Exploring Non-human Language and Vision in Virtual Reality Within the Context of Visual Culture

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Abstract
This study investigates non-human communication and perception via virtual reality (VR) in the field of visual culture. It seeks to integrate visual stimuli and evaluate a non-human perspective in a simulated environment. To lay the groundwork, an emphasis is placed on comprehending the conventional human perspective, particularly through an examination of cinematic and filmic language. The language of film, including narrative structures, shot compositions, and editing techniques, has had a substantial impact on our understanding of non-human visuality. By carefully analyzing the linguistic structure of film, we can gain insight into how human visualize non-human. The study then shifts its focus to investigating language and vision of non-human entities using virtual reality. Using VR's potential to challenge established human perceptions, visual cues are strategically placed to emphasize the non-human viewpoint. The objective is to uncover new dimensions of visual comprehension in VR while revealing the limitations and biases of human perception. The purpose of this study is to expand our understanding of visual culture beyond human experience by investigating non-human language and vision using virtual reality technology. Through a rigorous analysis of linguistic elements in cinema and its relevancy to VR technology, we aim to uncover new perspectives and investigate visual communication that is more inclusive in an interconnected visual culture.

Keywords: Virtual Reality, Non-human Vision, Visual Culture

Introduction

In the modern landscape of communication and perception, the incorporation of virtual reality (VR) has emerged as an enticing way to explore new dimensions of visual comprehension (Tai & Chen, 2021). Utilising the immersive capabilities of VR technology (Rueda & Lara, 2020), this study investigates the realm of non-human communication and perception in the context of visual culture.

The tapestry of visual culture, which is woven from the fibers of human perception and expression, evolves continuously in response to technological developments (Reia-Baptista, 2010; Rose, 2014; Zhang, 2006). This research examines the intersection between two transformative forces: the language of film and the virtual technologies to represent non-human vision. These forces converge to transform our understanding of visual storytelling and our perception of the world. This study's overriding objective is to broaden the horizons of visual culture beyond the limits of human experience. Utilising the transformative capabilities of VR technology, we set out on a mission to investigate non-human language and vision. Through a meticulous synthesis of cinematic language and VR applications, the study aims to diversify viewpoints, thereby facilitating the investigation of visual communication and perception within a broaden and interconnected visual culture that considers non-human entities.

As we delve deeper into the philosophical underpinnings of epistemology and aesthetics, we discover the foundations that support the comprehension of human and non-human perspectives. The philosophy of knowledge, or epistemology, acts as our compass, navigating us through the complexities of understanding and perception (Bradford, 2015). Aesthetics, a subfield of epistemology, sheds light on the essence of beauty and sensory experiences, expanding its scope to include non-human entities (Nadin, 1991). Our research is centred on a comparison of human and non-human perspectives within VR technology. As we traverse this enthralling terrain, we concentrate on the complexities of visual perception, investigating the anatomical differences in ocular structures that distinguish between species. We provide a comprehensive understanding of how diverse species interpret their environments by shedding light on the intricate interaction between vision and anatomy.

Nevertheless, our voyage is not devoid of obstacles and considerations. As we navigate the complexities of comparative analysis, technical constraints, ethical concerns, and the realism of VR simulations loom large. Recognising these factors is crucial for ensuring the authenticity and comprehension of non-human experiences in virtual reality. In the following sections, these aspects will be discussed in detail, illuminating the way forward in our mission to unravel the mysteries of non-human language and vision, all within the rich tapestry of visual culture.

In this transformative odyssey, we hope to shed light on the multifaceted dimensions of perception, bridge the chasm between the human and non-human worlds, and forge new paths for the study of visual culture in the swiftly evolving digital age.

Epistemology and Aesthetics in Non-human Perception

The philosophy of knowledge and its acquisition, commonly referred to as epistemology, serves as the foundation of our investigation into non-human communication and perception. This branch of philosophy contains numerous subfields that contribute to our understanding

of the world as a whole. To embark on this transformative voyage, a solid epistemological foundation must be established. Aesthetics emerges as a central branch of epistemology, providing insights into the nature of beauty and sensory experiences (Friedman, 2016). As a branch of philosophy that investigates beauty and taste, aesthetics plays a crucial role in comprehending the sensory experiences that result from our interactions with the universe, extending its scope beyond the human domain to consider non-human entities (Levinson, 2009). Along with aesthetics, another branch of philosophy, ontology, contributes significantly to our investigation of non-human communication and perception. Ontology concerns itself with the nature of existence, confronting questions about which entities exist or can be said to exist, how they can be categorised, related within hierarchies, and subdivided based on similarities and differences. Through ontological inquiry, we acquire a deeper understanding of the nature and position of non-human entities in the world. Two additional philosophical perspectives, cognitive relativism and contextualism, are pertinent to our study. According to cognitive relativism, knowledge is culturally relative and devoid of objective truth (Rescher, 2003). Contextualism, on the other hand, asserts that knowledge is context-dependent, with the meaning of a statement contingent upon the context in which it is made (Partee, 2004). By investigating these epistemological perspectives, we set the groundwork for a deeper understanding of how non-human entities perceive the world and how their cultural and environmental contexts influence their perceptions (Goldstein et al., 2014; Hird, 2012). This epistemological foundation guides our subsequent exploration of aesthetics, sensory perception, and the transition to nonhuman perspectives.

Aesthetics, Sensory Perception, and the Transition to Non-human Perspective

At the intersection of philosophy and sensory perception, aesthetics plays a central role in our investigation. As the branch of philosophy concerned with the nature of beauty, taste, and the creation and appreciation of art, aesthetics hinges on our five senses—sight, hearing, touch, taste, and smell—as conduits through which we engage with the world and appreciate beauty in its diverse forms (Freeland, 2012). To fully comprehend the concept of beauty, a dynamic interaction between human observers and diverse artistic forms or works of art is required (Nadin, 1991). Each of the artistic movements functions as a canvas for the expression of beauty, providing avenues for appreciating the beauty of the world (Mallon et al., 2014) and gaining insight into the nature of non-human perspectives. Our research endeavour focuses primarily on measuring and comprehending the non-human perspective. The incorporation of cutting-edge virtual reality (VR) technology enables this endeavour. Our objective is to seamlessly incorporate visual stimuli within a controlled environment, thus creating a compelling simulation of a non-human viewpoint. Before venturing into the realm of non-human perspectives, it is essential to have a thorough grasp of the conventional human perspective. This requires a thorough analysis of cinematic and filmic language, which includes narrative structures, shot compositions, and editing techniques (Lino et al., 2010; Medhurst, 1982). The language of film has significantly influenced our understanding of visual storytelling and our perception of the world (Kaiser & Shibahara, 2014). The intriguing transition from the human perspective to claiming the non-human perspective adds depth to our research voyage. This transition involves the strategic use of visual signals within the VR environment, revealing the untapped potential of technology to amplify the non-human perspective. Through this inter-disciplinary investigation involving epistemology, aesthetics, sensory perception, and virtual reality technology, our research aims to uncover previously unexplored dimensions of visual comprehension. In addition, it seeks to illuminate the inherent limitations and biases embedded in human perception. This holistic approach provides a comprehensive comprehension of beauty and its multifaceted manifestations in the

era of digital immersion, all the while building on the solid epistemological foundation established at the outset of our investigation.

Comprehending the Conventional Human Perspective: A Bridge to the Non-human Realm

Understanding conventional human perspectives is essential to understanding non-human perspectives. This task requires a thorough analysis of filmic language, including narrative structures, shot compositions, and editing (Finn, 2015; Koutsoubou, 2010). Film's storytelling has forever changed how we see the world and interpret visual narratives (Kraft et al., 1991). Film language—narrative structures, image compositions, and editing—is essential to visual storytelling. Many film and media studies references support this claim (Bradbury & Guadagno, 2020; Smilevski et al., 2018; Yuan, 2018; Zhou, 2005). No Film School claims that filmmaking uses a global cinematic language. This universal language lets us see hope, fear, love, and excitement on characters' faces. The camera deftly reveals key plot points and our deepest emotions through subtle movements and framing (Hellerman, 2021). Industrial Scripts defines cinematic language as a set of techniques and conventions used in film to communicate with the audience. Lighting, performances, cinematography, and editing convey emotions and ideas (Scripts, 2021). Videomaker shows how cinema has become a global language, using shots, shot sequences, scenes, and dramatic sequences to tell a story. Organising cinematic elements like language structures improves a video's narrative impact and makes it accessible and engaging for a variety of audiences (Schmierer, 2019). In addition, Ken Aguado explains visual storytelling in film and TV. This art form uses optical effects to make films transcend language barriers and connect with audiences through imager power (Aguado, 2021). The Writing Studio examines film's unique language, where art directors, directors, and cinematographers collaborate to create visuals. In this field, filmmakers use camera work, sound design, and visual effects to artistically convey the story's essence and complexities, capturing the 'bits and pieces' of the narrative in the visual tapestry (Dercksen, 2015). The Film Fund Blog shows how visual narrative transcends language to deeply engage viewers. Visual storytelling alone conveys emotions, conflicts, and character development in films (Johnson, 2023). We enter the unfamiliar world of non-human perspectives by strategically using cinematic storytelling conventions (Wright et al., 2012). This transition is ongoing in our study of non-human perspectives, especially in VR technology (de Klerk et al., 2019). The shift from human to non-human adds depth and dimension to our research. By using visual indicators and signals in the VR environment, this transition shows how technology can augment and simulate the non-human perspective. Understanding the conventional human perspective is essential to studying non-human perspectives. This understanding helps you navigate the unfamiliar and prepares you to use VR to accurately simulate non-human perspectives. Immersive simulations using film language can bridge human and non-human virtual reality experiences.

Embarking on a Comparative Journey: Exploring Human and Non-human Perspectives in VR

Our research goes beyond observation to compare human and non-human perspectives, which is key to understanding perception using virtual reality (VR) technology. VR delivers an unforgettable experience that lets us see the world as non-humans (Rueda & Lara, 2020). In this comparative analysis, we focus on the intricate aspects of visual perception, often manifested as ocular structure differences. Comparative anatomy is fascinating, and we learn how eye characteristics affect how different species perceive their environment.

Chicken vision, which contrasts with human vision, is one of our examples. Chicken irises have adapted to their environment (Aleman & Schaeffel, 2018). Optimal for long-distance navigation, prey detection, and mate selection, their larger eyes relative to head size provide a wider visual field. Their higher density of photoreceptors, especially cones, enhances their ability to perceive colours, including ultraviolet light. The chicken pecten, which nourishes the retina, and the "double fovea," a unique adaptation in many bird species, improve visual acuity across a wide range (Wai et al., 2006). We conclude this artwork by comparing human and non-human perspectives. We use VR to show the complexities, differences, and limitations of each perspective to help humans understand the non-human experience. This ambitious project shows how virtual reality can help us understand visual culture and navigate digital perception. This investigation connects human and non-human domains, revealing perception's complex nuances and expanding visual culture research. Our study of human and non-human perspectives in visual culture has prepared us for a transformative direct comparison. This crucial phase of our investigation maximises VR technology's immersion. We want to help humans and non-humans understand each other. Understanding the complexities, differences, and limitations of each perspective will do this. Consider the extraordinary world of vision in animals other than humans, using the chicken as an example, to shed light on this path. Evolution has shaped the chickens' visual environment to meet their specific needs as a species. One distinguishing characteristic is the placement of their eyes on the sides of their heads, which affords them a field of vision significantly greater than that of humans. Despite having very little overlap between their eyes, chickens have approximately 300 degrees of monocular vision, whereas humans have approximately 120 degrees of peripheral vision and approximately 60 degrees of binocular vision. Due to this adaptation, they are able to detect potential dangers and navigate their environment without excessive head movement (in my garden, 2019). Figure 1 depicts a comparison of the visual fields of humans and chickens.

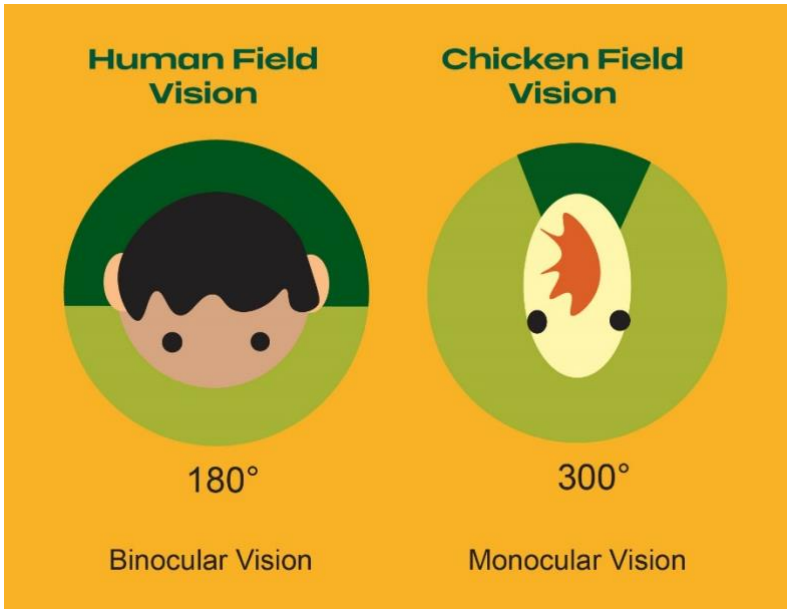

Figure 1. Human vs. Chicken Vision

For such a wide field of view, chickens have sacrificed their depth perception. In order to compensate for this deficiency, they exhibit the peculiar behaviour of bobbing their heads from side to side, which enables them to determine distances more precisely. This difference in visual acuity is a result of the vastly different lifestyles and ecological niches of chickens and humans. Chickens prioritise panoramic awareness due to their need to avoid being

consumed by predators, whereas humans prioritise depth perception due to their need to develop their eyesight for precise activities and complex environments (in my garden, 2019). Another fundamental difference between human and chicken vision is the ability to distinguish between colours. A large number of cone cells in the human retina allows for the detection of a broad spectrum of colours and contributes to the colourful symphony that is human colour vision. In contrast, chickens have only two types of colour receptors, which makes their colour vision system more straightforward. Due to their decreased sensitivity to the red portion of the spectrum, it is difficult for them to perceive the full spectrum of colours in the same manner as humans. As a result, they may perceive certain tones as various shades of grey or entirely different colours (Ham & Osorio, 2007; Odeen & Håstad, 2003). Due to their exceptional colour vision, chickens are able to navigate their environment effectively. They are able to differentiate between edible and non-edible objects and use colour cues to identify flock members. The adaptive differences between human and chicken colour vision illustrate the divergent evolutionary paths of humans and chickens. In order to ensure their own survival, chickens have developed a more basic colour vision system, whereas humans have developed a more nuanced colour vision system, which enhances their enjoyment of the various hues around them (Lind, 2016; Olsson & Kelber, 2017; Schmidt et al., 2004). A study conducted by researchers investigates the complexities of chicken vision in greater depth. According to their research, chickens are tetrachromatic, meaning their eyes contain four distinct types of photoreceptor cones (in my garden, 2019), while humans are trichromatic (Verrelli et al., 2008). Figure 2 depicts a comparison of trichromatic and tetrachromatic.

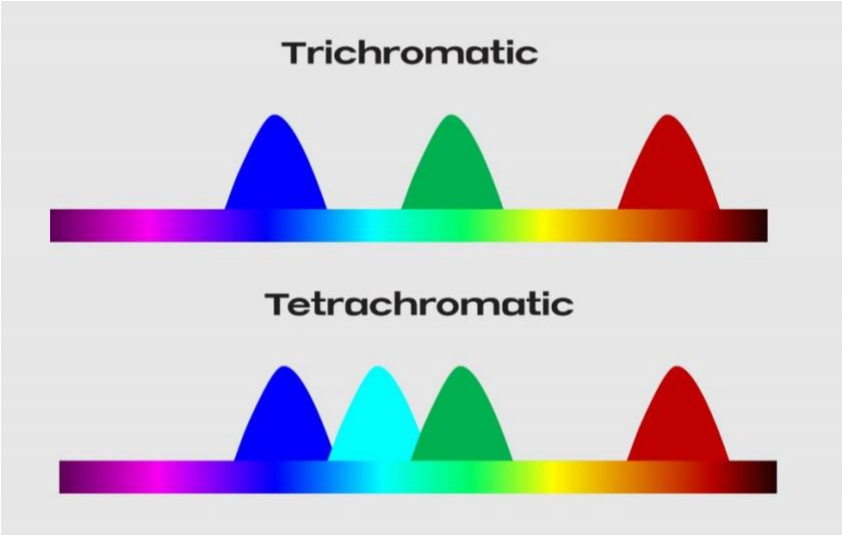

Figure 2. Trichromatic and Tetrachromatic Color Vision

Trichromats, like humans, have three photoreceptor cones for the RGB colour spectrum, as shown in the figure. Chickens, as tetrachromats, have an additional cone to see cyan. Chickens have RGCB vision due to their expanded cone range. Chickens' tetrachromatic vision lets them see cyan and other colours beyond the RGB spectrum. These species' unique environmental and survival needs have led to unique colour perception adaptations (in my garden, 2019). Our exploration of comparative vision in virtual reality shifts to the perspectives of humans and non-humans. Chicken vision is an example of non-human perception to illustrate perception's complexities. This divergence in vision, with its wide field of view and specific adaptations, illuminates anatomy, environment, and perception. Our study of chicken vision illuminates these differences and shows how visual culture shapes our perceptions and interactions with the world. These insights, grounded in non-

human vision, will help us examine the integration of different perspectives in virtual reality environments, enriching our understanding of visual culture in the digital age.

Navigating Challenges and Considerations in Comparative VR Analysis

As we compare human and non-human perspectives in virtual reality (VR), we must recognise and address several challenges and considerations that affect the authenticity and comprehensibility of the non-human experience. Technical constraints, ethical considerations, and VR simulation realism affect our comparison. Comparing human and non-human perspectives in VR is hindered by technical limitations. Even though VR technology is advanced, it may not fully replicate non-human sensory experiences. Although we can simulate a chicken's field of view, we may not be able to replicate its visual acuity, photoreceptor adaptations, and cognitive processes. Be aware that even the most immersive VR environments can only approximate non-human sensory realities. These technical limitations must be acknowledged to accurately interpret our comparative study results. Ethical considerations are also important in our comparison. We must be ethical and responsible when studying non-human perspectives to help humans understand them. Informed consent from participants is needed when using non-human avatars or perspectives. Participants who view the world from a non-human perspective may also experience emotional or psychological effects. Respecting ethical boundaries and participant well-being are key to our research. VR simulation realism is crucial to our comparative study's efficacy. The degree to which virtual reality (VR) environments replicate non-human experiences affects human comprehension (Alyahya & McLean, 2021). Careful design, accurate data integration, and a thorough understanding of the non-human perspective are needed to create high-fidelity VR simulations. To replicate poultry vision, one must accurately represent their visual field, colour perception, and head movements. Interpretations of non-human experiences can result from representational errors. Thus, virtual reality simulations must attempt realism. Interpreting our comparative analysis results is difficult. A nuanced approach is needed to understand how VR viewers perceive and interpret non-human experiences. Are cognitive biases and anthropocentric interpretations real? Do humans realise non-human perspectives' limitations? These questions emphasise the need to analyse and interpret our findings, taking into account human and non-human aspects of the experience.

Creating the VR Experience

To provide a comprehensive comparison of human and chicken perspectives, we undertook the challenging task of developing a virtual reality (VR) experience that accurately simulates the poultry's sensory environment. This endeavour required a comprehensive comprehension of the distinctions between the tetrachromatic vision of chickens and the normal trichromatic vision of humans. While we strived for accuracy, it is crucial to note that the VR experience is merely a simulation of how chickens see the world, not a perfect replication.

Using Adobe Premiere Pro CC, we edited video footage as the initial phase in the production process. In order to simulate tetrachromatic vision, we had to introduce cyan to the visual spectrum. This required adjusting several Adobe Premiere Pro parameters, including hue, saturation, luma, and RGB curves. Using credible sources regarding chicken vision, we adjusted these settings to approximate tetrachromatic vision. It was then exported as a cube file, making it compatible with VR platforms. Figure 3 depicts the waveform of a chicken in Adobe Premiere CC.

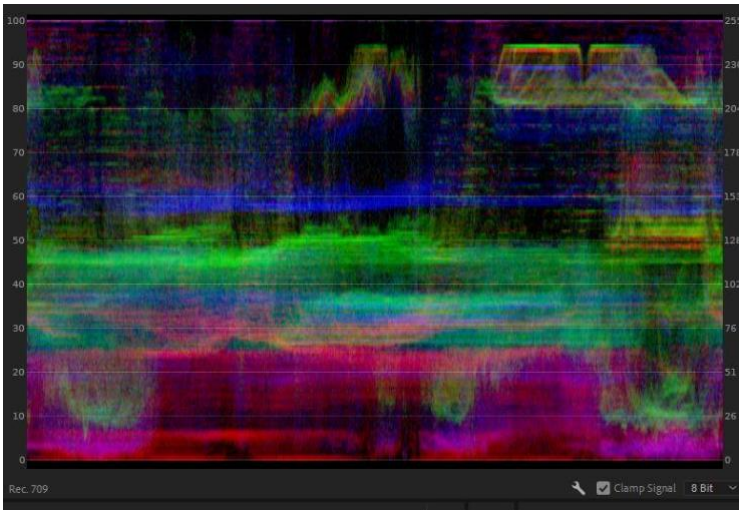

Figure 3. Chicken Waveform

We recorded VR footage with a 360-degree camera. Our camera was the Insta360 Insta360x3. For an authentic chicken's perspective, we used an arbitrary and unplanned approach. The 360-degree camera was placed in the chicken's cage so it could move freely and interact naturally. This subtle method ensured the chicken's movements and behaviour were real, laying the groundwork for our VR experience. We considered mounting a small camera on the chicken's head. We soon discovered that the chicken couldn't support the camera. Thus, we carefully observed and replicated the chicken's movements during filming. We accurately simulated the chicken's 300-degree field of vision, compared to 180 degrees for humans. We used 360 studio apps to adjust the field of view to match a chicken's perspective. After filming, Adobe Premiere was used to edit the footage. The tetrachromatic filter accurately simulated chicken vision. We had to meet technical requirements to immerse viewers in the chicken's visual world. This included VR devices, which are needed to fully experience VR content. In these VR experiences, they see the world from a chicken's eye, which is novel and stimulating. Figure 4 compares human and chicken output (filtered) to preview the results. These environments allow VR headset users to fully experience a chicken's perspective. In this unforgettable experience, cutting-edge technology and a chicken's perspective bridge human and non-human perception. This innovative VR experience aims to advance visual culture research by revealing the complexities of non-human vision.

Figure 4. Human vs. Non-Human Output on VR

Impact on Visual Culture and Opening New Dimensions

Our VR research on human and non-human views has a huge impact on visual culture. As we learn more about perception, we develop new ideas that challenge our preconceptions and spark new art, media, and communication conversations. Visual culture is a living tapestry of self-perception (Davis, 2019). Understanding, discussing, and connecting with the visual world are all part of it. VR technology allows visual culture to expand by connecting humans and nonhumans. Our study may change how we create and view visual content, which is important. Immersing ourselves in non-human sensory truths teaches us about visual experiences. The new information may affect how artists, filmmakers, and other creators work. It allows for new story formats that appeal to more perspectives. Consider what this means for directors. Our study challenges film language and encourages filmmakers to try new storylines and visual cues that appeal to humans and nonhumans. It encourages content that crosses boundaries, which helps different species communicate. Dialogue and media are also greatly affected. The way we talk to and understand non-human things will change if we put ourselves in their shoes or see things through their eyes. Now that environmental films can show animal life, people value biodiversity more and want to protect it (Collard, 2016). Under the theme "Exploring Non-Human Language and Vision in Virtual Reality Within the Context of Visual Culture," our research is groundbreaking. It shows how VR can help us understand digital visual culture. As we progress with this research, perception research expands. It connects human and nonhuman worlds and illuminates visual culture's complexities. We lead the way towards a more inclusive and compassionate world as we explore nonhuman perception. The new dimensions we create allow us to enjoy the complex tapestry of all visual culture beyond what humans can feel. By bringing human and nonhuman voices together, our study breaks down barriers. It challenges anthropocentrism and encourages us to explore visual culture's many perspectives. We gain empathy, understanding, and respect for different worldviews by doing this. These new dimensions are also evident in education and study. They help teachers engage students in learning and encourage critical thinking, pushing them to think bigger. Our research helps people from different fields collaborate beyond academic fields.

Conclusions

Our study of non-human language and vision in virtual reality (VR) intersects with the rich tapestry of visual culture in the digital age, where the virtual and real merge. Our journey to transcend human comprehension has opened new doors in visual storytelling and perception. Our research has illuminated the path to understanding human and non-human perspectives, from epistemology and aesthetics to cinematic language and virtual reality. Epistemology has taught us to appreciate perception's complexity, while aesthetics has expanded our understanding of beauty and sensory experiences to include non-humans. The comparative analysis of human and non-human perspectives in VR technology illuminates the complexities of visual perception and the anatomical differences that affect diverse species' environmental interpretations. The study of chicken vision shows how visual acuity, colour perception, and anatomical adaptations affect how species interact with their environment. Our pursuit is not without ethical considerations and challenges. We emphasise authenticity in our exploration of non-human realities as we navigate technical limitations, ethical boundaries, and VR simulation realism. Our transformation requires us to embrace multifaceted perception, bridging human and nonhuman realms. As we explore visual culture in the digital age, we affirm that virtual reality's fusion of human and non-human perspectives offers new storytelling, dialogue, and comprehension opportunities. In this

visual culture tapestry, we transcend our own perception to embrace the many ways the world is seen, felt, and expressed.

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