masiero Sgrinzatto; Luca Vascon

4.6 Enhanced Interactive Environments

The following immersive panoramas – *Venice Original*;[44] *EU GCCA+ Around the World in (More Than) 80 Projects*;[45] and *Tribuna Grimani VR*[46] – constitute enhanced interactive environments.

Venice Original is a project promoting venetian craftsmanship through an online and e-commerce platform that contributes to the preservation of artisanal know-how and intangible cultural heritage. In the work object design and DH are strictly connected (Trocchianesi, Bollini 2023) and the visualisation is aimed to solve problems (in this case: how to manage extremely different luxury items in an online shop) while making ideas and "Venetian feeling" visible. The digital handmade spherical panorama helped in creating a functional framework that gave a visual meaning to complex information, and in doing so it pushed beyond the mere mapping of quantitative data towards the visual narration of values and qualitative information that the humanities are seeking (Scagnetti et al. 2007; Masiero Sgrinzatto 2021). The 360º panorama can be viewed interactively: each active object switches its colour when the mouse is held on it. By clicking on it, the user is forwarded to the chosen object within the e-store. Within a year from the launch of the platform, the 360º panorama page has been visited more than 2600 times, with time spent on the interactive image between 1 and 5 minutes: the illustration is used to find inspiration and discover new products.

Around the World in (More Than) 80 Programmes designed for the EU GCCA+ (European Union, Global Climate Change Alliance Plus), is an interactive experience presented at COP26 Youth Event and published on the EU flagship programme's website. A hand-drawn 360º digital illustration allows navigating across different environments – oceans, fields, forests, deserts and buildings – displaying 15

44 "Take a 360° Look – Discover our products – Venice Original" (s.d.). *Venice Original E-Commerce*. https://www.veniceoriginal.it/en/content/23-360. 360º illustration © C. Masiero Sgrinzatto (2020). The 360º illustration was presented and exhibited at Artech Conference 2021, Aveiro (PT) at *Artech 2021 Contingency Exhibition. Hybrid Praxis – Art, Sustainability & Technology*; the illustration has been shortlisted in the award of Italian contemporary illustration; *I selezionati Annual 22*. (2022). Autori di Immagini. https://www.autoridimmagini.it/selezionati-annual-22/; *Venice Original* is a project by CNA Metropolitana di Venezia, with the support of J.P. Morgan and with the Patronage of the Municipality of Venice, CCIAA of Venice and Rovigo and Ca' Foscari University; Barbera, F. et al. (2022). *Venice Original. E-commerce dell'artigianato artistico e tradizionale veneziano*. Venice: Edizioni Ca' Foscari. http://doi.org/10.30687/978-88-6969-615-2.

45 European Union (s.d.). "The 360° Panorama: EU Climate Actions". https://europa.eu/capacity4dev/gcca-community/documents/360deg-panorama-eu-climate-actions. 360º illustration © C. Masiero Sgrinzatto (2021).

46 "Tribuna Grimani VR". https://www.lucavascon.net/domusgrimani/; Project © C. Masiero Sgrinzatto; L. Vascon (2020).

themes related to the programme's activities (e.g. solar panels, cooking stoves, water management, forestry, tree nursery, waste management, women awareness, youth education, etc.), to discover the many ways people can take action against climate change. Visitors are encouraged to discover the projects by exploring the panorama, clicking/tapping on the photographs overlapping the illustration and reading the additional content. (Ferreira et al 2023)

Figure 16 Chiara Masiero Sgrinzatto, *Venice Original*. 2020. 360° illustration in equirectangular projection, digital painting / Adobe Fresco on the iPad Pro with Apple Pencil, 16384 × 8192 px. © Chiara Masiero Sgrinzatto

Figure 17 Chiara Masiero Sgrinzatto, *EU GCCA+ Around the World in (More Than) 80 Projects*. 2021. 360° illustration in equirectangular projection, digital painting / Adobe Fresco on the iPad Pro with Apple Pencil, 16384 × 8192 px. © Chiara Masiero Sgrinzatto

Finally, *Tribuna VR. In the exhibition – 'Domus Grimani 1594-2019'*, whose goal is to show a range of innovative ideas and technologies and novel technical tools for VR shooting. It is made of two

high-resolution 360º photos at different heights and a spherical drawing.[47] It allows one to navigate the Tribuna and see the 88 sculptures from different points of view. The characteristics of the Tribuna allow to show how a conscious use of technology can enhance the perception of a work in its space, both *in situ* and off-site. The experiences and the level of information across different devices is tailor made: due to the high quantity of content, the full experience is available on desktop computers and large touch screen installations. On smartphones the interface is reduced to a basic interaction, to permit the onsite augmented exploration of the sculptures thanks to the gyroscope feature of the devices. On VR headsets the navigation buttons are almost hidden, to focus on the beauty of the environment.

The digital construct was part of the programme *#grimaniacasa*,[48] and it allowed virtual visits during the COVID-19 pandemic, providing the audience a pre-visualisation for an in-person visit after the lockdown. The high quality of the photographic material makes the digital construct suitable also for experts and researchers.

Actually, virtual environments like Grimani Museum represent a practical framework for understanding tourists' use of 3D virtual worlds. According to Huang et al.:

> Enhancing the experiences in 3D tourism sites, customers are more likely to develop destination brand awareness. (Huang et al. 2013)

Also Wen, Sotiriadis and Shen's findings indicate that:

> AR/VR technology plays an important role in influencing the tourism experience. Performance expectancy, price value, habit, personal innovativeness, and involvement significantly positively affect behavioural intention. (Wen et al. 2023)

and Muangasame and Tan confirm that:

> A successful community-based *phygitalisation* strategy requires grassroot engagement across all stages of planning, development, implementation and management of the rural cultural heritage tourism product. (Muangasame, Tan 2023)

47 Masiero Sgrinzatto, C.; Vascon, L. (2020). "Tribuna Grimani VR | Behind the Scenes". https://youtu.be/AhsLevw3ZW8.

48 Beniculturali (s.d.). "#grimaniacasa | Tribuna VR in 'Domus Grimani 1594-2019'| Visione immersiva ad alta definizione". https://polomusealeveneto.beniculturali.it/eventi-e-mostre/grimaniacasa-tribuna-vr-domus-grimani-1594-2019-visione-immersiva-ad-alta.

This suggests that also tourism practitioners should consider alliances with panoramas' designers and developers to jointly implement useful and easy-to-use 3D platforms that facilitate trip planning.

Figure 18 Chiara Masiero Sgrinzatto, Luca Vascon, *Tribuna VR. In the Exhibition – 'Domus Grimani 1594-2019'*. 2020. Screen of the digital construct on desktop. Venezia, Museo di Palazzo Grimani.

4.7 Meta Environments

Meta environments such as the aforementioned *Venice Original* or *GCCA+ Virtual Exhibition* open the possibility to connect content which are different for typology, geographic coordinates, purpose, scale and characteristics through a 360° illustrated environment. The interesting point concerns the convergence between the real and the digital worlds through a graphic mediation which somehow interlaces elements from both the worlds and creates a trustable experience.

The former depicts a 'realistic but not real Venetian environment' to showcase 'the idea of the products' on sale in the e-shop: more than 30 different objects ranging from various Murano glass products up to books, clothes, prints and gondolas. The project's committee opted for an illustration rather than a photograph or a 3D model for the ability to express concepts in a stylised way and the versatility in the editing process.

To obtain a *pòrtego*-like interior,[49] the author combined the requested elements basing her work on the study – from books only due to the lockdown taking place at that time – of various Venetian architectures, paintings, drawings, decorations.

In the latter, to combine visions of places in Africa, Asia, the Caribbean and Pacific region the author created a composition interspersed with three vertical elements that split and connect at the same time. The imaginary landscape embraces the whole World, thanks to the ability of the illustration to synthesise concepts and build a vision, it can be plausible and enjoyable.

4.8 Multi-Dimensional, Multiple Shape Panoramas, Remapping

The projects *2000eyes* and *Venice Original*, propose a further interconnection between physical and virtual dimensions of which, 360° illustration panoramas stay in between. Both immersive artworks explore the hybrid space between analogical and digital media. They use both in a complementary way, to create an enjoyable environment in the physical and digital dimensions. Actually the plain drawing gives access to the virtual spherical environment in which the user is called upon to interact/play with. At the same time, the same drawing suggests the users to cut it and to build a physical paper sphere to interact/play with in the real world. It is a mirror effect: in the digital dimension, users enter into the sphere, in the analogue dimension, users interact with the sphere from outside (Araújo et al. 2019; Masiero Sgrinzatto 2023).

2000eyes was disseminated also by a 100 pieces limited edition paper-sphere kit on sale at the theatre's bookshop.

In *Venice Original* a printed kit and the assembled paper-spheres were made for the press conference and presentation of the project in March 2021. A dodecahedron simplified model was printed on the occasion of a workshop for kids at the *Salone Nautico* 2021 in Venice.

A bigger hand-crafted paper sphere was exhibited at *Venice Original in Italy on Madison* at Istituto Italiano di Cultura, New York City (18-25 May 2022) with a selection of objects by 20 Venetian artisans.

Spherical images are suitable for further editing, and playing with different projections (i.e. stereographic, mercator, mollweide, azimuthal equidistant, etc.) to obtain unexpected views on physical artworks. For example *Shibuya Nonbei Yokocho* is a screen

49 The *pòrtego* is the main hall of the noble level in Venetian palaces.

print,[50] whose design comes from a post-production of 360º photography.[51] The idea of turning a 360º photograph of a narrow alley into a stylised graphic illustration reminiscent of Japanese woodblock prints[52] was born during the lockdown in early 2020. The first result of the collaboration between Rohn and Masiero Sgrinzatto was presented at *SXSW* 2021.[53] The final print was exhibited at *Splendidi Dialoghi* in Venice, a side event of *Homo Faber* 2022.[54]

Figure 19 Chiara Masiero Sgrinzatto, *2000 Eyes*. Phygital installation (left) and the artist in front of the artwork holding a paper-sphere (right). 2020. Interactive installation made of the original 360° drawing, the interactive version on a touch screen monitor and the making of video. Limited edition of 100 paper-sphere kits numbered and signed by the artist. Printed on A3 paper, laser cut. Venice, Teatro La Fenice.

50 *Shibuya Nonbei Yokocho* is an hand-pulled 5 colours screen print, edition of 50 copies, on Fedrigoni Arena 300gsm Ivory paper with water based inks, 25 × 50 cm; printed at Fallani Venezia screen printing studio.

51 The panorama was taken by the 360º photographer Sam Rohn in Shibuya, Tokyo (JP) in December 2019, while filming the commercial *Introducing RICOH THETA Z1 / Sam Rohn in Tokyo*; Ricoh Theta (2020). "Introducing RICOH THETA Z1 / Sam Rohn in Tokyo". https://youtu.be/CB9wPQeFFZ8.

52 The main inspiration was one of the views of Kyoto by the Japanese woodblock Master printer Kan Kawada.

53 Creating Creative Content. Roundtable with S. Fujiki, Y. Guo, K. Martin, C. Masiero Sgrinzatto, S. Rohn. South by Southwest Virtual Conference and Festival (18 March 2021); Fujiki, S. et al. (s.d.). "SXSW 2021: Lessons Learned on Creating Creative Content with THETA". https://www.thetalab.ricoh/en/report/9377/.

54 Exhibition *Splendidi Dialoghi*. Splendid Venice Starhotel Collezione, Venice (10 April-01 May 2022); Fondazionecologni (s.d.). "Homo Faber in città: Splendidi Dialoghi presso l'Hotel Splendid Venice - Starhotels Collezione". https://www.fondazionecologni.it/it/attivita/anni/homo-faber-citta-splendidi-dialoghi-presso-lhotel-splendid-venice-starhotels-collezione.

Figure 20 Chiara Masiero Sgrinzatto and Sam Rohn, *Shibuya Nonbei Yokocho*. 2022. Limited edition of 50 screen prints numbered and signed by the artists. 25 × 50 m. Venice, Fallani Venezia screen printing studio. © Chiara Masiero Sgrinzatto

Visualisation is conceived as a tool for thought, and it is not merely the final outcome of data representation, information and knowledge but as a transformation process within a continuum which allows users to gather content visualising them through artefacts (e.g. panoramas). This can create new knowledge in the recipient (Masud et al. 2010). In this sense, the connection between analogue and virtual dimension highlighted in *2000eyes* and *Venice Original* finds a third degree of development when using *Little Planet* format (analogue → digital → analogue). Real spaces are transformed into spherical 3D digital environments to be then reconverted into 2D analog prints on paper/support to be published or displayed in museums, as it was in the case of the project *Panorama of Congo: Unrolling the Past with Virtual Reality* **[fig. 21]**.

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Figura 21 Chiara Masiero Sgrinzatto, *Orientation plan of Panorama do Congo*. 2023. Digital illustration, cylindrical 360° panorama reprojected in stereographic projection (little planet). © Chiara Masiero Sgrinzatto, Congo VR project

4.8.1 When Panoramas Meet Generative AI Algorithms

In the project *Eternal Cities*[55] research focuses on immersive drawn panoramas and generative AI algorithms as key elements to investigate and represent the enigmatic interplay between Myth and reality within the context of cities that in our world and across History, have acquired a powerful mythological allure. In these cities, there are "facts and events" that cannot be seen through human naked eyes, but have the potential to reveal places and routes in a different way compared to how physical senses perceive them. In this case, panoramas are the key to enter that complexity, to (1) see where the

55 Ongoing in 2024 © Project by Fondazione M-Cube within the EU project Erasmus Young Entrepreneurs.

inspiration and conceptualisation of Myth took place (we are more into the artist/designer's mind/imaginary world rather than in the real place) and (2) to understand how Myth content (e.g. cinema, music, etc.) and narratives have retro-influenced the city itself, and the perception its inhabitants and visitors have. In order to verify the given assumptions, immersive panoramas – hand-made drawings are used together with AI-generated panoramas.

Figure 22 Chiara Masiero Sgrinzatto. *Study for Eternal Cities*. 2023. Manhattan, 177 Bleecker Street (Urban layer) + Dr Strange Sanctum Sanctorum (Myth layer), digital illustration on 360° video frame. © Chiara Masiero Sgrinzatto; M-Cube Foundation

In *MultipliCity. Exploring the Influence of Myth Cities. The Case of Venice*,[56] couples of immersive panoramas emerge from hand-made equirectangular drawings allowing the identification and the correspondence of specific places in the city of Venice and in a series of parallel cities **[fig. 23]**. Real locations are represented by the Artist through on site drawing, post-production process and little adjustments when daily life urban elements can disturb the view. The AI is responsible for drawing the "invisible" third layer, where the interpretation of the content is given by the machine to be then combined with the one by the Artist.

56 Ongoing work is part of a project for the joint PhD programme in Digital Media Art of the Universidade Aberta and the Universdade do Algarve. It will be on display to the public during the collective exhibition *Circuitos* in Lisbon, 16-19 July 2024. © ongoing project by Fondazione M-Cube within the EU project Culture Moves Europe.

To do that, the AI generation process is enhanced with the hand-made sketches with data about Venice and *the other Venice*s around the world. The prompt takes into consideration both the description of the hand-made panorama representing Venice and the corresponding one concerning the other locations.

Figure 23 Chiara Masiero Sgrinzatto, *Multiplicity*. 2024. Image showing on the left the 360° handmade drawing of Aveiro (Venice of Portugal), on the centre the sketch map obtained from the drawing used to feed the AI, on the right the AI generated image. © Chiara Masiero Sgrinzatto; M-Cube Foundation

Three hand-made mini-domes are realised by the Artist and used to install the immersive panoramas produced by hand and by the AI and to provide a strong immersive feeling. Visitors are invited to walk through the hanging domes, finding the possible points of connection between the three paper environments.

The installation also opens a second layer, unlocking the other three views. All panoramas are available in the virtual dimension, they can be reached through a QR code and explored by users with their smartphones or tablets. Virtual environments enable us to see what cannot be caught through naked human eyes, and have the potential to reveal places and details in a different way compared to how physical senses perceive them.

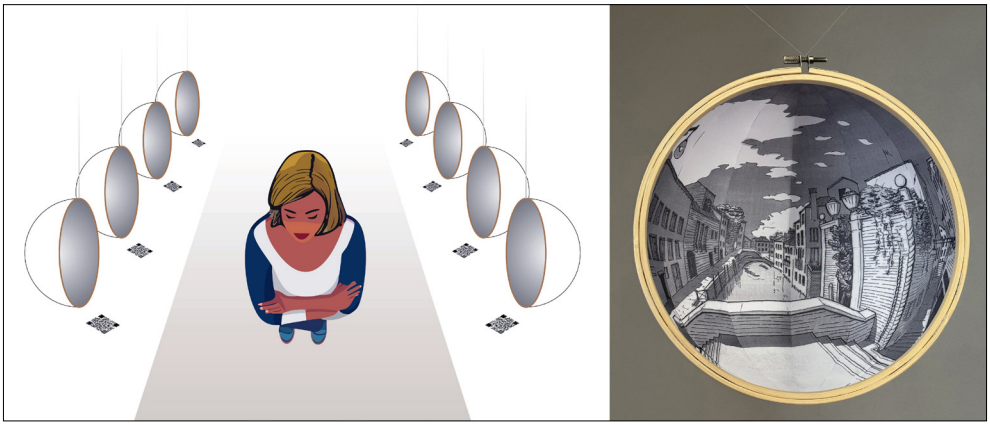

Figure 24 Chiara Masiero Sgrinzatto, *Multiplicity*. 2024. Left: conceptual diagram of the installation. Right: prototype of the mini-dome display. © Chiara Masiero Sgrinzatto; M-Cube Foundation

In *The Code of Extinct & Lost Creatures*[57] partners from Design, Art, Modern Mythology, Video Games, Music and Movie sectors join technological partners from VR/AR/XR technologies, haptic technologies, generative AI, 360° panoramas drawing software, binaural and immersive audio.

Visitors can learn how to design immersive panoramas and create new environments. This will be accomplished by painting the panorama on a digital canvas with a custom AI drawing software that will exploit a GAN optimised for 360º images. Users will not need to deal with any knowledge about spherical perspective, as the drawing software will be focused on a simplified experience where they are only proposed to draw spots of different colours/materials, that will be interpreted by the AI powered system and rendered into realistic environments. Once completed, new user-side virtual environments are created, and the spherical drawing can be used as the texture of a large digital sphere displayed on the screen. This digital sphere has a camera at its very centre, which can be operated by the visitor because the software recognises hand gestures. In a second experience of the same project, visitors can experience and compare human and animals' vision by observing with VR HMDs a series of immersive illustrated panoramas based on geometric innovative solutions (Araújo

57 Ongoing in 2024 © Pilot international exhibition driven by Fondazione M-Cube, design in collaboration with Politecnico di Milano (IT), Hochschule für Technik und Wirtschaft Berlin (DE), Universidade Aberta (PT), Tiny Bull Studios (IT), Kling Klang Klong (DE).

2024).[58] According to Lupi and Posavec (2016), embracing complexity also means transforming raw information into interconnected knowledge, presenting unexpected parallels and secondary narratives to complement the main story. Therefore it is possible to generate multiple visual tales and outputs over a main story, providing varied angles where users can choose the point of view and the application most aligned with their interests in a similar way to nonlinear interaction. Therefore, expected results include: 360° equirectangular drawing software to promote educational applications in the fields of architecture, design and visual arts as well as applications for fast prototyping; gesture recognition software to implement interactive immersive viewer for museums and exhibition installations, without the need to touch, real-time display of interactive 360º panoramas in performative contexts, application in show rooms and fairs to allow users to interact with content in a new way, without wearing / handling any device (Olivero 2023); VR panoramic subjective customised views: for real-time customisation and comparison of situations not visible to the naked human eye, for example how UV rays are affecting surfaces or micro pollutants are spreading and depositing in the air; for educational / health prevention purposes, see how vision sense and perception is altered when we consume alcohol; and finally for industrial applications, visualise and assess how vision and perception change when we look through a material (we barely perceive it but also glass does).

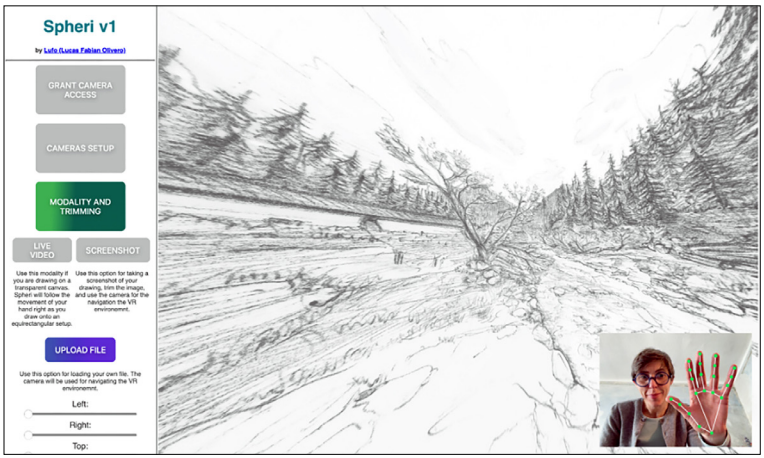

Figure 25 Interacting with your 360° panoramas through hand gestures (natural interaction). Software concept and development © Lucas Fabian Olivero

58 Araújo, A.B. (2024). "Spherical Perspectives and Beyond: Handmade Immersive Drawings and their VR Visualizations". *AWE International Week: Open 360°*. HTW – Hochschule für Technik und Wirtschaft, Berlin.

5 Conclusions

This research highlighted the wide variety of 360° panoramas produced and currently in use: monumental panoramas for towers and domes, infrared 360º photos, 360º illustration panoramas, collaborative panoramic drawings, virtual tours, 360º/VR videos, immersive interactive installations, immersive videotelling, virtual environments – indoor/outdoor, gigapixel panoramas, time-travel immersive experiences, enhanced interactive environments, multi-dimensional and multiple shape panoramas, remappings or panoramas which already adopt AI to enhance new features – represent only a selection of possible functioning and application of this powerful medium.

This research also made clear that panoramas are not 'simply media' but multifaceted tools DH and DHu can adopt to explain complexity and bridge relationships between knowledge fields, spatial and temporal, physical and abstract dimensions. Findings showed that the impact they can generate goes beyond the technological features of the tool, coming rather from a combination of the creator's point of view and the users' experience in a specific place-time coordinate. It also reflects personal narratives and emotions the participants are perceiving whilst living a virtual experience. Moreover, embodiment and presence shift the perspective of the participants and storytelling becomes storyliving and dismantles complexity. This is true also when managing a phygital content. The possibility that panoramas enable us to open a dialogue between physical and virtual worlds, past and present, a location with another location or a story with other stories, separate parts of one narrative making the whole story bigger than the sum of the parts, makes outputs unique and person-specific. Within this frame, according to this study, a number of elements emerged: a single medium (and every smooth variation of it) can enable multiple visions; different kinds of panorama can enhance content in specific ways and reach specific targets. The focal point is not panoramas themselves, rather the multimedia connection these can provide and the enriched content their languages mix can define. A single panorama can generate other panoramas as well as multiple products, including virtual and analogue objects; immersion brings with it a gaming perception which facilitates users from DH and DHu fields to manage much deeper content and to connect knowledge or data which are apparently detached one from the other.

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