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The fabulous history of immersive devices
by Laurent Lesop, Associate Professor at ENSA Nantes, HDR, member of the CRENAU team.

Virtual reality has moved from the academic and industrial world to the entertainment and general public sectors over the past twenty years, thus bringing the notion of immersion to the forefront.

The advent of "digital natives" in the commercial space, the generalization of an accessible and easy-to-use material, the availability of applications that are simple to use, create a positive context for the diffusion of so-called immersive content. This rapid diffusion and the excitement they generate must raise questions about the hypothesis of a paradigm shift regarding narrative, representation and immersion issues or we are simply in a new iteration. The aim is therefore either to consolidate knowledge around current paradigms or to identify or sketch out those that will renew current practices. The approach proposed here is that of topology.

Immersion defines several spaces that need to be characterized and compared. The first space is the classic one of the narrative to which the one of the real responds. But this score does not describe the specificities and nature of each of them, the way they are articulated and communicated, how they are conceived and experienced. In an attempt to answer this question, it is necessary to investigate the question of immersion through its devices and to determine by them what is common or differentiating. This is based on the strong premise that the container qualifies the content, that the conditions and circumstances of message delivery, in this case the immersive illusion, are as important as the message itself. This investigation should provide some evidence to assess the contribution of digital technologies to immersive narratives.

Immersive systems, as devices designed to project a spectator



into a trompe l'oeil world, could be recognized in the domes of Tuscan churches where angels and clouds seem to float above us. But it is more accurate to see in Barker's invention of the panorama in 1787 in Scotland the true ancestor of all that developed afterwards. His first work is a huge canvas depicting Edinburgh developed inside a cylinder in the centre of which is the spectator hoisted on a platform. By the effect of misleading synecdoche, the panorama is often reduced to its simple painted canvas, yet it is a total illusionist device as the description of the patents clearly shows. The one in Barker dates from 1796, the one in Fulton from 26 April 1799.

The design of a panorama meets extremely precise specifications, articulating and linking spaces immersed in contrasting lighting environments. In his Essay on the History of Panoramas and Slideshows, Germain Bapst points out that the construction is done according to "scientific laws":

"The panorama is a circular painting exposed in such a way that the spectator's eye, placed in the centre and embracing his entire horizon, encounters only the painting that envelops him (...). To establish the illusion, the eye, on whatever point it is worn, must everywhere encounter figurations made in proportion with exact tones and that, nowhere, it can grasp the view of real objects that would serve as a comparison; whereas it sees only one work of art, it believes to be in the presence of nature. This is the law on which the principles of panorama are based."

The first panorama designers understood from the beginning that the only painted canvas, however immense and perfectly realistic, cannot alone guarantee the immersive illusion.

It is necessary to create a scenography from the entrance, from the ticketing to the observation platform, the latter also contributing to perfect the spectators' experience.

Louis-Jacques Mande Daguerre, Pierre Pétot's former assistant who had also bought Barker's patent, transformed the device by adding sound and light. He thus mobilized another sensory dimension for reconstructions of Napoleonic battles that he called "Diorama". Daguerre's success is such that he will raise enough funds to finance and complete his research on photography. But it is not he who will create the first photographic panorama that we owe to Girault de Prangey. In 1842, the latter would show Rome from the hills of the Palatine. As we have mentioned, Robert Fulton also obtained the patent of Barker. Saifer whose panorama made between 1826 and 1829 is still visible in Salzburg, Austria.

The panoramas were very popular from the 19th century to the beginning of the 20th century and became more and more impressive. To shelter them and master the scenography of illusion, rotundas, architectural objects designed for this purpose, have been built. Thomas Howson's colosseum, for example, built in London in 1827 east of Regent Park, will long be the most imposing. In addition to the interior show that the public could admire from a central platform and peripheral kiosks, it was possible to visit the summit to enjoy the real panorama of the city. The total vision of the city could only lead to a synoptic vision of the world, especially at a time of global competition from European powers. Interior maps, "earthworks" to dare to refer to Edmond Halley, in which visitors will discover a monumental cartographic projection have been built. There is for example the "Circorama" of Charles Auguste Guérin (1840)

which is in the form of a sphere 10 meters in diameter, inside, the map is at 1:77000. In England, it was the Wydd's Great Globe, designed by James Wydd, that was installed at Leicester Square in London between 1851 and 1862. The panoramas are nourished by the latest technological advances to perfect the illusion and offer increasingly powerful sensations.

Thus the panorama "The Avenger" developed by Théophile Paulpe in 1891, proposes to experience a naval battle. The public installed on a real ship's deck is tossed around by a mechanical swell that makes some people motion sickness. It was especially during the 1900 Universal Exhibition that the most innovative proposals were opened. Raoul Grimoin-Sanson patented the Cinorama in 1897, which allows spectators to experience a virtual balloon trip. Ten synchronized projectors project the film of an ascent inside a cylinder while the audience is on a platform built like a nacelle. Unfortunately, the system, presented at the 1900 exhibition in Paris, was very quickly stopped for reasons due to the high heat emission.

Moreover, the "Météorama" creates the illusion of a real boat trip. Passengers embarking on the deck 50 metres long and 9 metres wide feel the effects of the swell. The landscape is given by a set of double panoramic canvases, each 70 metres long and 15 metres high. After the balloons, visitors can take the Trans-Siberian Railway, an immersive journey through Europe proposed by the architect Georges Chedame. Here again, the landscape pans by on painted canvases that are set in motion by an ingenious mechanism.

This Panorama of "Old Edinburgh" by Robert Barker still exists and resides at the The Edinburgh Virtual Environment Centre, University of Edinburgh. The Panorama was as wide as 300 feet and as high as 50. It is known as "Edinburgh from the Crown of St Giles". Image Copyright © City-Arts Centre

Girault de Prangey had succeeded in assembling photographs to create a 360° panorama, the Lumière Brothers made stronger and in 1900 registered a patent for 360° photography on a single plate, with a continuous image allowing an overview, the Photorama.

During the 20th century, improvements will continue to be made so that the feeling of immersion is even more powerful, but without the massive success of the 19th century panoramas. A work on luminous atmospheres has been attempted with Jean-Pierre Alau's "Météorama", it is in a way the first at-tempt to imitate an inner perspective. Cinema has already placed the large panoramas and the rotundas will be destroyed or converted. Nevertheless, the desire for a large, immersive, enveloping image continues to motivate research and development. This idea of giving back the movement, of following the action wherever the eye looks, is found in Abel Gance's Napoleon project, carried out in 1927.

In fact, only one sequence was projected on three screens. The Polyvision system developed by Émile Vuillemoz, with a 4:1 aspect ratio, proved too complex to implement and maintain, and was eventually abandoned.

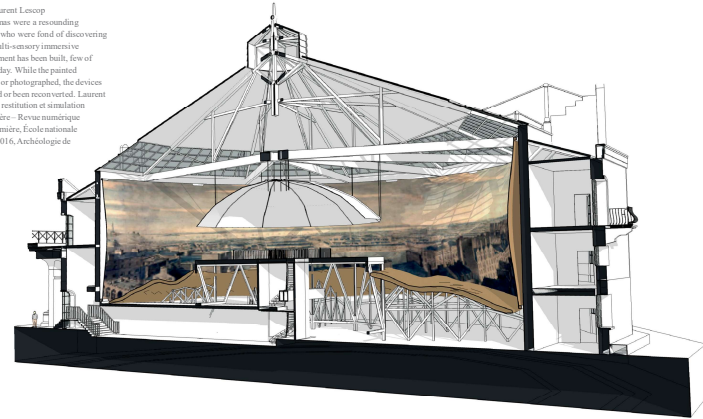
However, we will see the development of multi-screen projects that would be too long to list here, but we can have in mind the "Vitarama" (1939 - 11 cameras), the "Cinéma" (1952 - 3 cameras), the Cinéorama (1958 - 11 cameras), the "Hexaplex" (1992, 6 cameras). At Disney, it is the "Circarama" that offers visitors an immersive rotunda with eleven screens arranged in a crown.

Digital technology is reviving interest in the panoramas. The assembly of images and their projection becomes easier and easier and we will find projection devices becomes easier and we will find cylindrical projection devices such as those of the Australian artist Jeffrey Shaw, founding director of the ZKM in Karlsruhe and used by artists such as Bernd Lintermann, Joachim Buttger, Torsten Belschner for "Globorama" or Jean-Michel Brody for "AMG (C&F)" or the Wooster Group with "There is Still Time... Brother (2007)" for installations where the viewer explores the panorama through a virtual viewer. The "Sphercam", an ingenious assembly, allows the realization of an animated panoramic view. We have lost some of its trace, but one of the first cylindrical immersive devices is the "Hemisphaerum" built in 1999.

The screen is a 6 metre wide dome mounted vertically giving an authentic 180° opening in both vertical and horizontal planes. The dome is a particularly interesting solution because the image appears as three-dimensional by enveloping and going beyond the field of vision, it can imitate the celestial vault and naturally becomes the figure of the planetariums. The Moscow one opened its doors on

November 5, 1929. The building, with its avant-garde architecture, was designed by architects Mikhail Baech and Mikhail Siniavski. The main hall has a 17-metre dome, it was used in the 1980s to perform "Le Théâtre Fantastique" where adapted shows of works by famous science fiction writers were performed. The domes dedicated to projection are spreading throughout the world, such as the "Géode" in the Parc de la Villette in Paris, built by the architect Adrien Fainsilber and the engineer Gérard Chamuyon, inaugurated on 6 May 1985. Its hemispherical screen is 26 metres in diameter and 1000 m² in area. There are many other examples of immersive domes, but we can remember in Montreal, the "Satosphere" or "Séminorium 10°" of the Society for Arts and Technology (SAT) which occupies an old industrial building on the edge of the Arts district and the Elbs, Magdeburg Dome, with the know-how of the Fraunhofer, but there are many other systems still available and on all scales.

Panorama section image Laurent Lesop
 In the 19th century, panoramas were a resounding success, offering spectators who were fond of discovering new things to experience multi-sensory immersive sensations. Important equipment has been built, few of which have survived to this day. While the painted canvases could be preserved or photographed, the devices themselves have disappeared or been reconvered. Laurent Lesop, Panoramas oubliés : restitution et simulation visuelle, Cahier Louis-Lumière - Revue numérique annuelle de l'ENS Louis-Lumière, École nationale supérieure Louis-Lumière, 2016, Archéologie de l'audiovisuel, 10, pp.49-64.



Individual experience versus Collective experience

Today, a panorama is created in one click with very economical 360° cameras such as the Samsung Gear or Ricoh's Theta. Holding in their pockets, connected to a mobile phone, they give everyone the means to grasp the world in 360° and observe it in a helmet such as the Google Cardboard that you can buy for the price of a café on the terrace. This facility triggering a very abundant supply economy suggests that the future lies in individual devices. However, looking back, we will find the same alternative to the birth of cinema. In 1889, the brilliant Thomas Edison invented the "Kinetoscope", which could be described as a kind of piece of furniture in which a spectator, as far as the term is concerned, can watch a film through a binocular placed on the upper part.

If you open the cabinet you can see the perforated film scrolling on roller systems that passes in front of a lamp equipped with a shutter operating at high speed. Shortly afterwards, W.D.L. Dickson & Herman Casler introduced the "Mutoscope" in 1894, a kind of large coil also -

equipped with a binocular optic. Here, no film, but a hub on which the images are plugged. The fast rotation on the hub restores the animation.

The Lumière brothers adopted a similar system with the "Kinora" in 1895. These are precisely devices addressed to one person at a time and it is difficult not to see an astonishing correspondence between the images and users of the Mutoscope, installed in history and those of the salons or museums where visitors sitting in clusters try to enjoy the virtual. The analogy goes even further since already at the time, "naughty films", small naughty films could irritate the most cautious as it happens today with the promises of immersive masks.

In fact, "Kinetoscope" and "Mutoscope" have disappeared in favour of the collective experience offered by cinema. Today the same alternative can be found between the collective devices that will still be found as attractions and the solitary individual devices, such as the Oculus Rift, HTC Vive, Sony Playstation VR or Samsung Gear VR to mention only the VR headsets. •



¹Germain Bapat, Essai sur l'histoire des panoramas et de diaporamas. ps

²www.salzburgmuseum.at

³www.worldffairs.info

⁴Méchaux E., Du panorama pictural au cinéma circulaire: Origines et Histoire d'un autre Cinéma, Editions L'Harmattan

⁵www.waldisney.org

⁶http://www.icinema.univ.edu.au/

⁷www.thewoostergroup.org/blog

⁸Marcel Freydefont "Les contours d'un théâtre immersif",

Revue Agon ens Lyon

⁹http://www.icinema.univ.edu.au/

About CRENAU

The Urban Architecture Nantes Research Centre (CRENAU) is the AAU Laboratory's team based in Nantes.

CRENAU was created in January 2015 and is the merger of the Graduate School of Architecture of Nantes' two laboratories: CERMA, Research methodology in Architecture Centre, created in 1971 and specialised in the built environment's methodological and numerical approaches.

LALIA, Languages, Urban Actions, Alterities laboratory, founded in 1991 and specialised in the urban building and forms of urbanities' socio-ethnographic approaches. The GERSA's members, Stage Design in Architecture Research and Study Group, joined the CRENAU separately.

The CRENAU's research is part of the AAU Laboratory's scientific project. In this context, they include numerous themes related to architectural and urban ambiances, models, public territorial action instruments and policies, virtual and enhanced reality, maps and sensitive representations of the built environment, cities' adaptability to climate change, and so on. Through its history and composition, CRENAU has been using a wide variety of knowledge in architecture, urban planning and urbanism, sociology, anthropology, computer science, physics, history and arts. It welcomes numerous PhD students in these fields of study.

The CRENAU members belong to the institutions under the AAU UMR's supervision.