



VR Panoramic Photography and Hypermedia: Drawing from the Panorama's Past

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Abstract

Since the 1787 patent of the immersive 360-degree painted panorama by Robert Barker, the panorama has been used as a narrative storytelling tool. With VR (virtual reality) panoramic photography in tandem with the notion of hypermedia, the VR panorama can further advance the idea of storytelling as both an object and an interface. Using the principles of Robert Barker's patent of the panorama as a point of departure to explore the conceptual relationship between painted and screen-based panoramas, this paper will explore: how the potential for a hypermedia system can be found in the painted panorama; the unique qualities of the computer-based panorama; and discuss related hardware advances for the digital panorama, which appear to bring us closer to Robert Barker's original intent as an immersive image space for the masses.

Keywords

VR Panoramic Photography, Hypermedia, Narrative, Painted Panorama, Immersive Image Spaces

Introduction

VR (virtual reality) panoramic photography is the science, art and practice of creating interactive and navigable immersive 360-degree screen-based images, which usually depict a place and/or event. While some may equate VR photography's beginnings to Apple Computer's Quicktime VR Authoring Tools Suite and QTVR (Quicktime Virtual Reality) software introduced in the early 1990s for creating and displaying screen-based digital panoramas, it can be argued that the development of VR panoramic photography has a much longer history that can be traced back to the introduction of immersive image spaces and the invention of perspective. Nevertheless, its closest relative is the painted panorama, which was patented in 1787 by Robert Barker. [1]

While the word "panorama" has become commonplace – evoking such ideas as sublime vistas – it should be noted that the term, which is referred to in this paper, had not been formulated until the late 18th century. Its usage was much more restricted than it is now. It was through the Irish painter Robert Barker's invention called *la nature a coup d'oeil* (known today as a panorama) as well as the "panopticon" – a unique round architectural prison design

with a central observation platform – that is thought to have inspired the creation of the word "panorama." [2] In the Parisian *Dictionary of Building Terms, vol. III* published in 1881–82, "Panorama" is defined as "a building in which a painting referred to as a *panorama* is exhibited, that is to say painted on the inside wall of a rotunda, covered by a cupola or cone-shaped roof. These paintings attempt to be faithful reproductions of what a place looks like when viewed from all angles and from as far as that the eye can see." [3]

Since its 1787 patent, the panorama has been used as a narrative storytelling tool. One of the tenets of the "panorama" as described by Barker has remained the same in its development, whether analog or digital, which is to strive for creating a completely immersive environment that "feel[s] as if really on the very spot." [4]

With computer-based panoramas in tandem with the notion of hypermedia, the VR panorama can further advance the idea of storytelling, as both an object and an interface. Using the principles of Robert Barker's patent of the panorama as a point of departure to explore the conceptual relationship between painted and screen-based panoramas, this paper will explore: how the potential for a hypermedia system can be found in the painted panorama; the unique qualities of the computer-based panorama; and discuss related hardware advances for displaying the digital panorama, which appear to bring us closer to Robert Barker's original intent as an immersive image space for the masses.

The Tenets of the Painted Panorama

Created as a commercial endeavor to entertain the general public, the goal of the painted panorama was to create an immersive image space that reproduced the real world with such skill that viewers would have difficulty distinguishing between "reality" and the illusion that the panorama created. [5]

Robert Barker's *la nature a coup d'oeil* (a.k.a. panorama) invention did not just consist of an uninterrupted cylindrical painting, but also the unique structure that housed it. Barker's patent had certain requirements that needed to be met to make this immersive environment convincing. According to Barker's patent, not only did the painting need to be accurate and provide "an entire view of any

country or situation,” but the architectural structure needed to meet certain criteria according to the patent’s directive including the following:

- Upon entering the painting from below, a balustrade or circular structure must be in place, prohibiting the viewer from going too close to the painting in order to maintain the desired illusion.
- Not only should the observation platform be elevated to further establish the illusion of a scenic vista, but there should be some kind of barrier above like an umbrella shaped roof, as well as below to prohibit viewers from seeing the top and bottom of the painting.
- The painting needs to be lighted entirely from above so that light is reflected off the painting, providing a uniform level of light throughout the gallery. [6]

Many panoramic structures required viewers to pass through a long darkened corridor and up a staircase, entering the circular painting area from below in order to create a transition between the viewer’s daily life and the illusion of the panorama. [7]

An example of a panorama that meets these requirements and which still survives today is the *Panorama Mesdag* located in The Hague, The Netherlands. The monumental painted panorama, which measures 14.2 meters high (46.5 feet high) and 115 meters (over 377 feet) in circumference, opened to the public on August 1, 1881. Much like the criteria listed above for Barker’s panorama patent, the viewer goes through a long, darkened hallway and then up a staircase to enter a gazebo, which rests upon a dune that looks out upon the 360-degree curvilinear painting of Scheveningen and The Hague – transporting the viewer back to daily life in 1880. [8]

Providing a “false terrain,” discarded baskets, nets, ropes and anchors nestled within the sand are thoughtfully placed between the gazebo (viewer’s area) and the edge of the painting, creating a sense of seacoast life in the late 19th century for the viewer. With the natural light piercing through the skylights against the painting’s subdued color palette, it appears to bring the panorama to life. The panorama is realistic yet painterly, creating a subtle illusion of movement.

As did many of the panorama painters, Hendrik Willem Mesdag strived to capture a realistic and accurate depiction of his subject matter. The panorama provides a snapshot of daily life in The Hague and Scheveningen, from the fishermen and sailors going about their work to a woman in the village putting out her clothes to dry. As the viewer scans the shore, one can see horses pulling a boat up to the shore, and from afar sailboats on the horizon. Looking into town, the viewer can see villagers fixing nets and going about their daily lives, providing a better understanding of the coastal community’s living heritage.

Usually, the public sought panoramas that depicted the unusual and foreign. The themes for the panorama ranged from locations such as Pompeii or Cairo or Jerusalem to events such as the Battle of Gettysburg. [9] While some

panoramas may have taken more artistic liberties than others, the painted panoramas attempted to be an accurate account of a place and/or event through rigorous research. This was not only a requirement of Barker’s patent, but visitors would be quick to identify inaccuracies. As Stephen Oettermann points out, “It was not only concrete objects that needed to be represented accurately in a panorama, however. The precise date and time of the event also had to be taken into consideration. This entailed careful study of conditions of light and shade, the position of the sun and colors of the landscape at specific times of the day.” [10]

Souvenir programs of the panorama were also part of the experience. Bought when visitors purchased their tickets to the panorama, the programs helped visitors orient themselves to the exhibition. These programs typically contained a drawing of the panorama, which was marked with numbers and descriptive text to identify the panorama’s significant features. Guides ranged in size from single sheets to booklets ranging from sixty to eighty pages with accompanying commentaries. [11]

Narrative and the Panorama

The potential for hypermedia using the digital VR panorama can be found in the painted panorama. In the book *From Text to Hypertext*, Silvio Gaggi argues that a paradigm shift occurred from pre-modernism to modernism in that the subject becomes unstable, fragmented, and decentered, leading to the post-modern potential of hypertext or hypermedia using such examples as Pablo Picasso’s *Demoiselles d’Avignon* (1907). Nevertheless, it is in this author’s opinion that the painted panorama offers another node to Gaggi’s “decentered subject,” as it emphasizes the marginal micro-narratives as much as it does the thematic focal point using curvilinear perspective. An example of this “decentered subject” can be found in such works as *The Jerusalem Panorama of the Crucifixion of Christ* (1903) located in Altötting, Germany.

In order to support his theory, Gaggi uses Perugino’s *Christ Giving the Keys to Saint Peter* to show how a pre-modernist artwork offers a unified ideology with multiple narratives using linear perspective. [12] The fresco *Christ Giving the Keys to Saint Peter* (1481), which was completed in 1481 and is located in the Sistine Chapel, offers the viewer a window seat into Christian thought. In the foreground, the focal point of the painting, Christ, is handing over the keys of heaven and earth to his disciple, Peter, who is kneeling, where he also announces his intention to build a church. Located in the mid-ground are two micro-narratives, which depict earlier stories in Christ’s life: the stoning of Christ and tribute money. The middle structure in the background refers to the Dome of the Rock, an important site in Jerusalem for Christianity as well as the other Abrahamic religions. The two round-arched porticoes are introduced as a compositional device to divert the viewer from the center. The use of linear perspective unifies the multiple narratives and draws the viewer to the

main focal point of the painting, which is the interaction between Christ and Peter.

Using Pablo Picasso's *Demoiselles d'Avignon* to contrast Perugino's *Christ Giving the Keys to Saint Peter*, Gaggi argues that *Demoiselles d'Avignon* decenters the subject with the flattening of the picture plane and the rejection of illusion found in pre-modernist paintings. [13] The painting in-part is no longer about the illusion of space, but is rather questioning it. The subject matter has been diverted from the painted to the conceptual. Gaggi writes that Picasso's "painting decenters the subject – both the represented subject and the viewing subject. Renaissance space is self-consciously subverted, the various planes pushing forward to create an approximate congruence of illusionistic pictorial space and actual flat space surface of the canvas, like sides of a cardboard box unfolded and flattened in a messy two-dimensionality." [14]

The contrast between Picasso's *Demoiselles d'Avignon* to Perugino's *Christ Giving the Keys to Saint Peter* is important to consider when looking at the painted panorama as a storytelling tool, as the subject is also "decentered." However, in the case of the panorama, the absence of a centralized focal point is due to curvilinear perspective. The perceived visual focal point shifts from a central point to multiple coordinates within the panorama, depending on the viewer's location. This is especially evident in the *Jerusalem Panorama of the Crucifixion of Christ*, a panorama completed in 1903 and located in Bavaria's principal pilgrimage center, Altötting. Under the personal initiative of the painter, Gebhard Fugel, who specialized in Christian art, along with his partners, the architect Georg Volkl and the painter Josef Krieger, the *Jerusalem Panorama of the Crucifixion of Christ* attempted to create a panorama of "vigorous realism," which opposed the sentimental style of religious art of its time. [15] Stephen Oettermann writes in *The Panorama: History of a Mass Medium*, "Their insistence on exact realism made progress slow...[A]ccording to one account, the artists set up real wooden crosses in their studio and 'fastened' models to them, in order to be able to paint from life. [16]

While the macro-narrative of the panorama is of Christ's death on the cross, it also presents many micro-narratives into the other events that occurred at the same time as written in the *Holy Bible* and interpreted by Fugel and his team, such as the disciple Peter kneeling near Jesus's burial site and a regiment of Roman soldiers returning from Golgotha, the site immediately outside Jerusalem's walls where Jesus was crucified. As the viewer wanders away from the thematic focal point – the crucifixion of Christ – and explores other parts of the Jerusalem panorama, the marginal micro-narratives presented within the panorama become central. With this in mind, in the case of the painted panorama, there is no primary axis or focal point where particular coordinates have priority over any other – except as the viewer determines – potentially offering several micro-narratives within the overall macro-narrative of the panorama. Not only is the panorama capable of standing on its own as a storytelling tool, but the decentered focal point

within the panorama opens up opportunities for expanded narratives using the notion of hypermedia.

The VR Panorama and Hypermedia Narratives

Much like the painted panorama, a VR panorama is an immersive 360-degree panoramic viewing of a place and/or event. Nevertheless, the VR panorama not only has the ability to act as an object, whether stand-alone, like the painted panorama, or within a larger project, but it can also act as an interface. The VR panorama has its own distinct attributes, which reveal not only its homage to the painted panorama but convey its potential within the digital domain:¹

- Immersive: provides an experience of entering into a simulation or suggestion of a three-dimensional environment.
- Integrative: the ability to combine image, sound, text, and image into a dynamic 360-degree panoramic form.
- Interactive: the ability for users to manipulate and affect their experience with the panorama, and potentially communicate with others through its interface.
- Hypermedia: When the panorama is used as an interface, it has the potential to link separate media objects (text, image, video, other panoramas) to one another.

The hardware and software that support the viewing of the panorama metaphorically acts much like the architecture that houses the panorama painting as described by Robert Barker in his patent. While the VR panorama as an object offers a temporal and spatial excursion to a place and/or event much like the painted panorama, using the VR panorama as an interface and linking objects to it in order to create a hypermedia system provides a wealth of opportunities for user exploration and investigation.

In the essay, "Database as a Genre of New Media," Lev Manovich proposes that the computer offers a new form of cultural expression. He writes, "The 'user' of a narrative is traversing a database, following links between its records as established by the database's creator. An interactive narrative (which can be also called 'hyper-narrative' in analogy with hypertext) can be understood as the sum of multiple trajectories through a database. A traditional linear narrative is one, among many other possible trajectories." [17] By integrating a database of images, stories, and descriptive information that links to pertinent objects within a panorama, one may create a hypermedia narrative using a search-and-discover navigation system. In *Hypertext 3.0: Critical Theory and New Media in an Era of Globalization*, George Landow reasserts this idea when he writes, "All hypertext [or hypermedia] systems permit the individ-

¹ This list of vr panorama attributes was influenced by the book *Multimedia: From Wagner to Virtual Reality* edited by Randall Packer and Ken Jordan.

ual reader to choose his or her own center of investigation and experience. What this principle means in practice is that the reader is not locked into any kind of particular organization or hierarchy.” [18]

Stemming from the work of Vannevar Bush, who perceived the computer as a database and information retrieval system to help both scholars and decision makers with managing information, and Ted Nelson, who coined the terms “hyperlink” and “hypertext,” a paradigm shift occurred when literary theory and computer hypermedia converged forming the notion of hypermedia narrative. [19] For the purposes of this paper, “hypertext” and “hypermedia” are used interchangeably; although hypermedia is a much more inclusive term, as it includes not only text, but also such media objects as images and video. It should be noted that this author defines “hypermedia narrative” as the linking of separate media elements to one another, creating a thread of associations that form a narrative. However, having a user click a series of random links does not necessarily generate a “hypermedia narrative,” as the system requires a designed structure with a collection of media objects that refer to each other in one way or another.

The use of a hypermedia system using the cylindrical panorama as an interface can be found in Zoe Beloff’s interactive film *Beyond* (1995–1997). According to Beloff, *Beyond* “explores the paradoxes of technology, desire, and the paranormal posed since the birth of the mechanical reproduction...Just as the earliest film makers struggled to find a new visual language through the newly developed technology of cinema, here I aim to invent in a personal way, a new digital articulation of space and time that both grows out of cinema yet goes beyond it.” [20]

When the participant begins *Beyond*, a small black and white movie appears at the center of the screen with camera shots of the Hindenburg blimp flying above New York City coupled with pages of text being stacked upon one another. The participant is then introduced to the first panoramic landscape interface. The viewer moves the mouse from one side to another, encountering a 360-degree view of a landscape depicting the grounds of an abandoned mental institution with collaged icons that invite further investigation. The user has an option of choosing multiple “hotspots” to explore. Once the selection has been made, the viewer may be confronted with graphics, text, collaged fragments of early 20th century film footage, animations, or another panorama.

While Beloff reveals that there “was no predetermined ‘master plan.’ Just some rough ideas in my head,” there is a definite hypermedia structure that enables a narrative to emerge through an exploratory investigation of the project. [21] As users move through the web of panoramic interfaces in *Beyond* and explore the various media objects, they continually shift the center. Landow asserts that hypertext or hypermedia “provides an infinitely recenterable system whose provisional point of focus depends on the reader, who becomes a truly active reader in yet another sense. One of the fundamental characteristics of hypertext

is that it is composed of bodies of linked texts that have no primary axis of organization.” [22]

Another project that uses a similar exploratory-like hypermedia system is the interactive installation written and produced by Sarah Kenderdine and Jeffrey Shaw, entitled *Place Hampi*. Completed in 2006, *Place Hampi* is an interactive immersive environment that incorporates augmented stereographic panoramic projections of Vijayanagara, a UNESCO World Heritage Site located in southern India. *Place Hampi* examines Hindu mythology through user-controlled investigations within its immersive environment. [23] Differing from Beloff’s intimate CD-ROM, Kenderdine and Shaw’s monumental installation consists of a rotating platform placed centrally within a large circular projection screen, which allows the viewer to interactively rotate the projected image and discover at his or her own pace. *Place Hampi* offers sixteen cylinders or panoramas that re-present selected areas within Vijayanagara. Once selected, the viewer becomes engulfed within the chosen panorama, much with like the painted panorama. However, in this case, there also may be embedded moving imagery within the panorama and one can navigate from one panoramic cylinder to another, allowing the viewer to explore and examine place in whatever order chosen.

It should be noted that both *Beyond* and *Place Hampi* further the traditions of the panorama and cinema by offering an extended cinematic environment where user-centered search and discover become central to its design. The participant becomes the assembler of their own experience through choice, as opposed to traditional cinema, which offers a strict linear experience of beginning, middle and end. It should be noted that while these two works provide successful examples of “search and discover” hypermedia narratives, they do not represent the full range of hypermedia narrative patterns existing, which can capitalize on the use of the vr panorama as an interface.

While the notion of hypermedia narratives may appear liberating for both the reader and author, it may also be considered confusing, as the reader or user may become disoriented while navigating through the information space. [24] The process of creating and reading hypermedia differs from printed text, as the cause and effect relationships are obscured and it requires structures that can help orient the reader. [25] The VR panorama provides such structure, as it may act as both an object for investigation and interface for further exploration. The VR panorama can be the catalyst for a storyworld of mystery and inquiry that encourages search and discover. As Landow writes, “Storyworlds, which contain multiple narratives, demand active readers because they only disclose their stories in response to the reader’s actions.” [26] The painted panorama *Jerusalem Panorama of the Crucifixion of Christ* is an example of a 20th century analog “storyworld” where the viewer engages with many micro-narratives within an overall macro-narrative, providing a cross-over link from the analog painted panorama to the digital panorama’s potential in regard to the use of hypermedia for narrativity purposes. Furthering the hypermedia relation-

ship between the analog painted panorama to the digital panorama's potential is the painted panorama's souvenir guide, which acts almost like an intermediary step between the painted panorama as an interface and the textual blocks of information necessary for the further understanding of the panorama. In other words, the painted panorama's souvenir guide can be seen as a precursor to the potential of integrating the use of hypermedia in the development of VR panoramic photography projects.

Advances in the Presentation of VR Panoramic Photography

While the term "virtual reality" has become much broader than its original intent, much like the shift in the definition of the panorama, its original meaning referred to an interactive environment that fully immersed its users in a three-dimensional world generated by a computer. [27] The term grew from such ideas as Morton Heilig's 1955 essay "The Cinema of the Future," which proposed a multisensory cinematic experience and Ivan Sutherland's 1965 essay entitled, "The Ultimate Display," in which he conceived of a head-mounted display that married the computer to the promise of what is now known as "virtual reality." [28] Sutherland writes, "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked." [29]

While fulfilling this vision is still a way off, it appears that the next step has arrived for VR panoramic photography to become totally immersive by using such HMD (head-mounted display) hardware devices as the Oculus Rift unit (<http://www.oculusvr.com/rift/>). The Oculus Rift is a new virtual reality headset that allows users to immerse themselves inside their favorite games and virtual worlds at an affordable price [30]. It combines stereoscopic 3-D, 360-degree visuals and a wide field of view to create a believable immersive environment. [31] The device enables the body to turn around and inspect various parts of the VR panoramic image by constantly updating the image in relation to the movement of the head, much like the experience when visiting a painted panorama. In addition, metaphorically similar to the long darkened corridor that the visitor passes through before entering into the painted panorama, donning the headset prepares the user to enter into another reality. With this type of spatial immersion, viewers may have an emotional and intellectual response to the VR panoramic image – something not possible with the current monitor-based display. With such HMD devices as the Oculus Rift, the VR panoramic image can now be viewed within a completely immersive environment, which appears to be similar to Robert Barker's 1787 intent as stated in his patent, but using the technology of present time. In addition, the HMD appears to be an effective plat-

form to advance hypermedia narrative construction practice and theory using vr panoramic photography as an interface by offering an individuated immersive experience for interaction and play.

Concluding Remarks

The painted panorama offers an entry into the potential of hypermedia with the digital VR panorama, as it decenters the subject allowing for the traditionally marginalized micro narratives to take on greater importance, as seen in the *Jerusalem Panorama of the Crucifixion of Christ* when compared to Perugino's *Christ Giving the Keys to Saint Peter*. The use of hypermedia provides depth to the panorama, as in the panoramic projects mentioned above, which is not possible within the traditional painted panorama acting alone. Landow reaffirms that hypermedia systems "permit the individual reader to choose his or her own center of investigation and experience. What this principle means in practice is that the reader is not locked into any kind of particular organization or hierarchy." [32] The integration of hypermedia into the digital panorama allows for branching systems that enable further investigations into the micro-narratives of the panorama.

Nevertheless, hypertext or hypermedia systems can add confusion to the reader. As Christiane Paul writes in *Digital Art*, "Hypertext reading and writing in many ways differ from the process of creation and reception of printed texts. A reader whose expectations and reading interests are fueled by the question "What is happening to whom, and when and why? may be disappointed and frustrated...in the sense that the narration may seem to presuppose knowledge and information the reader will come across only later in the reading." [33] As a result, structure and intent need to be carefully considered when designing a hypermedia system for a panoramic imaging project. Like a detective, the user engaging in a hypermedia system must take an aggressive approach or will encounter very little in the way of story or "world." [34] Consequently, further research and practical investigations in narrativity using contemporary museum education and game theory are crucial to the furthering of hypermedia systems for panoramic imaging purposes.

In the 1997 essay entitled, "The Dream Life of Technology," Beloff writes, "I am fascinated by long outdated forms resurfacing anew in the digital realm. Such are panoramas. Actual panoramas painted around specially constructed circular rooms are a popular form of entertainment in the nineteenth century...they now reappear in the virtual realm." [35] While the painted panorama as an art form still continues today, the residual from the painted panorama offers new possibilities within the digital realm. It appears that with the introduction of such HMD displays as the Oculus Rift, which are designed for consumer consumption, that Robert Barker's original intention for creating a completely immersive environment that "feel[s] as if really on the very spot" will again come to fruition using the digital media technologies of our time. [36]

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