Metaverse - New Ecology of Future Art Development

JiaYao Li [1] and LEE SEOK HWAN [2]*

[1] Department of Animation，Suncheon National University，Korea，Ph.D. Student; lijiayao61@naver.com
[2] Department of Animation，Suncheon National University，Korea，Professor; 0079gundam@naver.com
* Correspondence

Abstract: The metaverse is not only considered as the "next stop" of the Internet, but also an important application scenario combining computer science with culture and art. The author believes that with continuous upgrading and development of the metaverse, four new changes will be brought to the current art ecology: 1) decentralization of the metaverse art; 2) dynamic interactivity of metaverse art; 3) NFT-ization of metaverse art; and 4) daily recording of metaverse art. The metaverse can reverse the relationship between art and reality, reshape the aesthetic paradigm of future art, and open a broader research channel for the development of future art forms.

Keywords: Metaverse; Metaverse art; Artistic character; Development of shape

1. Introduction

1.1 The concept of the Metaverse and its meaning

The concept of the Metaverse was originally introduced in 1992 by Neal Stephenson, an acclaimed American cyberpunk science fiction writer, within the pages of his book Snow Crash [1]. Stephenson envisioned a parallel universe, referred to as the Metaverse, which interconnects the physical world with the virtual realm of networks. The term "Metaverse" itself is a composite of the root term "meta," denoting something transcendent, and "verse," an abbreviation of "universe," conveying the notion of an expansive hyper-reality.

As an emerging concept, the metaverse has received widespread attention from the industry, academia, media, and the public. However, the definition and concept of the metaverse are not yet unified and clear enough. Different practitioners, experts, and institutions have provided insights into the metaverse, as shown in [Table 1].

Table 1. Different opinions of practitioners and experts on the metaverse

Name	Affiliations	Description
SE Bibri	Norwegian University of Science and Technology	The metaverse is a virtual world connected and created through science and technology, mapped and interacted with the real world, and has a digital living space of a novel social system[2].
Zuckerberg M	Facebook	The metaverse is a world composed of countless interconnected virtual communities where people can meet, work, and entertainment through virtual reality devices (e.g., headphones and eyes), smartphone applications, and other devices[3].

JDN Dionisio	Loyola Marymount University	The metaverse is a virtual world that connects everyone. Everyone has a virtual identity and can do anything desired. The metaverse has eight characteristics: identity, friends, immersion, low latency, diversity, anywhere, economy, and civilization[4].
Redmond E	Nike	The metaverse spans the physical/digital gap between reality and virtual reality[5].
Kimber C	Posterscope	The metaverse is an observable digital universe composed of millions of digital galaxies[5].
Shabro L	Army Futures Command	The metaverse is a fuzzy digital hybrid reality. The things and people in the metaverse are irreplaceable and infinite and are not limited by the traditional physical space[5].
Kicks P	BITKRAFT Ventures	Metaverse: a lasting and real-time digital world, providing individuals with a series of agency, social existence, and shared space consciousness. It has a wide range of virtual economic systems[5].
Bellinghausen B	Alissia Spaces	The metaverse is a bridge between the real and virtual worlds[5].
Redding N	Redding Futures	The metaverse is an infinite space where people can do everything physically and still have sensory stimuli such as vision, hearing, touch, and smell[5].
Piech E	AMP Creative	The metaverse is a world that no longer pays attention to the difference between our digital avatars and bodies. It is a world where we are surrounded by information (e.g., work, entertainment, and education) using intelligent lenses and brain–computer interface devices. It is the next generation of the internet[5].
Ning H S	University of science and technology Beijing	The general cyberspace (metaverse) is a unified description of conventional cyberspace and cyber-enabled physical, social, and thinking spaces formed based on ubiquitous connections between things and the deep convergence of spaces[6].

In 1981, Vernor Vinge, an American mathematician and science fiction writer, published his novel True Names [7], which introduced the concept of visualization within the vast realm of computing: a realm that extended beyond the confines of reality. This seminal work can be considered as the seed from which the concept of the metaverse originated [8]. In 2009, Snow Crash was published in Chinese, with Guo Ze serving as the translator. Guo Ze chose to convey the essence of the Metaverse through the term "metaverse," imbuing it with strong connotations derived from Chinese philosophy. This adaptation served as a catalyst for subsequent discourse and conceptual development within Chinese intellectual circles, ultimately contributing to the crystallization of the notion of a "metaverse" in the Chinese context.

In English, "meta" signifies "beyond," while "verse" is a veiled reference to the term "universe." Thus, the

term "Metaverse" implies a reality surpassing our present life, society, and even the confines of our existing universe. Within Stephenson's novel, he delineates an entirely digital and virtual hyper-reality, underpinned by elements such as "computer drawing protocols," "software," "fiber optic networks," and "computer imaging".

1.2 The Development of the Metaverse

Over the past five decades, the rapid advancement of modern technologies such as the Internet, computers, mobile phones, virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) has sparked profound speculation and imagination regarding the future society.

The cinematic representations found in three major films—The Matrix (1999), Avatar (2009), and Ready Player One (2018)—have offered captivating artistic portrayals of people's vivid visions of virtual worlds, ultimately stimulating lively discussions on topics such as brain-computer interfaces. On March 10, 2021, Roblox, the largest multiplayer online creation game company in the world, made its initial public offering on the New York Stock Exchange. Astonishingly, the stock price surged by 54.4% on its first day, propelling Roblox's market value to exceed $40 billion. This meteoric rise, considering that just six months prior its valuation stood at $4 billion, signaled a significant milestone. However, what holds even more significance is the term mentioned in Roblox's prospectus— "Metaverse" [9]. Almost overnight, the notion of the metaverse captured the collective imagination of the internet community and tech giants, conjuring visions of a "Brave New World".

After undergoing a joint fermentation within the spheres of science, technology, and art—particularly within the realms of film and gaming—the emergence and proliferation of the metaverse seemed almost historically inevitable. The metaverse represents a breakthrough from the limitations of our current reality, enabling the intricate interweaving and overlapping of time, space, people, and everything else with the digital virtual world. This realization facilitates the complementary, synergistic growth of multidimensional, multimaterial, and diversified resources and energies, significantly enhancing the operational efficiency of our world and society. Moreover, it greatly amplifies the output and construction capabilities of new value systems, stimulating the eventual establishment of an ecological universe and the iterative evolution of our reality. Thus, the metaverse opens up new horizons—both spatially and temporally—for the continued development of Earth and humanity [10].

In the metaverse, the shortcomings of reality, such as one's socio-economic status, physical disabilities, lack of prospects, setbacks in life and career, or emotional deficiencies can potentially be compensated for within the virtual realm [11]. The virtual world offers the possibility of attaining equilibrium, and even surpassing reality itself, granting individuals digital identities, digital power, digital wealth, digital love, and digital abilities as the goals of the future. Within the metaverse, it becomes conceivable to extend, reverse, or even substitute elements of the real world with digital and virtual modes. By utilizing the template of the real world to create digital virtual realms and subsequently augmenting and improving the real world through these virtual domains, the metaverse envisions a new paradigm where human existence transcends to N dimensions, encompassing multiple identities spanning both the tangible and the digital. This parallel and interdependent development, characterized by seamless compatibility and three-dimensional convergence, gives birth to a new and extraordinary realm.

1.3 Research content

With the rapid advancement and widespread adoption of digital technologies, the concept of the Metaverse has garnered significant attention. In the Metaverse, individuals can create, showcase, and communicate artistic works in novel ways, thus profoundly influencing the future of art. However, as an emerging field, the Metaverse requires in-depth research to explore its specific impacts and potential for artistic development.

The objective of this study is to explore the emergence of the Metaverse as a new ecosystem for future artistic development and analyze its potential contributions to artistic creation, dissemination, and consumption. By examining the influence of the Metaverse on art, we aim to gain a better understanding of its role in the artistic domain and provide insights and guidance for the future of artistic development.

This study contributes to the field in the following ways:

1. Enhanced understanding of Metaverse art: Through in-depth research on the impact of the Metaverse on art, we can gain a clearer understanding of the characteristics, creative processes, exhibition forms, and other aspects of Metaverse art. This helps expand our knowledge and comprehension of art and promotes

artistic innovation and diversity.

2. Exploration of emerging artistic ecosystems: The Metaverse, as an emerging artistic ecosystem, creates new opportunities for interaction and engagement between artists and audiences. By studying the establishment and development of this ecosystem, we can explore innovative artistic creation and dissemination models, providing new references and pathways for the future of artistic development.

3. Analysis of the Metaverse's influence on art markets and consumption patterns: The rise of the Metaverse has disrupted traditional art markets and consumption patterns. By examining the impact of the Metaverse on art markets and consumption, we can understand its reshaping of relationships between artists, collectors, and audiences, and explore the possibilities of constructing fairer, more open, and transparent art markets.

4. Guidance and insights for future artistic development: Through an exploration of the Metaverse's impact and potential for art, we can provide guidance and insights for future artistic development. This includes offering new perspectives and methods for art education, creative technologies, and innovative models, fostering artistic innovation and advancement.

In summary, this study aims to investigate the Metaverse as a new ecosystem for future artistic development. By analyzing its impact and potential, it provides new perspectives and references for artistic creation, dissemination, and consumption. Through an in-depth examination of the relationship between the Metaverse and art, we can better understand and grasp the trends and directions of future artistic development.

2. Connection between the metaverse and art

2.1 Metaverse and art

It is not nonsense to say that the metaverse have a close relationship with art, even a strong inline relationship. The metaverse arose from art, and it will also be attributed to art. The word "metaverse" itself is the artistic creation of the novel, and the visual presentation of the virtual world and digital world is still movies or online games. In other words, in addition to artistic imagination and works of art, it is difficult to have a better way and means to express the digital virtual characteristics of the metaverse.

The films "True Names," "Matrix," and "Avatar" have secured their positions as timeless classics in the history of cinema. Among these, the term "Avatar" has transcended its cinematic origins to become synonymous with digital identity, digital image, and digital embodiment in the online world. Additionally, the film "Inception" vividly presents the concept of entering a virtual dream through external devices, thereby constructing two parallel worlds: the virtual dream world and the real world. This serves as an imaginative extension of the metaphorical metaverse within the realm of art.

The notion of a "dream" in the film represents consciousness and the human mind, while computers and the Internet serve as instruments that imitate the complexities of the human brain and consciousness. The characters existing within dreams symbolize the virtual identities that humans aspire to or envision, aligning with the digital avatars prevalent in the online realm. In "Inception," thoughts are either stolen from or implanted into others—an act that signifies the pursuit of innovation and wealth. Similarly, the purpose behind constructing a virtual network world is to foster the exchange of ideas, innovation, and the acquisition of wealth. While "Inception" portrays the act of stealing thoughts, the cyber world facilitates the swapping of ideas, yet both share similar objectives, motivations, and even port technologies.

Although "Inception" utilizes computer 3D design and assisted imaging techniques to design dreams, the interactive presentation and parallel dialogue between the dream world and reality resemble the operations of the metaverse. A similar artistic metaphor is employed in the movie "Lucy." The film portrays the manipulation of telecommunications signals, transcending space, time, and human history. When Lucy abruptly disappears at gunpoint, her cell phone message, "I am everywhere," illuminates the interconnectedness of all things—an essential aspect of the metaverse's structure.

Released in 2018, "Ready Player One" serves as a more precise depiction of the metaverse. The film constructs a marvelous and vibrant online virtual world, wherein anyone equipped with virtual reality (VR) devices can embark on an exhilarating and enchanting journey. Online games, in essence, represent the most advanced form of artistic entertainment within the social practice of the metaverse. Realism acts as the artistic realm pursued by these games, as characters, sounds, visuals, landscapes, attire, props, and storylines are meticulously designed and crafted to resemble the real or physical world. The saying, "What is lost in the real

world must be earned back in online games," captures the psychological foundation that compels numerous players to indulge in these virtual realms. Furthermore, it encapsulates the fundamental significance of the metaverse—the equilibrium, coordination, and coexistence of the virtual and real.

Video games can be viewed as pioneering attempts within the networked world towards the realization of the metaverse. Their remarkable development has accelerated the actualization of this concept. Games such as "Animal Crossing," "League of Legends," "Fortnite," "World of Warcraft," and "Honor of Kings" enjoy global popularity. Within a mere six months after its launch, Fortnite amassed over 45 million online players. In April 2020, the game hosted an online virtual concert featuring American hip-hop artist Travis Scott, attracting a staggering 27.7 million players and creating shockwaves across the Internet.

With statistics revealing that individuals spend an average of 12 hours per day immersed in the online realm—excluding sleep time—while only allocating a mere 4 hours to the real world, it is apparent that the internet has become an integral part of modern human existence. Hence, it is conceivable that future generations may prefer the virtual world as a replacement for reality. In anticipation of this shift, in April 2021, ByteDance invested nearly 100 million yuan in the metaverse game developer "Daimaqiankun," strategically establishing its presence within the metaverse. Moreover, in May 2021, Apple acquired virtual reality company Next-VR for $100 million, thus bolstering its capabilities in VR entertainment, artistic creation, and sports.

Naturally, the metaverse exhibits strong ties with art, particularly within the domains of video, imagery, music, language, text, three-dimensional visuals, and holograms—these are the central mediums bridging the virtual and real worlds [12]. Through the utilization of video recording, transcoding, decoding, and encryption technologies, the real world can be seamlessly integrated into the virtual realm. Conversely, the virtual world can transmit digital content through cloud computing, decryption, transcoding, and decoding, evolving into an object of human appreciation. The metaverse represents the culmination of the beginnings of a new artistic era, providing art with an unprecedented form.

Art and science, contrary to common belief, are not mutually exclusive but rather share a common origin and complement one another [13]. Both art and science are intelligent creative pursuits that stem from mankind's noblest endeavors. They seek depth, universality, permanence, and meaning. Art inspires the inception of the metaverse, propelling its advancement towards maturity. Ultimately, art and science converge as two sides of the same coin, intimately intertwined within the most profound aspects of human existence.

2.2 Forms of metaverse

In order to ensure the validity and advancement of the metaverse, art must play a crucial role. The Metaverse acts as a platform that offers a diverse range of avenues for the promotion, circulation, trading, and preservation of artwork, thus significantly expanding the lifespan and spatial boundaries of art. Nevertheless, these aspects are of secondary importance. The key lies in the fact that the metaverse not only serves as a source of inspiration for artists, providing them with powerful creative materials, but also empowers individuals to become artists themselves through the We-Media space, self-uploading mode, and self-playing mechanism. In other words, the metaverse possesses the extraordinary ability to unlock and cultivate the artistic potential within each individual, truly representing the greatest advantage it brings to humanity.

Renowned author Liu Cixin, who was honored with a Hugo Award at the 73rd World Science Fiction Convention, explores this notion in his work "The Three Body Problem" [14]. He posits that in the face of the demise of the solar system, humanity's final salvation lies in the preservation of artworks by the likes of Van Gogh and other artistic masters. As the solar system transitions from a three-dimensional space-time framework to a two-dimensional plane, it transforms into vibrant images on paper when viewed from the depths of the universe, akin to Van Gogh's fiery oil paintings. Does this not reflect the ultimate value and purpose of the metaverse? Namely, that life originates from beauty and ultimately merges back into it.

Since the inception of the concept of the metaverse, the concept of metaverse art naturally emerged [15]. However, given that the academic community has yet to establish a comprehensive and precise definition of the "metaverse," research pertaining to metaverse art lacks the necessary motivation and enthusiasm. Metaverse art, as it is currently understood, embodies the symbiotic relationship between the virtual and physical realms: digital twin art, digital native art, and physical twin art. Digital twin art involves the translation of art from the physical world into the digital realm, while digital native art encompasses the creation of entirely new digital art forms within the virtual domain. On the other hand, physical twin art refers to the physical realization of art derived from the digital world. These three forms of metaverse art shall serve as the primary focus of exploration and study in this field.

2.3 A new field of artistic practice

Moreover, from the perspective of art history, there has always been a complex relationship between new technology and art. For example, during the Renaissance, the invention of geometric perspective and the application of light and shadow and anatomical techniques formed a whole set of new rules and methods for observing nature and constructing pictures. Photography technology and Oriental decorative art gave birth to Impressionism to a certain extent. The large-scale popularization of the Internet also promoted the network art, digital art, video installation art and other art gradually into the mainstream of contemporary art.

As technology continues to advance, digital twinning has the potential to offer artists and art institutions even more opportunities for innovation and interaction. Digital twinning technology is a process that involves creating a virtual replica or simulation of a physical object, process, or system. It combines data from various sources such as sensors, IoT devices, and simulations to create a digital model that replicates the characteristics and behavior of its real-world counterpart. Digital twinning technology finds applications in the field of art in the following ways:

1. Artistic creation and design: Artists can utilize digital twinning technology to create virtual artworks or design models to explore creative concepts, shapes, and material effects. By observing the reflection of the digital twin, they can experiment with different styles, combinations, and layouts, previewing and making modifications before actual production.

2. Interactive art installations: Digital twinning technology can be employed to create interactive art installations that engage the audience. By integrating sensors and virtual reality technologies, viewers can interact with the digital twin outputs, manipulating and altering their form, sound, or other characteristics, thereby creating an interactive artistic experience.

3. Virtual exhibitions and art scenes: Digital twinning technology can be used to create art exhibitions and scenes in virtual environments. Artists and curators can showcase artworks, stage designs, exhibition spaces, and more through digital twinning, enabling viewers to remotely visit and experience art exhibitions without physically being present.

4. Art preservation and restoration: Digital twinning technology can be utilized for art preservation and restoration. By creating digital twins of artworks, art conservators can conduct comprehensive analysis and evaluation to devise protection and restoration strategies, preventing and repairing damages on art pieces.

The digital existence represented by the metaverse is likely to shape major changes in the way humans perceive and experience life. In such a period of change, it will become an important research field for artists to observe, understand or foresee the possible changes of the metaverse from the dimensions of life, living and ecology. On the other hand, from the artist's view of the metaverse, if what we present in the metaverse is just a virtual representation of the physical world, there is no doubt that there is a lack of productivity; The author believes that art practice in the metaverse should pay more attention to the construction of the imaginary world rather than the reproduction of the physical world. For the construction of the imaginary world, more innovative artists are needed to jointly intervene, release our imagination in such a space with more freedom, and generate new art forms that may surpass the existing experience of human beings through new ways of artistic creation, such as human-machine collaboration with artificial intelligence.

Metaverse may form the actual law of ecological symbiosis of new life, new world, new social relations, the new way of life are likely to is that we cannot be achieved in the physical world, in this sense, the universe is full of imagination and productivity, also based on the metaverse survival experience opened a new field of artistic practice [16]. In my opinion, this is the most imaginative part of the metaverse that can bring to artistic creation.

3. Analysis of the characteristics of metaverse art

The "metaverse" is likely to create completely different aesthetic landscapes in the field of future artistic activities. Previously it was the recipient who viewed or read the work of art externally, but now everyone enters the artistic activities in the way of physical and mental immersion. In the past, it was the artist who exercised his aesthetic will, but now it is the receiver who exercised his aesthetic power. In the past, works acted on human's audiovisual organs.

Now, it is perceptual technology that makes a person's body completely immersed in the works of art, and

even can be seen and heard without visual perception. Perceptual technology directly acts on the brain nerves. Where previously art texts encouraged the recipient to forget the body and maintain the perspective of observation, now they require everyone to abandon the perspective of observation – like the scatter perspective of painting, where the whole body and mind merge into the virtual landscape; In the past, art relied on the medium to act on human, but now it makes the "medium disappear", so that the perception directly merges with the perceived "object" (digital scene)... Here, what Margaret Wertheim called the medieval artist's "the inner eye of the soul" gradually dissolves, "the physical eye of the body" becomes the core [17]. In fact, the metaverse would create a very different meaning for art. Jay David Bolter mentioned that virtual reality uses perceptual media rather than symbolic media [18], so "perceptual logic" rather than "observation logic" is the core of metaverse narrative. The metaverse pursues the immersion of the body; however, this immersion is not negative or passive, but active, and requires participants to actively participate in the text and "strictly imagine". Here, setting, plot and characters are the key, the narrator disappears, and the story never has an ending, nor does it need one [19].

Undoubtedly, the metaverse has the potential to disrupt the conventional relationship between art and humanity, leading to a complete transformation of established rules, forms, theories, and evaluation methods within the realm of artistic activities. What adds to its intrigue is the metaverse's capability to enable individuals—provided they possess certain economic and technological skills—to construct their own virtual lives within it. Consequently, the era of grand narratives will gradually fade away, making room for the era of individualized narratives.

The metaverse can be seen as a "virtual reality narrative space" where diverse human experiences, desires, and stories naturally intertwine. Traditional art no longer adheres to a rigid hierarchical structure characterized by a central storyline and branching subplots, but rather follows what Deleuze referred to as a "fabric structure": a complex interweaving of countless meanings, forming the very foundation of the metaverse itself. This prompts us to ponder the visible transformations that the development of the metaverse will bring to the current state of art.

3.1 The decentralization of metaverse art

The metaverse is a decentralized world, mesh weaving or crystalline unicom is the main form of metaverse society, in such form, there are two almost parallel to the development of digital virtual world and the physical world, the inside of the two parallel world most kind between unicom join, making the social structure formation is cross network relationship. In the metaverse society, the virtual digital world and the physical real world are equally important, and no one is more important than the other. The two worlds exist in parallel, but the digital and physical sectors are closely connected with each other. They talk, circulate, and interweave with each other, forming a harmonious relationship of mutual resource infiltration and complementarity.

The reason why the Metaverse is referred to as decentralized is because it doesn't rely on a single central control entity or authoritative institution [20]. Unlike traditional internet and virtual worlds, the Metaverse is built on the foundation of blockchain technology and decentralized networks. In this decentralized Metaverse, control and decision-making power are dispersed among the participants in the network. No single entity has complete control or manipulation over the entire Metaverse; rather, it is formed through the collective participation and decision-making of users in the network [21]. This decentralization grants the Metaverse greater openness, autonomy, and democracy. It provides users with more freedom and control, allowing them to independently create, interact, and make decisions without being bound by centralized institutions or platforms.

One of the most prominent distinctions between the metaverse society and traditional society lies in the interconnectedness that permeates every aspect of the metaverse. Connections are formed between resources and resources, human and human, virtual and real, digital and physical, machine and machine, numbers and numbers, and so on. The underlying purpose of such mutual infiltration, complementation, interweaving, and blending is to foster mutual exchange, inspiration, and supplementation, ultimately leading to the collaborative creation of new ways of thinking, ideas, models, directions, and resources—ultimately yielding new values.

The decentralization of Metaverse art is manifested in several aspects:

1. Freedom of creation and exhibition: In the Metaverse, artists have the freedom to create and showcase their works without relying on the approval of intermediaries or art institutions in the traditional art market [12]. They can directly create and exhibit their digital artworks on the Metaverse platform, linking them to their digital identities, thus establishing a more direct and transparent connection between the artist and

the artwork.

2. Decentralized transactions: The Metaverse enables decentralized art transactions through blockchain technology and smart contracts. Artists can issue their works as digital assets and directly trade with buyers of the artworks on blockchain-based markets or secondary markets [22]. This decentralized transaction model reduces the fees, commission, and restrictions often associated with the traditional art market, enabling artists to obtain a fairer value for their works.

3. Democratic participation in art communities: Art communities in the Metaverse provide a decentralized environment that grants more people the opportunity to participate and influence the development of art [23]. Any user can join art communities, engage in interactions and discussions with artists, curators, critics, and collectors. Art communities can serve as platforms for collaborative creation and appreciation, where the voices and opinions of all participants are equally heard and valued.

4. Digital ownership and provenance of artworks: The application of blockchain technology in the Metaverse ensures digital ownership and provenance of artworks [24]. Each digital artwork is recorded on an immutable blockchain, publicly and transparently establishing its ownership and transaction history. This provides a more reliable proof for the appreciation and collection of artworks and offers a viable mechanism for protecting the rights of artists.

In summary, the decentralization of Metaverse art empowers artists to exhibit, create, and trade their works with greater autonomy. This decentralized art ecosystem creates more opportunities and possibilities, distributing power among artists and participants in art communities.

Recognizing that exchange and cooperation are indispensable in the creation of new value, the metaverse society capitalizes on connectivity, grafting, and mutual assistance, opening up a new realm of human collaboration. This new world of collaboration is supported by the technological pillars of digital networks and intelligent technologies. Distinct from traditional society, the metaverse society thrives on the interaction, complementarity, and integration of both the physical and online worlds. The digital realm assumes an unprecedented significance, effectively diminishing the centralized power structures that have historically defined human society and giving rise to a decentralized phenomenon across the entire societal landscape.

In metaverse society, artists, art, artistic conception, art criticism the center position of completely disappear, art is no longer a mysterious object, the creation into a body of ideas and implementation of digital technology of delay, reduces the threshold into the digital world, also generalize the online of the network performance, let everyone with a computer has the potential to be an artist. The fundamental reason for the decentralization of metaverse art lies in the alienation of digital art to human beings [25]. In the metaverse society, human is becoming more and more mediated, a medium of alienation from himself. As a member of human beings, the powerful digital network makes artists alienated from their biological existence, social identity, artistic concept and artistic creation.

In addition, none of the cultural organization and art groups to manipulation of the market will be one of the characteristics of the metaverse society [26], decentralization is the performance of the network in the world every person shall have the right, channel and position to express his artistic ideas, because The metaverse is all-encompassing and provides a fair and open creation platform for users. So that every soul can be expressed, every inspiration can grow and blossom, which breaks the myth of traditional art, so that art becomes a part of life itself.

3.2 The dynamic interactivity of metaverse art

Communication and interaction are the core characteristics of the metaverse society. From the technical level, in addition to relying on the powerful information transmission network, the metaverse also needs the perfect Internet of Things (IoT) technology to provide users with real, lasting and smooth interactive experience. Technology development is not the goal but is essentially a means and a tool. Their fundamental purpose is to provide an adequate "interactive experience" for the user. The metaverse is modeled in terms of a "game of life", that is, "learning, work and life can be gamified" [27]. Network game's biggest feature is strong interaction between human, human and machines, machines and machines, digital content and digital content. There is no interaction has lost its fun, even lose the game, also want to get online communication, online voice of pleasure and happy expression, traditional art belongs to static expression, and commanding a unidirectional transmission, viewers have no way to refute, the artist does not have to explain or promise anything to the audience. The individualization and emotional expression advocated by the traditional art theory has the power to cover everything. Any doubt from the audience is redundant or even ridiculous. The inability to appreciate

and accept is the unilateral problem of the audience, not the mistake of the artist or the artwork. The inability to appreciate and accept is the audience's unilateral problem, not the artist or artwork's mistake.

The metaverse can be understood as a virtual community that facilitates the sharing of aesthetics—a form of "knowledge sharing." This concept encompasses various aspects such as knowledge transfer, knowledge selection, absorption, and sublimation. In the metaverse, aesthetic activities serve as a means of knowledge acquisition, where the process of appreciating, questioning, answering, and sharing forms the foundational procedure for engaging in aesthetics [28].

In the traditional era, it was inconceivable for aesthetic activities to be considered a form of knowledge acquisition. This was due to the pervasive control exerted by political authorities, economic powerhouses, social elites, and other forces, which limited human agency over their bodies, imagination, and even their will. In such a context, learning, doubting, and refuting were unnecessary, as mere acceptance and recollection of externally imposed information sufficed [29].

Conversely, in the metaverse society, memory exists in the form of digital and intelligent memory. This liberation of the human body and mind enables individuals to fully immerse themselves in experiencing and perceiving the ever-changing environment. The metaverse ecology, or ecological planet, expands the space and time available to individuals, exponentially surpassing the confines of the physical real world. Humans constantly navigate between the virtual and real worlds, encountering countless "others" and their diverse experiences, which in turn present numerous cognitive challenges.

Especially in front of the artificial intelligence brain, the brain's memory, storage and reactivity cannot match, identify users to really go to the heart of "the other" experience, the creation of the "other", only after full communication, dialogue can really understand him and know him, but lost to ask questions, communication and interaction, and any individual in metaverse virtual world will be difficult [30]. This stems from the fact that metaverse art is a decentralized art, and no so-called artistic authority or critical authority can control the whole virtual world.

3.3 NFT-ization of metaverse art

In the metaverse society, the identity of traditional artists has been broken. To survive in the network world, artists must participate in the network world as digital human and virtual human, so as to become an effective member of the metaverse society. This gets into the question of online identity. The NFT system is an important guarantee for the establishment of the metaverse society [31]. NFT, English full name Non-Fungible Token, also known as "irreplaceable token", refers to the circulation in the virtual world has indivisible, irreplaceable, unique digital currency or digital access property rights. NFT represents digital wealth on the one hand and digital identity on the other [32]. Digital wealth represents the wealth and assets owned by users of the metaverse network in the virtual network world, which can be used for survival and exchange in the virtual world.

Digital identity is actually the "birth certificate" on the network. There are two types of Internet users in the metaverse: "virtual native human" and "virtual digital human", and both "require identification for their management and research" [33]. So-called "virtual native human", that is, the identity of the digital native produce digital virtual human, index of "virtual digital person" is a word of twin reality of digital doppelganger, Zhao Guodong, Yi Huanhuan and Xu Yuanzhong divided future human into "biological human, electronic human, digital human, virtual human and information human" in the book Metaverse [11]. In addition to the fact that digital human are the dope-body of biological human, cyborgs, virtual human and information human are actually the avatars of biological human [34]. Avatars do not necessarily have realistic prototypes but must have accurate online birth certificates and digital native parameters. The birth certificate, the native parameter, is protected by the law: "The killing of an intelligent or digital being is also a criminal act and must bear the corresponding legal consequences." In fact, metaverse artists, artworks and artistic concepts are all NFT.

Within the metaverse, artists possess virtual digital identities through their avatars, head portraits, facial features, speeches, and artworks. These digital representations hold symbolic significance and must not be subject to indiscriminate denigration or misuse. It is important to note that the term "artist" here encompasses all users within the metaverse.

Artistic creations shared on the internet, such as digital paintings, videos, audio, avatars, photographs, music, and literary works [35, 36], inherently possess copyright protection. Copyright serves as the lifeblood of artistic works, providing them with a unique identity that ensures a sense of belonging, ownership, and recognition within human civilization. This principle holds true for metaverse art as well.

However, NFT is born with different value characteristics. The birth position, production process, creative

environment, signifier and signified, creative and producer situation, production process and operation trajectory in the blockchain are all unique and difficult to be tampered with artificially [37]. Modern technology has imprinted a natural imprint on metaverse art, and this imprint has become the original basis for copyright even when no one intervenes. Once the metaverse art is released, its author, birthplace, birth time, ownership and right to use have been restricted by the network, and the change of owner through trade will be recorded by the network forever. This is the NFT thinking, which is also the legal logic of digital art in the virtual world circulation. NFT is the "birth certificate" of metaverse art, and NFT "cannot be split, so it has the unique characteristics of similar works of art" [38]. With the unique attributes of art, NFT marks everything in the digital world of the metaverse, including the logo of metaverse art.

3.4 The daily recording of metaverse art

The daily recording of metaverse art refers to the act of documenting or capturing the artistic activities and creations that take place within the Metaverse on a daily basis. It involves keeping a record or journal of the various artworks, exhibitions, events, interactions, and activities that occur within the digital realm of the Metaverse [39].

As the Metaverse is a dynamic and evolving space where artists and users can freely create and express themselves, the daily recording of metaverse art helps in preserving the history and development of art within this virtual world. It may include documenting new artworks, virtual exhibitions, virtual gallery openings, performances, collaborations, and other creative endeavors happening within the Metaverse [40].

By recording these artistic endeavors, it becomes possible to track the growth and transformation of the Metaverse art scene, the participation of artists and users, and the emerging trends and styles. This documentation can have various forms, such as written accounts, visual archives, video recordings, or any other mediums that capture the essence and evolution of metaverse art over time.

Immersive experience is a central feature of metaverse society. AR, VR, MR, including XR technology and equipment, enhance the integration of virtual space and time, imaginary world, human brain and body sense. The current era belongs to a calm "picture reading era". That is, users of electronic products receive information and connect the world through calm static reading on the screen. Reading at this time is an interactive interpretation of the separation of subject and object, and readers cannot really integrate into the electronic content. In such an environment, traditional art is only "the spiritual soul outside the body, but the perceptual 'soul' rooted in physical experience", which is the existence form of metaverse art.

According to Redding N: "Metaverse is a space, this space may reach infinity, by imagining can even reach interstellar space anywhere, the odd thing was, in this space, human can finish all the actions of the body, such as sight, hearing, touch and smell can feel, in the universe, human can live normally" [5]. This just proves that everyone can be an artist in the metaverse society. All digital pictures, digital audio, digital pictures, digital words, digital human and digital stories are mostly daily records of life, not art for art's sake, but all digital products are works of art. Wearable digital devices make all viewers no longer stay in the calm static reading, but walk into the digital network fantasy, participate in the lives of others, feel, experience, communicate and interpret different lives or the fate of others with empathy. Nowadays, short Video, Vlog (Video Blog), including all the content uploaded to the network, such as a paragraph of text, a picture, a voice, a roadside encounter, etc. in the eyes of others may be a work of art.

With the help of NFT, even the flow of daily life records will become a unique digital wealth and content identity, which will gain readers and likes for themselves. This mode is the basic way of digital information dissemination in the metaverse. "With the advent of the metaverse, the dominant position of image language will be gradually replaced by digital language", and the biggest feature of digital language is the immersive experience mode, which emphasizes the "embodied" hegemony in the 'mimicry' society " [41]. The "embodied "is a way to disseminate information with the body and life. To get more clicks, reads and likes, everyone who disseminates information chooses unique, attractive and public aesthetic content and form to record everything about themselves. There is no art for art's sake, art for society, life, body and spirit is the basic tone of Marxist art. Only when everyone becomes an artist can art become daily and universal, and metaverse art becomes the beginning of the implementation of such ideas and actions. Although "space is not a container for filling objects, but a dwelling place for human consciousness" [38], but if everyone consciously pursues the aesthetic expression and visualization of their own behavior, which is closely connected with life, then the metaverse will gain its true meaning.

4. Discussion

4.1 Metaverse and future art development

Metaverse as a virtual public space, and the relationship of the natural world is likely to be reconstructed [11]. Today we are living in a space which has been solidified and ordered, but when we enter the metaverse space (not necessarily to be a space, or may be a multiverse consisting of space, even everyone may form their own universe). In such a more multidimensional, borderless and unsolidified space, it opens up new possibilities for the imagination and construction of space. As many artists try to express, every participant in the virtual world can become the builder of a "world". In the metaverse each person may become a builder, a new rule, a native of a new world and the original builder. In this sense, everyone who participates in the metaverse actually has the attributes of an artist. Of course, it is not that the value of art is diminished in such an era of public participation, but that a public demand for art is being stimulated.

In previous planned social discourse systems, the roles of authors and viewers were relatively fixed. However, with the potential for reconstructing discourse rights in the metaverse [42], the desire for expression among the public is inevitably stimulated, which, in my perspective, lies at the core of creative productivity. Furthermore, the integration of artificial intelligence and other digital technologies in art has resulted in an empowering effect, consistently lowering the barriers to artistic participation. Within the metaverse, the value of an artist will not solely be determined by individual creation, but also by their capacity for artistic expression. The metaverse provides an experimental space for the emergence of new roles in art creation.

One may consider the metaverse as a work of art or an art world, as it serves as a digital counterpart and representation of the real world. It can even be understood as a digital reflection of the natural and cultural realms, granting everything within these realms an alternative form of existence in the metaverse. From a perspective of representation, the metaverse can be seen as a work of art. Not only does it mirror the real world, but more significantly, it maximizes our aesthetic ideals and can be regarded as an art realm. As Hegel stated, artistic beauty surpasses natural beauty since human aesthetic ideals can permeate art but not nature [43].

However, the aesthetic ideal embodied in art is limited after all, because art expresses aesthetic ideal in the form of sensibility. The perceptual form is limited, the aesthetic ideal is infinite, so for the expression of aesthetic ideal, art has its shortcomings. Because of this, Hegel declared that art should give way to religion and philosophy when it had done its job, thus forming the famous "The End Of Art". But for digital twinning technology, which is not limited by sensuous forms, no matter how lofty and complex aesthetic ideals may be, it is possible to realize them in the metaverse. In this sense, the metaverse is no longer a digital twin of the real world, but a digital realization of the human imagination. If so, the metaverse is not art in the sense of representation, but art in the sense of expression and creation. The latter is not only superior to the former, but is as infinite as religion and philosophy in the Anthropocene. In this sense, the metaverse as art will not end, there will be no so-called art end problem.

More importantly, just like human culture from the beginning of the imitation of nature, in the end into the creativity in the advanced stage, the metaverse begins by creating a digital twin of the real world, again create conform to the ideal world of human imagination, eventually into the creativity in the advanced stage of artificial intelligence, creating world beyond human imagination than culture. Given intelligence created culture is human can't imagine in the world, and also is the human cannot understand, in this sense it is a bit like not to understand, lead the genius of art, also is a bit like a new state of nature, human beings may transfer the aesthetic experience of how the natural and artistic talent to appreciate and understand the intelligence to create the culture of the world. Through the above comparison, we find that the metaverse can be the art of reproducing reality, the art of expressing human ideals, and the hypercultural world beyond human imagination.

As the metaverse in hypercultural world, it can be understood as both the art of genius and the nature of understanding mysteries. In this sense, from a human standpoint, we need art to imagine and understand the metaverse. As for whether the master of the metaverse, artificial intelligence, needs art, that's not clear. Humans always understand AI in their own image, just as they understand gods in their own image, but if AI is intelligent, and if gods are really gods, they are both beyond human understanding. Their world does not need human to worry about, and the human world may need them to worry about. At the end of the Anthropocene, we need to reposition ourselves in the universe, and we need art to imagine the non-human world.

4.2 limitations or challenges

As a new ecosystem for future artistic development, the metaverse brings various benefits but also faces potential limitations and challenges:

1. Technological Dependency: The development of the metaverse relies on advanced technologies and infrastructure such as virtual reality, augmented reality, and blockchain. This dependency on technology becomes a limiting factor as not all artists or audiences possess the ability to access, understand, and operate these technologies. The complexity of the technology may exclude some individuals from opportunities for artistic development within the metaverse.

2. Digital Divide: Participation in the metaverse requires internet connectivity and digital devices, but there exist digital divides in certain regions or populations, making access and usage of the metaverse challenging. This may result in some people being unable to enjoy the artistic opportunities and experiences offered by the metaverse, thus limiting inclusivity in artistic development.

3. Content Quality and Authenticity: Artistic creations and content within the metaverse may face challenges in terms of quality and authenticity [44]. Compared to traditional art forms, the production and distribution of digital media are relatively easy, which may result in the metaverse being flooded with low-quality or inauthentic works, negatively impacting the overall artistic ecosystem. Protecting the authenticity and quality of art becomes a crucial task.

4. Copyright and Legal Issues: Reproduction, distribution, and display of artistic works within the metaverse may involve copyright, intellectual property, and legal issues [45]. Traditional copyright laws may not fully apply to the creation and dissemination of digital media within the metaverse, necessitating new legal and regulatory frameworks to protect artists' rights and promote fair creative use and economic returns.

5. Personal Privacy and Data Security: The metaverse relies on data interaction and personal engagement, raising concerns regarding personal privacy and data security [46]. In the metaverse, personal information and behavioral data may be collected and used, leading to concerns about privacy breaches and misuse. Addressing data security and privacy protection becomes a challenge to establish user trust and drive sustainable development of the metaverse.

6. Social and Cultural Impact: The development of the metaverse may have profound influences on society and culture, including changes in values, ethics, and identity. In-depth research and discussions are needed to strengthen social and cultural reflection within the metaverse's development and address any potential negative impacts [47].

In conclusion, the metaverse as a new ecosystem for future artistic development confronts potential limitations and challenges in terms of technological dependency, the digital divide, content quality and authenticity, copyright and legal issues, personal privacy and data security, as well as social and cultural impact. Addressing these challenges requires comprehensive consideration of technological, legal, ethical, and other factors, while enacting corresponding policies and standards to ensure that the metaverse's artistic development can proceed with inclusivity and sustainability.

5. Conclusion

Based on the findings discussed in the paragraphs above, it is evident that the metaverse presents a virtual public space that enables the reconstruction of our relationship with the natural world. This multidimensional and borderless space provides new possibilities for imagination and spatial construction. Participants in the metaverse have the opportunity to become builders and creators of their own "worlds," thus attributing artistic qualities to every individual involved. The metaverse stimulates a demand for art and opens up experimental space for new roles of art creators within this digital realm.

Furthermore, the metaverse can be seen as a digital representation or mirror image of the real world and its cultural aspects. It has the potential to transcend the limitations of traditional art by allowing for the realization of infinite aesthetic ideals in a sensuous form. Unlike art, which has its shortcomings in expressing aesthetic ideals, the metaverse, through its digital twinning technology, can overcome these limitations and unlock the possibilities of human imagination and creativity. In this sense, the metaverse becomes not just a representation of art but a platform for expression and creation on a limitless scale.

Contrary to Hegel's notion of the "End of Art," the metaverse, as a medium of expression and creation,

is not bound by such limitations. It transcends the boundaries of representation and continues to evolve, devoid of an end to its artistic potentials. Moreover, the metaverse leads us from the imitative nature of early human culture to the advanced stages of creativity, eventually surpassing human imagination through the involvement of artificial intelligence. It becomes a hypercultural world that reproduces reality, expresses human ideals, and expands beyond what we can conceive.

As the metaverse embodies both artistic genius and a realm of unfathomable mysteries, it necessitates our engagement and understanding from a human standpoint. Art becomes a tool for us to imagine and comprehend this non-human world. However, whether artificial intelligence, the master of the metaverse, requires art is uncertain. AI, like gods, surpasses our understanding, and its existence may not be dependent on human needs. As we position ourselves in the universe at the conclusion of the Anthropocene era, we rely on art to envision and explore the possibilities of the non-human realm.

In conclusion, the metaverse represents a transformative platform that reconstructs our perception of space and blurs the boundaries between art and reality. It unlocks new dimensions of creativity, empowering individuals to become builders and creators within this virtual public space. The metaverse serves as a digital twin of the natural and cultural world, transcending the limitations of traditional art and offering infinite possibilities for expression and imagination. As we enter this hypercultural world, art becomes indispensable for us to envision and understand the metaverse, while the role of artificial intelligence within this realm remains an enigma. As we navigate the Anthropocene era, art not only shapes our understanding of the metaverse but also aids in redefining our place in the universe.

Conflicts of Interest: The authors declare no conflict of interest.

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