Binocular Dissociation in Ethnographic Narratives of VR Art
Бинокулярная диссоциация в этнографических нарративах искусства
виртуальной реальности

Binocular Dissociation in Ethnographic Narratives of VR Art

Rhett Tsai (Cai Yuxiao) (✉)

China Academy of Art, 352 Xiangshan Village, Hangzhou, Zhejiang Province, 310000, China
rhetttsaicyx@gmail.com

Abstract

This paper is a study of binocular dissociation that targets ethnography in the narratives of VR art. While most virtual reality head-mounted displays today use binocular vision systems, this paper proposes to use the anti-stereopsis tradition of binocular dissociation to create VR works. It begins with one of the earliest experiments with binocular vision by Wheatstone. To demonstrate the pertinence of such an experiment, a case study illustrates the idea of binocular rivalry in VR. The other case, created by the author, focuses on the simulation of the "land-sickness" of the Tanka people, a marginal ethnic group living mostly in boats on the waters of China. The practice in this case uses binocular dissociation to induce binocular rivalry or even disorientation in the viewers in order to produce an ethnographic VR effect that is based in the experience of the Tanka people. The fundamental purpose of this paper is to discuss technological life and cultural contexts through media experiments, and it regards the Tanka people as a representation of the current cultural contexts of technological art: The dichotomy between "water people" and "land people" embodied by this ethnic group and the "land-sickness" caused by the uncomfortable shifting between sea and land spaces becomes a poignant metaphor. The visual experiments with devices for binocular vision not only act as analogues for the ethnographic pictures of the Tanka people. They also create illustrative links between technological life and cultural identity.

Keywords: VR art; New media art; Binocular vision; Binocular dissociation; Practice-based research

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Ретт Цай (Цай Юйсяо) (✉)
Китайская академия искусств, Сяншань, 352, район Сиху, Ханчжоу, Чжэцзян, 310000, Китай
rhetttsaicyx@gmail.com

Аннотация
Статья представляет собой исследование бинокулярной диссоциации, ориентированное на этнографию в нарративах искусства виртуальной реальности. В то время как сегодня большинство наголовных дисплеев виртуальной реальности используют системы бинокулярного зрения, в этой статье предлагается использовать антистереописную традицию бинокулярной диссоциации для создания произведений виртуальной реальности. Один из самых ранних экспериментов с бинокулярным зрением был проведен Чарльзом Уитстоном. Чтобы продемонстрировать целесообразность такого эксперимента, тематическое исследование иллюстрирует идею бинокулярного соперничества в виртуальной реальности. Другой кейс, созданный автором, сосредоточен на моделировании "болезни земли" народа танка, маргинальной этнической группы, живущей в основном в лодках в водах Китая. В данном случае практика использует бинокулярную диссоциацию, чтобы вызвать бинокулярное соперничество или даже дезориентацию зрителей, чтобы создать этнографический эффект виртуальной реальности, основанный на опыте народа танка. Основная цель этой статьи – обсудить технологическую жизнь и культурный контекст посредством медиа-экспериментов, и в ней народ танка рассматривается как представитель современного культурного контекста технологического искусства: Дихотомия между "водными людьми" и "сухопутными людьми", воплощенными в эта этническая группа, и "болезнь суши", вызванная неудобным перемещением между морским и сухопутным пространством, становится острой метафорой. Визуальные эксперименты с приборами бинокулярного зрения выступают не только аналогами этнографических изображений народа танка. Они также создают наглядные связи между технологической жизнью и культурной самобытностью.

Ключевые слова: Виртуальная реальность; Искусство, VR-искусство; Новое медиаискусство; Бинокулярное зрение; Бинокулярная диссоциация; Практика исследований

LAND-SICKNESS OF THE TANKA PEOPLE AND MISPLACED STEREOPSIS

For artists in the field of technological art, the use of technological media to address cultural issues (e.g., ethnographic narratives) is often caught in a dilemma: limited by the design of the technological media, specific cultural objects can only be interpreted through highly homogenized artistic experiences,[1] making it difficult to refer more directly to the situation of the object being explored and to enter into the corresponding cultural contexts. How can technological media be used to discuss a specific cultural context? This is a way of connecting the technological media to a cultural context by addressing the fact that the structures with cultural presuppositions and expectations in the technological media need to be reinterpreted and used. This paper explores VR as a technological medium and Tanka people as a cultural subject as an entry point.

In the waters of eastern and southern China, there is a group of boat people who live in boats and on the water all day long, known as the "Tanka people," a subset of the boat people found throughout the waters of South and East Asia, including the Orang Laut of Malaysia and Indonesia (Anderson, 1970). For many years, the Tanka people have attracted the attention of many Chinese sociologists because of the problems of ethnicity, modernity, and ethnic discrimination that they embody. However, from the perspective of technological culture, this group of people, living in the "borderland"[2] seems to have little to do with contemporary technological life. Its concerns are highly humanistic and vernacular, yet they represent a reflexive interpretation of the cultural context of today's technology. While the "land people" have gradually entered "the technological society" in the sense of Ellul (1964), these "water people" appear to still be living in a state of "pre-technological society".[3] The phenomenon of "land-sickness"[4] among the Tanka people is the central expression of this. As a kind of physiological dizziness caused by the change of spatial structure, what lies behind the land-sickness is the stress reaction of the individual caused by the reconstruction of cultural identity and the process of modernization. After going ashore to become "land people," the Tanka people abandon the pre-technological life on the water, with the result of their body shape and social cognition differing from those of the land people.

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[1] Most VR artworks follow the narrative and presentation methods of art forms such as film and animation, which usually have a story (whether concrete or abstract) and provide the viewer with a more immersive movie.

[2] The world in which the Tanka people live is an imaginary of the "other" and of the "abnormal" that the people on the shore gaze upon. At the same time, the dwellings on the water face a dichotomy of pressures from state domination, geography and socialization. See Huang (2019) for more details.

[3] Tanka people are a group of people who have been greatly affected by a technologized society. In Hong Kong, for example, the modernization and mechanization of the fishing industry has triggered the decline of the fishing industry. Pursuing high efficiency, the technological society has led to the downfall of the unevolved technology on which the water people who live on the water used to rely for their survival. This is further reflected in the fact that some of the water people's jobs have been taken over by machines (Zheng, 2012).

[4] Land-sickness is a temporary vertigo caused by the inability of the central nervous system to adjust to the spatial sensations of land when Tanka people move to land. See Wu & Situ (2011).

Considering the Tanka people as an important signifier of contemporary technological life, the use of technological art to present ethnographic narratives about this group has a profound introspective and experimental significance. Simultaneously, the phenomenon of land-sickness of the Tanka people is deeply rooted in spatial and visual phenomena, with VR technology based on the principle of stereopsis[5] becoming one of the most suitable means of expression for it. In this sense, the Tanka people can provide a perspective and an entry point for observing technological life, while stereopsis or 3D vision, as a principle of technology, can be utilized in research on cultural contexts.

To realize the dizzying effect of land-sickness and the confrontation of spatial relations that it implies, the principle of stereopsis needs to be used not in the traditional way of stabilizing binocular depth perception but to unsettle it through binocular dissociation. It now serves experiments with binocular vision – to achieve the dizzying sensation and the narrative expression through the counter-intuitive design of the visual images that are seen by the two eyes separately in VR.

Expressing the spatial antagonism between "water" and "land" embedded in land-sickness is the way to add a narrative element to this experiment, and based on this, the approach investigated in this paper focuses on the use of "binocular dissociation"[6] to create a disorientation of the visual space seen by both eyes.[7] Such disorientation is also a way to achieve a sense of dizziness, making this VR experiment aptly depict a cross-section of ethnographic narratives about the Tanka people, both in terms of narrative content and form.

BINOCULAR DISSOCIATION: EXPERIMENTS AGAINST THE PRINCIPLE OF STEREOPSIS

Although binocular dissociation theoretically violates the principle of stereopsis, it is still capable of providing visual images with a sense of space, and it can bring about unconventional stereoscopic vision with extensional perception. In fact, binocular dissociation[8] is nothing new in the history of binocular vision. In 1838 already, Wheatstone proposed the direction of the visual experiment of binocular dissociation, which is the concern of this paper. In his article, Wheatstone mentioned experiments in binocular vision prompting the two eyes to see inconsistent images, for example, by swapping the images of the left eye and the right eye with each other, and by presenting

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[5] Stereopsis refers to depth perception based on binocular disparity. The term was coined by Charles Wheatstone, the inventor of the stereoscope, in the 1830s. It influenced Western visual culture throughout the 19th century in conjunction with the inclusion of the binocular vision mechanism.

[6] From the perspective of the stereopsis principle, binocular dissociation implies a break with the principle of binocular vision. In general terms, it usually means that the images viewed by both eyes separately cannot form the correct stereoscopic image result according to the parallax rule of stereopsis. Due to the difference in the content of the images, the two sides of the images appear to be isolated and separated from each other.

[7] This especially concerns spatial disorientation (Temme et al., 2009, p. 552-553).

[8] Binocular vision is also the principle of current VR technology that is based on head-mounted displays (HMDs).

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the same object in inconsistent sizes for the left and the right eye, etc. (Wheatstone, 1838).[9]

Wheatstone's two experiments above exemplify the two possibilities of binocular dissociation, and their main difference is the presence or absence of the central element of binocular vision, the "binocular disparity"[10] condition, which is the key to binocular vision. As Scroggins explains, "The 'binocular disparity' created by lateral parallax offset in the images presented to the left and right eye allows a fusion of the two images in the visual cortex to create a sense of depth termed stereopsis" (Scroggins, 2013). Swapping the images of the left and right eyes implies the elimination of correct binocular disparity; seeing the same object at different sizes in the left and right eyes indicates that the binocular disparity principle is still in operation. It is worth noting that in the series of experiments conducted by Wheatstone, he found that two different images projected on the two eyes still lead to a perception of objects in space, and this conclusion proves that experiments on binocular dissociation in VR are worth trying, and for artworks, it still creates a sense of immersion and space, and even provides a specific way of viewing with particular intentions.[11] Another experiment in the same article by Wheatstone is equally illuminating: He presented different letters to each of the two eyes to study particular spatial perceptions, which he described:

> If a and b are each presented at the same time to a different eye, the common border will remain constant, while the letter within it will change alternately from that which would be perceived by the right eye alone to that which would be perceived by the left eye alone. At the moment of change the letter which has just been seen breaks into fragments, while fragments of the letter which is about to appear mingle with them, and are immediately after replaced by the entire letter. It does not appear to be in the power of the will to determine the appearance of either of the letters, but the duration of the appearance seems to depend on causes which are under our control: thus if the two pictures be equally illuminated, the alternations appear in general of equal duration; but if one picture be more illuminated than the other, that which is less so will be perceived during a shorter time. (Wheatstone, 1838, p. 386, as cited in Scroggins, 2013, para. 6)

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[9] See Wheatstone (1838) for more details. As an inventor, it makes sense for Wheatstone to study the possibilities of unconventional binocular vision. However, binocular dissociation is often not an outcome that creators and audiences are glad to see.

[10] In mainstream VR creation tools such as Unity and Unreal Engine, manipulating binocular disparity is difficult and requires high level programming foundations, while adjusting the difference between the images seen by both eyes is easier. On the other hand, most artworks do not seek a completely dislocated three-dimensional space, so preserving binocular disparity can provide a sense of space that fits the needs of the creator.

[11] Wheatstone's discovery is crucial. These experiments demonstrate that binocular dissociation still follows certain guidelines of stereopsis; it still provides a sense of space, just in an unconventional way. It is also important to realize that such experiments are quite difficult to do in the age of HMDs, due to the various software setups and minds of artists currently influenced by technological tools.

In addition to the distinctive three-dimensional spatial formations brought about by binocular dissociation, Wheatstone conveys the equally important phenomenon of "binocular rivalry."

In current experiments on binocular dissociation in VR art, the phenomenon of binocular rivalry is triggered by seeing different images in both eyes. This has become a major concern and is an important part of the experiments studied in this paper. As Hayashi and Tanifuji (2012) point out regarding this phenomenon: "When completely different images are presented to the two eyes, they compete for perceptual dominance, such that only one image is consciously perceived at a time, with the dominant image alternating between the left and right eye images every few seconds" (p. 1).

At the point where binocular dissociation triggers binocular rivalry, the two images will begin to have an antagonistic relationship. However, they are not simply antagonistic; they can also coexist in the perception of the image (Scroggins, 2013),[12] and sometimes the illusion of "monocular vision" occurs (Leopold et al., 2005). In the creative experiments and discourses of the artist Memo Akten (2017), he shows how a VR work can embody the mutual influence and coexistence of two different images. In the research-based VR art project "FIGHT!" he experiments with a particular spatial visual experience using images with different color combinations but similar visual forms. It is instructive to read the viewers' feedback as recorded by Akten (2017):

> Some people report giant swipes cross their vision, revealing or hiding the left or right sides. One person reported seeing a sharp line down the middle of their vision, with the left side showing the left image, and the right side showing the right. One person reported sudden cuts between the two images. Personally, I usually see a flat background from one image, with a corner from the other image in a circular mask moving across it. (Narrative Journey section)

The above discussion from binocular dissociation to binocular rivalry provides references to visual theories and experimental results that differ from traditional stereopsis, but also involve special sensory perceptions about stereopsis. Stereopsis consisting of binocularly different images carries special spatial attributes as well as coexisting and antagonistic properties. More importantly, these factors give the viewers direct physiological feedback while evoking active behavior from their eyes. On a visual and structural level, this is very close to the deeper connotations of what triggers the Tanka people's land-sickness. Through binocular dissociation in VR, the two spaces of "water" and "land" become physically and spatially connected, and this connection creates a clear and concise narrative structure for the VR work.

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[12] Scroggins' article provides a valuable compendium of the influence of binocular rivalry in art, citing the experiments with binocular rivalry by artists such as Salvador Dalí, John Hawk, Alan Ammann, Roger Ferragallo, and others in their stereoscopic work.

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BE SAMPAN: FROM BINOCULAR DISSOCIATION TO DISORIENTATION

"Be Sampan" (2021) is a VR work created by the author based on the above research, which attempts to present ethnographic narratives belonging to the Tanka people using binocular dissociation, and to simulate the experience of land-sickness by realizing the disorientation caused by binocular dissociation (fig. 1).
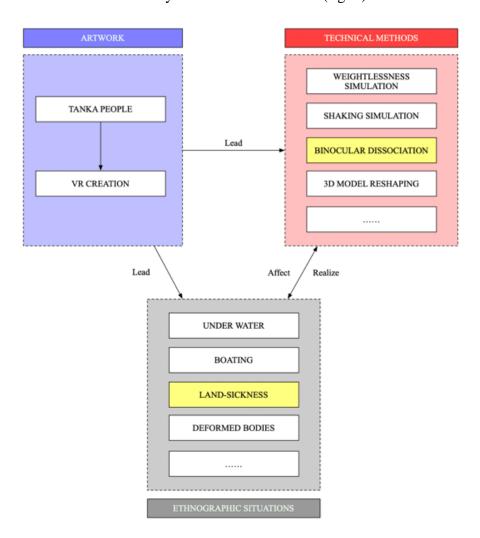
Figure 1. Roadmap for the realization of "Be Sampan."

The work explores the topic "from Tanka people to post-humanity in the present"[13] and fictionalizes Ah Xin, a Tanka who goes ashore. The viewer takes on the role of the

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[13] The concept of "posthuman" used in "Be Sampan" refers specifically to the modern human being who has been shaped by technological society. It manifests itself in the deformed body shape of the "land people" affected by various technological objects, such as the deformed little thumb resulting from years of holding a smartphone – a situation that echoes the discrimination of the land people against the body shape of the Tanka people, formed by life on the water. This part is reflected in the "Deformed Bodies"

other Tanka who is searching for Xin and goes through the imaginary journey of the Tanka people going ashore. "Be Sampan" has three chapters, "The Buoy", "Black Dream", and "Land-Sickness", which are about the metaphors of the Tanka people in the complex relationship between "water" and "land." These chapters interpret the various situations of the Tanka people, such as boating (fig .2), capsizing, and falling into the water, and the land-sickness of going ashore. From the perspective of the characteristics of VR-media they seek to simulate the special situation of the Tanka people, which is different from that of the land people.

Figure 2. The scene of the boating experience in "Be Sampan."

The third chapter of "Be Sampan", "Land-Sickness", is the core of the entire work. Through the approach of binocular dissociation, the viewer plays the role of Tanka who goes ashore to find Ah Xin under the state of land-sickness, which is an ironic metaphor for the process of Tanka people being adopted by the land culture. When viewers wear the head-mounted display (HMD), their left eye sees the world on the water (including water buoys,[14] boats, etc.), and their right eye sees the world on the land (including wooden houses, power poles, and mountains, etc.), a design derived from the origin of land-sickness among the Tanka people – the dislocation of two kinds of space. As the

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presented as plate prints independent of the VR part of "Be Sampan," which is an account of the technological oddities of the land people that Ah Xin sees when she comes ashore. Together with the VR section mentioned in the body of the article, the plate print section constitutes an exploration of issues of technological life and cultural identity.

[14] The water buoys in "Be Sampan" are presented in the visual form of "blue and white porcelain," floating on the water as a special metaphor. During the late Qing dynasty, most Westerners who came to China recognized the country through the tanka people who lived on the water, which was reflected in much of the Orientalist images. In this section, the use of blue and white porcelain, a visual element of Orientalism in the Chinese context, refers to the tanka people as a mediator of stereotypes. See Lin et al. (2018) for more details.

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valuable experiments by Wheatstone (1838) have shown, this particular binocular vision still gives the viewer a sense of a three-dimensional space. It is worth pointing out that when viewers close their right eye, they will see the entire world on the water through their left eye, and this world seems to spill over into the right eye, and vice versa; this phenomenon proves that what Rogers (2019) calls the "immersive screen" still holds when VR undergoes binocular dissociation: The visual world is still characterized by immersive spaces without "boundaries of immersion" (Ng, 2021, p. 110) only that these immersive spaces are overlapping each other.
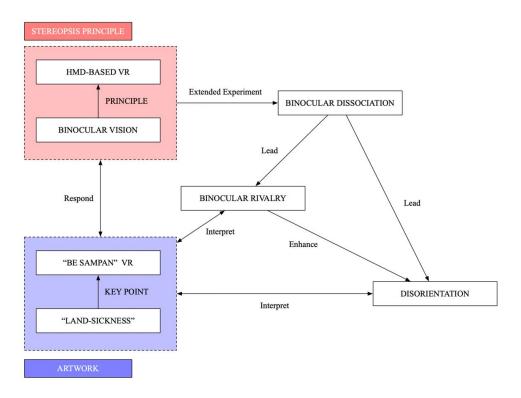

Figure 3. The principle of realizing land-sickness in "Be Sampan."

The key to land-sickness in "Be Sampan" is the realization of disorientation, which is one of the possible outcomes triggered by binocular dissociation and binocular rivalry (fig. 3). In the research by Temme et al. (2009) on the effects of "mistakes" in the visual system of warfighters, they point out that both depth perception and complex images seen binocularly have a chance of triggering spatial disorientation when using an HMD device. In this case, the majority of the survey sample was coping with a situation where the HMD images of the outside world were triggered, rather than experiencing the binocular dissociation of VR, which can induce more immediate and non-contingent depth perception and image cognition disorientation, especially in the case of binocular rivalry.[15] Combining these factors creates the dizziness induced by disorientation and

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[15] Temme et al. (2009) likewise mention the impact and specific analysis of binocular rivalry as another visual "mistakes" (p. 497-504).

binocular rivalry. If the visual depth perception mismatch created by disorientation creates some orientation perception illusion, then binocular rivalry creates dizziness by virtue of its derivatives, e.g., perceptual artifacts (Law et al., 2013).

Figure 4. The scene that utilizes binocular dissociation in "Be Sampan."
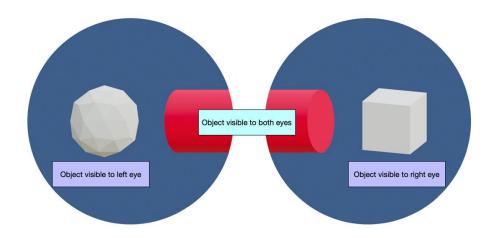

Figure 5. The simplified structure of the design of binocular dissociation in "Be Sampan."

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However, excessive dizziness can cause substantial physiological damage and is a great challenge for the viewer. Therefore, in the VR binocular screen of "Be Sampan," there are visual elements (e.g., Ah Xin and some descriptive texts) that can be seen by both eyes, which makes the viewing screen partially stabilizing (fig. 4). It adds a stabilizing "virtual nose" (Whittinghill et al., 2015) in the content of VR to reduce the discomfort of playing. On the other hand, in terms of the content of the work, these visual elements that are visible to both eyes are also necessary. For the Tanka people and their metaphorical cultural identity in a technological society, the two spaces, "water" and "land", are not completely independent of each other, and the objects that exist in both spaces become the bond that connects the spaces and the implication in the metaphor of the story (fig. 5). In fact, the feelings created by VR can be very different from the reality that people are familiar with, and have a verisimilitude that is beyond reality. As Thurman and Mattoon (1994) point out, it can express the novel sense of abstraction. But it is not so much a representation of "verity" as it is what Zeltzer (1991) calls "presence." What "Be Sampan" wants to show is this sense of presence, not the real sense of one-to-one simulation.

In summary, "Be Sampan" demonstrates the exploration of binocular dissociation in an ethnographic VR narrative. In the representative chapter "Land-Sickness," the author simplifies the usual narrative structure of VR and uses the characteristics of binocular vision itself to advance the story and highlight its meaning. The fact that some of the viewers may feel physically uncomfortable while experiencing this chapter poses a problem for the experience of the work. However, this problem raises an even more poignant question: If the simulation of dizziness triggers dizziness in the viewer, is it therefore successful? It is because of the discomfort that viewers will actively mobilize eye movements to adapt to the work while experiencing it. For example, they will try to close one eye to reduce the sense of dizziness, and these attempts will allow them to discover other characteristics and the playfulness of the separate eye imaging experiment. These kinds of proactive actions affect "the meaning that we construct in our mind" (Akten, 2017).

EXPLORING CULTURAL CONTEXTS
IN TECHNOLOGICAL ART

HMD-based VR devices rely on binocular vision. Therefore, experiments with binocular vision, such as binocular dissociation, are a way to break out of the traditional narrative structure of VR and are central to bringing the medium of VR into alignment with the themes of the work. Such experiments often require the use of unconventional VR settings, and thus they essentially involve a more comprehensive technological outlook and media critique of VR, as well as presenting new challenges and demands on the conventions of technological artworks that address a particular cultural topic. Returning to the larger vision, it extends to questions about technological media and cultural themes. A central issue is that the presuppositions and expectations of culture are themselves hidden in the structure and design of the technological medium. In this sense, in order to break through this limitation and explore specific cultural contexts, it is

necessary to reflect on and create structures loaded with cultural presuppositions in technological media.

How is the creation of contemporary technological art grounded in specific cultural contexts? This paper is a response to that question. Using VR to create art for the Tanka people, the aim is to use technology to represent the cultural identity shaped by technology itself, of which the Tanka people exist as a representation.

What makes the Tanka people so special and necessary in this context is that they are the "other" simultaneously of the land people, of the technological society, and of the dominant cultural context. For the land people, they are a backward and marginalized group; for the technological society, the technology they possess is not yet advanced and can no longer be called "technology"; for the cultural context, they are often recognized as a grey area in the dominant cultural context. By using the technology of new media art to express this topic of technology and culture, this approach itself carries a response to this theme. Equally important, the experiments mentioned in this paper simultaneously allow creators to reflect on the experimental and malleable nature of their creative tools. Because binocular dissociation is inherently unconventional, most research and creativity begin with solving the problems it raises. In this case, it is important to think about how to innovate with it, and this is what the topic of the Tanka people brings to the medium of VR, forcing creators to reflect on whether VR has more possibilities.

Beginning from the structure of binocular vision and ethnographic narratives, this experimental innovation provokes an extended question and solution to the attribute of "simulation of reality" that VR is given by most people: Since "what we perceive to be real, what we see, is a reconstruction in our minds, a simplified model of the world, limited by our biology and physiology" (Akten, 2017), how can VR be used to present a different visual model, to depict a specific situation in a deeper sense?[16] Furthermore, what kinds of situations simulated by VR can represent a cross-section of a cultural context? These are the questions that this paper attempts to explore.

In conclusion, the subject matter of interest in this paper blends reflections on technological tools, cultural identities, and it is a practice that attempts to link multiple domains. The discussion of cultural contexts in the context of technological art involves a rethinking of technological tools, it requires the creator to use thinking about "reflexivity"[17]: The technological medium is used to transform the direct experience of a culture into an artistic experience, while at the same time the technological medium tries to guide the viewer to understand and feel this direct experience through the artistic experience. At the same time thinking about technology is difficult to disengage from the focus on specific cultural identities, especially those of marginalized groups, which are important to force the dominant groups to reflect on their own context.

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[16] The Tanka people's land-sickness is a specific situation under this argument.

[17] This reflexivity follows the path of creativity in the history of media art, since experimentation with the media requires artists to reflect on the tools of the media themselves.

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СВЕДЕНИЯ ОБ АВТОРЕ / THE AUTHOR

Ретт Цай (Цай Юйсяо), rhetttsaicyx@gmail.com

Rhett Tsai (Cai Yuxiao), rhetttsaicyx@gmail.com