Cinematic Suture and Panoramic Stitch: Subject Formation in Immersive Virtual Reality

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Abstract

This paper discusses subject formation in today's panorama-like digital moving images by contrasting the idea of suture in film theory with stitching process necessary in digital 360-degree photographic image production. Derived from Lacanian psychoanalysis, suture refers to the complicated mechanism of signification in classical narrative cinema: by integrating multiple points of view of movie camera, audience, and character in film into a syntagmatic entity, films successfully hide the "Absent One," an inevitably assumed absence of ownership of shots, and place spectators on a particular subject position in the diegetic world. Compared to the complicated suturing mechanism in the temporal medium, today's VR movies seem to choose a simpler solution for audience's immersion and their omnipotent all-encompassing view: the camera position always corresponds with the viewer's as viewing platforms were placed in the center in panorama buildings in the nineteenth century. However, the immersive images require a process called "stitching" in order to assure the audience's all-seeing power. Each image captured by multiple cameras needs digitally fixed to make the overlaps between them seamless. Based on the contrast of cinematic suture and panoramic stitch, this paper discusses contemporary panoramic immersive media as case studies of subject formation.

Keywords

subject formation; virtual reality; 360-degree image; immersive experience; film theory; suture; apparatus theory; panorama; stitching; art

Introduction

By the end of 2016, technology companies all over the world released a variety of digital devices providing consumers with an immersive visual experience from high-end head mount gears such as HTC Vive, Oculus Rift, and PlayStation VR to cheap cardboard boxes, in which smartphones are slide, like Google Cardboard. [1] Thus, 2016 is thought to be the year of virtual reality among evangelists, engineers, and tech geeks, and they think the market is getting bigger in the following years. [2] Although all of these devices are designed to provide an immersive experience, that does not mean that they can show an omnidirectional image. Instead, they show a rectangular excerpt of the entire scene on the small screen according to the user's head movements. Regardless of the technological limitation, the experience provided by such goggles-shaped devices are realistic enough to remind us of that in panorama paintings, which flourished in the nineteenth century. Are these devices released in 2016 personalized versions of the panorama? Do they follow the same aesthetic ideology, or are there any rupture between the nineteenth and twenty first centuries? The goal of this paper is to historicize such contemporary examples of visual immersion in light of panorama and to reveal the issue of subject formation common in the both media.

Two Categories of Immersive Images

There are many words people use to refer to such immersive visual experiences: virtual reality, 360-degree video, cinematic VR, and so on. Although these words are used somehow interchangeably, in light of panorama paintings in the nineteenth century and film theory, this paper sets two categories of "photographic" and "computer-generated" immersive images according to the source of the original materials. Both types enable spectators to experience all-surrounding images around them, and, in that sense, are similar to panorama paintings. However, while photographic images are made of multiple photographs, computer-generated images are processed from a three-dimensional model of space-time made on computers. In other words, photographic immersive images have an indexical tie with the material world, while computer-generated ones do not. It is too native to assume that photography is a fingerprint of the reality today because

digital cinema making uses live-action footage as a row material for further manipulation. [3] The two categories are, thus, set for the purpose of introducing theoretical argument later.

Photographic Immersive Image

Today's digital 360-degree camera consists of multiple sets of lenses and image sensors. (Fig. 1) These lenses and sensors are arranged on a special rig to capture the surrounding environment. Spectators of photographic immersive images wear head gear with a gyroscope that detects head movements. Depending on the spectators' head movement, the screen installed in the head gear shows the recorded image so that they can feel as if they are in the image. The basic mechanism of the photographic image shows that it can be placed in the tradition of the panorama in the nineteenth century. Visitors to panorama buildings are led to a platform installed in the middle of the cylindrical image in the building. They are at liberty to walk around on the platform to pick up a part of the huge image.

Fig 1. Jount's 360-degree Photographic Image Camera, 2016, Jaunt.

However, the space-time captured by the 360-degree camera is different from the natural world. The optical mechanism of the camera cannot fully prevent distortion in the images. Usually, camera engineers combine multiple lenses to decrease the distortion: the distortion is minimized in the middle of the rectangular frame, while the distortion on the edges is less corrected. In the photographic immersive image, which is made up of multiple camera images, huge distortion appears between two single camera images. The distortion is digitally retouched so that viewers can smoothly immerse into the world. This process is called "stitching." By stitching images of multiple cameras, the photographic immersive image becomes seamless and "natural" for the viewers. The same optical problem happens to panorama paintings because many panorama artists used the camera obscura or similar inventions to create a geometrically accurate pictures. [4] Panorama artists did not need technological measure to solve the problem because the image was still. They simply used their artistic techniques to cover the gap between the camera obscura images.

Even though the distortion between camera images is hidden by the digital technology or the artists' hand skills, the sense of distortion cannot fully be removed. The images we see in photographic immersive devices and panorama buildings are two-dimensional projections of three-dimensional space-time. When you walk around in the material world, objects in your sight move differently depending on the distance between you and the objects: near objects move a great deal, while distant objects move less. This does not happen in these devices because both shows a two-dimensional image of the three-dimensional world from a single fixed point of view.

Computer-generated Immersive Images

This is the reason that digital VR contents constitutes the majority of today's consumer products. By using digital technology, a virtual three-dimensional space-time can be processed into accurate two-dimensional projections from desired points of view. This feature is distinctive in HTC Vive than other devices. HTC Vive users need to set up a space up to 15' by 15', in which they can walk around, to play the VR contents for the platform. (Fig. 2) While panorama and other VR devices tend to focus on reproducing vision, HTC VR creates a virtual space-time: the vision of the user is just a particular aspect of the entire experience. Every second, the computer connected to the head set processes a new two-dimensional image according to the positon and viewing angle of the viewer. Therefore, the computer-generated VR image does not need stitching. In today's technological conditions, for acquiring a sense of immersion, it is easier to process two-dimensional images from a computer-generated three-dimensional model and to add texture on them than to modify multiple photographic live-action images.

Fig 2. Dospara VR Paradise, 2016, Dospara.

Computer-generated immersive images, which no longer require stitching, are actually not drastically different to panorama paintings and 360-degree photographic immersive images. All of these devices mirror the general tendency of human being to represent three-dimensional space-time without mediation. Since the invention of perspective in the Renaissance, Western civilization has gone to great artistic and technological lengths to produce accurate images of the material world. For conservative historians, according to Jonathan Crary, this effort led to the invention of still and movie camera in the nineteenth century (although Crary emphasizes the discontinuity between the Renaissance perspective and the modern mode of seeing). [5] If camera is regarded as a technological advancement toward verisimilitude of representation, panorama paintings, which frequently used the camera obscura and followed the rule of perspective, can also be placed in the tradition. Stereopticon Cyclorama (Fig. 3), a panoramic projection system using multiple projectors ceiled in the middle of cylindrical screens invented by John Winter and Charles Chase in the 1890s, embodies human yearning for representation of the world with accurate perspective and photographic detail in a very primitive form. Although computer-generated immersive images do not have a material tie to the real world because the origin of the images exist only in the programing code, they are the most advanced form of the tradition. Thanks to the technological advancement, the outputted two-dimensional images have more accurate perspective than any other stitched photographic images.
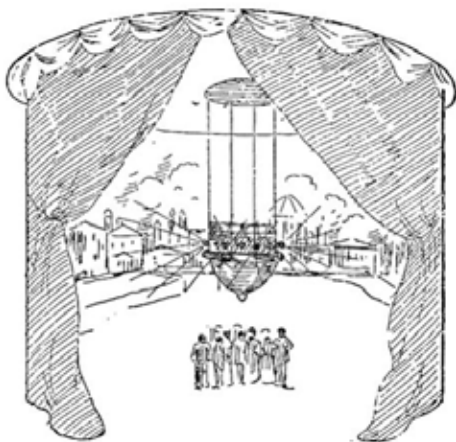

Fig 3. Image of Stereopticon Cyclorama, 1890s, Charles A. Chase and John Winter, *Lucerna Magic Lantern Web Resource,* www.slides.uni.trier.de/hardware/index.php?id=2000128. Accessed 15 September 2017.

Suture and Cinematic Subject Formation

By connection the history of panoramic immersion to the tradition of the Western perspective, subject formation becomes a matter in both photographic and computer-generated immersive images. In the field of film studies in the twentieth century, "what audiences were made to desire through the images" was one of the most central issues. Lacanian psychoanalysis allowed for the detailed study of the interaction between the spectators and the images and later yielded results in the form of apparatus theory and feminist criticism. Then, how can a moment of subject formation be found in panoramic immersive media? In order to examine the subject formation process in the panoramic immersive media, this paper overviews the idea of suture, one of the most basic concepts among these theories of how the spectator is formed into a desirable subject through watching movies.

The idea of suture is originally developed by Jacques-Alain Miller, a Lacanian psychoanalyst. He discussed the mechanisms that a subject is constructed through the signifier supplementing the fundamental lack in the discourse and is woven into the "symbolic" order. [6] Jean-Pierre Oudart applied the idea of suture to examine the spectatorship of film art. According to Oudart and Daniel Dayan, who introduced the idea of suture to English film studies, the most minimal form of suture happens in shot/reverse shot. When a single shot is given to a film spectator, the shot necessarily makes the spectator think about the authorship of the shot. In other words, the spectator questions "to whom does this view belong?" and needs to assume an "Absent One," a conceptual presence (in absence) who possesses and controls the image given to the spectator. At this point, the spectator cannot simply enjoy the image because he/she does not forget the process of representation. When the second reverse shot is given after the first shot, the spectator's question is answered. By showing the supposedly empty space from which the first shot was taken, the second shot erases the "Absent One" from the spectator's mind. This second shot sutures the spectator's ruptured view and settles his/her uneasiness in the film narrative. Through the numerous suture processes in a film, the spectator is woven into the film text and is established as a subject which fits the circuit of desire and pleasure in the film. [7]

While suture theory refers to the syntactic chronological order of temporal images in cinema, stitching in photographic immersive images is about the non-temporal gap between images. We thus cannot simply equate cinematic suture and panoramic stitching. However, their common ground is that they focus on how spectators can smoothly immerse themselves into an artificial world and are molded into a subject. Close examination of suture theory reveals the continuities from panorama in the nineteenth century to the two categories immersive images in the twenty-first century.

First of all, suture theory assumes the monocular mode of viewing rooted in the perspective in the Renaissance period. For example, Daniel Dayan distinguishes "[t]he Romantic landscape of the nineteenth century" which imposes "a monocular perspective, transforming the landscape into that which is seen by a given subject" and "the Japanese landscape with its multiple perspective." [8] His distinction is significant because the multiple-subject mode of viewing in the Japanese landscape relativizes each perspective and, thus, undermines the importance of spectator's question of "Who has the specific perspective?" That's why visual representations that are not in the monocular perspective, such as Jackson Pollock's Abstract Expressionist paintings and non-narrative animation movies, both of which draw spectators' attention to the lines, forms, and colors, do not operate the process of suture per se. While Crary's emphasis is more on the discontinuity from the Renaissance mode of seeing embodies in camera in the nineteenth century, Dayan associates the monocular perspective in the Romantic landscape with his cinematic suture theory and, by doing so, places cinema in the Western tradition of the single perspective.

The first positon, assumption of monocular perspective, necessarily leads to the second assumption of suture theory: the material extension of space-time. Suture theory, at its superficial level, sounds very temporal because the succession of shot and reverse-shot is the driving force suturing the halls in the "imaginary" and concealing the "Absent-one." However, the theory in fact asks for a material existence of space. As argued above, suture theory assumes a monocular perspective and, thus, requires a specific point in space, from which the scene is seen. The specific viewing points theoretically need to be out of the scenes seen from the point and, thus requires the assumption that the material world exists out of the image. The fact that Dayan utilize Foucault's discussion of Diego Velazquez's *Las Meninas* endorses the spatial basis of suture theory. [9]

Subject Formation in Panoramic Immersive Media

These two assumptions of suture theory apply to panoramas in the nineteenth and immersive media in the twenty-first centuries regardless of whether they are temporal media or not because spectators of these devices are embedded into the singular viewing point, separated from the images, from which all the images in these devices are structured. Stiches between neighboring camera images hide not only the distortion between the images but also the fundamental contingency and instability of the privileged single view point: thus, panoramic stitch is a spatialized expression of cinematic suture theory. Therefore, considering Lacanian psychoanalytic basis of suture theory, both panoramic stitch and cinematic suture function to prevent the "imaginary" from entering the "symbolic" order of the perspective while utilizing the "imaginary" to establish a subject.

Zero Latency VR System

Zero Latency VR, an amusement-park attraction platform, exemplifies the characteristics that cinematic suture and panoramic stitch collaboratively exclude the "imaginary" and enforce the "symbolic" order. Zero Latency VR allows multiple users to walk around in a designated open space of around 400 m^2. Each user wears a head-mount goggle, a backpack with a computer, and other devices depending on the nature of attraction, all of which have motion captures to detect the users' movement. (Fig 4) The users see avatars of them in a shared computer-generated three-dimensional space-time. In case of *Zombie Survival*, a horror shooting game in which up to six users can collaborate, a multitude of zombies appears from all the corners in the VR world and attacks the control tower placed in the middle of the space. The users shoot the zombies with the guns to defend the tower. (Fig 5) *Zombie Survival* depicts an imaginary existence of zombies. However, that does not mean that the game allows users to get exposed to the "imaginary" realm in the Lacanian sense. As the "imaginary" is utilized in forging a subject in the "symbolic" order, the imaginary figures of zombies supplements the fundamental lack in the system, in this case, the control tower, to which zombies invade: although the zombies run much faster and jump much higher than human beings do, the imaginary possibility of the zombies contributes to perpetuate the "symbolic" order of the fictional world. As the name of the game platform declares, Zero Latency VR creates a sense of subjectivity in an illusory reality of zero latency.

Fig 4. Participants of Zero Latency VR system, Zero Latency.

Fig 5. A User's View in *Zombie Survival*, Zero Latency.

The tendency can be found in other panoramas and VR contents. Stitches made between two camera obscura images in panorama arts conceal the lack of the camera obscura in the center and, instead, establish a subject there. When spectators visit a panorama building, they are not encouraged to question the material reality expressed in the art. They are trained to accept the illusory reality because suture is a mechanism establishing a subject suitable to a specific "symbolic" order. Thus, historically speaking, political ideologies have utilized panorama buildings to express themselves. Let us examine some examples of how the issue is common in both panorama and today's photographic/computer-generated VR images.

Panorama 1453

The *Panorama 1453* placed in the same-named historical museum in Istanbul is a distinctive example of how the visual device functions to construct a specific ideological subject through its representation. [10] The visitor will witness the Fall of Constantinople, in particular the moment the Ottoman troops broke the defense wall of the Byzantine empire. The platform, from which the spectators observe the scene, is placed in the middle of the Ottoman troops. So the spectators can see in detail the effort of the Turkish soldiers to shoot cannon balls against the wall, the suffering of the soldiers, and the bravery of Sultan Mehmet 2, while the Byzantine soldiers bombarded by Ottoman cannons are depicted far away. Thus, the spectators necessarily identify themselves with the Ottoman Turkey rather than the Byzantine Empire. Considering that Turkey had been discussing its joining to EU with the EU since 2005, the view point shown in the panorama can be an action to reconfirm the ethnic identity of the country.

Remembering Pearl Harbor

Such an expression of political stand point can be seen in some photographic and computer-generated immersive images. For example, *Remembering Pearl Harbor* provides a typical American narrative on the attack on Pearl Harbor on December 7 in 1941. [11] The viewers of this VR content for HTC Vive platform are introduced into the experience by Lt. James Downing, who is a living American veteran survivor of the Pearl Harbor attack. According to the binary categories of photographic and computer-generated images shown above, this content basically belongs to the later. The space-time, in which users jump in *Remembering Pearl Harbor*, is not made of photographic records but computer-generated graphics. However, what is distinctive about the content is that it also utilizes photographic records from the National WWII Museum and the Library of Congress, which provided primary-source references. The users can interact with such genuine historical materials along with realistic computer-

generated images of bombarded battleships and Japanese aircrafts. (Fig. 6) As with *Panorama 1453*, the spectator sees the entire event only through one side of the parties. However, in the case of *Remembering Pearl Harbor*, the experience comes with more accurate perspective of the space-time and hands-on activity on the photo-realistic historical materials.

Fig 6. The demo reel of *Remembering Pearl Harbor*, 2016, Time Life, video.

Criticizing the political orientation in *Panorama 1453* or *Remembering Pearl Harbor* is not the goal of this paper. Instead, this paper would like to emphasize that both contents cannot be free of a specific ideological standpoint because of their optical monocular nature starting from the Renaissance. Both contents provide viewers with a pedagogical experience that cannot be obtained from small pictures. However, the issue is that they do that only through suturing/stitching the spectators into a specific subjectivity.

The history of art cinema shows aesthetic resistance to the problem. Avant-guard filmmakers had been considering the medium specificity of film and suggested some subversive works against the monocular nature of film. While suture conceals the disrupt between shots, montage theory starting from Eisenstein emphasized the artificial nature of film editing and tried to make the audience aware that film text is a human construct. For example, Alan Rene's *Hiroshima Mon Amour* (1959) is a good example which highlights the problem of *Remembering Pearl Harbor*. The film depicts everyday life in Hiroshima, Japan, after WW2, through a couple of a Japanese man and a French woman. The main topic of the film is, of course, the experience of the explosion of an atomic bomb above the city in 1945 and the people's suffering after WW2. Along with documentary footage of the city, the conversation of the traumatized couple leads the viewers to think about (im)possibility of seeing. The film maker does not try to make the audience feel the same pain of the victims of the atomic bomb explosion nor the French woman who was blamed for her relationship with a German officer during the WW2. Rather, the director emphasizes that we cannot fully see/experience others' pain. While the French women insists that she saw what happened in Hiroshima through

the museum exhibition, the Japanese denies her and says "You saw nothing in Hiroshima. Nothing." While historical materials in *Remembering Pearl Harbor* are utilized to strengthen the impression of a real representation, historical objects in Hiroshima *Mon Amour* rather alienates audience to question the status of reality.

Concluding Remark: Future of VR

Many immersive media in the past and present lack such a modernist/Avant-guard artistic quality, in which the authenticity of representation is self-reflectively challenged. However, that does not mean that future of VR is limited to the monocular mode of viewing. Actually, the Zero Latency VR system has the potential to explore an alternative mode of subject formation technology-wise. As mentioned above, up to six users can spontaneously be in the same visual world in the platform with a particular perspective for each user — a first in the human history. When spectators experience paintings, stage performances, cinema, or whatever, their perspectives are merged into a single privileged point of view. Although *Zombie Survival* enforces the "symbolic" order that the controlling tower protected from zombies is placed in the center, the Zero Latency VR system per se could subvert the spectator-representation paradigm by introducing the third party -- others who are neither the spectator nor visual representation. This potential resonates with the director's artistic attempts in the form of conversation of a couple in *Hiroshima Mon Amour* in the technological limitation of cinema medium.

Thanks to technological advancement and spread of immersive VR devices in the consumer market, many contents were supplied in 2016, and the number is thought to be increasing. In light of past flourishment of panorama, the rise of VR market can be thought as another (re-)emergence of the deep-rooted monocular perspective. Especially in the time of post-truth and fake news that trap audience into a solipsistic cage, the future of immersive VR devices as entertainment, pedagogy, and art needs further exploration.

Notes

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