
AI translation · View original & related papers at
chinaxiv.org/items/chinaxiv-202310.00132

On the Core Connotation of the Metaverse and Media Technology (Postprint)

Authors: Liu Kailong

Date: 2023-10-08T00:00:00+00:00

Abstract

[Objective] This article explores the most fundamental characteristics and technological foundations of the metaverse from the perspectives of basic concepts, etymology, historical context, features, and attributes. **[Methods]** By organizing and summarizing definitions of the metaverse, it analyzes its application scenarios and technological composition. **[Results]** The metaverse as currently understood is merely in its embryonic form; with the development of technology, it will possess even greater vitality in the future. **[Conclusion]** The media technologies of the metaverse constitute its underlying foundation, and from a broader perspective, the metaverse holds an even brighter future.

Full Text

Preamble

ChinaXiv Collaborative Journal: A Brief Discussion on the Core Connotations and Media Technology of the Metaverse

(Henan University, Kaifeng, Henan 475000)

Abstract

[Purpose] This article analyzes the most fundamental characteristics and technological foundations of the metaverse by examining its basic concepts, etymology, historical trajectory, features, and attributes. **[Method]** Through sorting out and summarizing definitions of the metaverse, the study analyzes its application scenarios and technological composition. **[Result]** The metaverse as currently understood is merely in its embryonic form; with technological development, it will possess even more vigorous vitality in the future. **[Conclusion]** The media technology of the metaverse constitutes its underlying foundation, while from a broader perspective, the metaverse holds an even brighter future.

Keywords: metaverse; core connotation; media technology; application scenarios; technological composition

Classification Number: G210

Document Code: A

Article Number: 1671-0134(2023)03-041-05

DOI: 10.19483/j.cnki.11-4653/n.2023.03.008

Citation Format: Liu Kailong. A Brief Discussion on the Core Connotations and Media Technology of the Metaverse [J]. China Media Technology, 2023(03): 41-45.

The concept of the “metaverse” emerged in 2021 and rapidly entered public discourse, becoming a topic of everyday conversation in contemporary society. Consequently, 2021 has been called the “first year of the metaverse.” Today, most public understanding of the metaverse derives from the prospectus of Roblox, a game development company listed on the New York Stock Exchange, and from Facebook’s renaming itself as Meta, which ignited a frenzy of speculation about the metaverse among major global internet companies. Currently, two extreme views exist regarding the metaverse: one considers it a new direction for human society and the ultimate form of the internet; the other views it merely as capital companies hyping a new concept to harvest the public as “leeks.” This article explores the core connotations and media technology of the metaverse by excavating its most basic concepts and characteristics.

1.1 Etymological Composition of the Metaverse

Both the English term “Metaverse” and the Chinese term “元宇宙” are compound expressions requiring decomposition. In ancient Greece, “Meta” generally meant “following” or “behind something.” During the medieval period, scholastic scholars creatively translated Aristotle’s *Metaphysics* into Latin as *Metaphysica*, identifying its subject matter as “first philosophy” beyond physics. Consequently, “Meta” acquired meanings indicating logical hierarchical relationships such as “the origin of…” Modern English primarily inherited this Latin meaning, applying it to disciplinary reflexivity, as seen in terms like “Metalanguage” and “Metahistory” emerging since the mid-20th century. “Universe” originates from the Latin *Universum*, composed of the prefix *uni/unus* and the root *vertere/versus*. *Unus* means “one, unique,” referring to God in Christian theological contexts, while *versus* means “having turned.” Thus, *Universe* represents a creationist cosmology of “turning toward the One” : God created the universe, and the universe is the path back to God [1].

In ancient Chinese writing, the character “元” first appeared in oracle bone script as “human head,” later evolving to mean “occupying the first position.” *Shuowen Jiezi* and *Erya* interpret it as “beginning,” while *I Ching* and *Wenxin Diaolong* use “元” to mean “fundamental.” Today, understanding of the metaverse often mistakenly interprets “元” as merely “surpassing” or “transcending,” thereby neglecting its deeper historical meaning in Chinese characters. Examining the metaverse from this richer historical perspective reveals its more profound im-

plications: the metaverse is a human-centered universe.

The 1992 science fiction novel *Snow Crash* by Neal Stephenson marks the earliest appearance of the English word “Metaverse,” translated as “超元域.” On March 10, 2021, Eastern US time, the Roblox gaming platform listed on the New York Stock Exchange, closing up 54.4% on its first day with a market value of \$38.3 billion—ten times higher than a year prior. Its prospectus cited “Metaverse,” noting that the concept had been mentioned by futurists and science fiction writers three decades earlier. In 2021, a Chinese article titled “How Much Potential Remains Unexplored in Voice Socializing?” directly translated Metaverse as “元宇宙.” Thereafter, the term took root in China and spread nationwide.

1.2 Historical Trajectory of the Metaverse

As the latest media assemblage, tracing the metaverse’s historical development requires reviewing media and technological evolution from a communication studies perspective. Humanity has experienced six major communication epochs: the analog communication period (approximately 2 million years ago—50,000 years ago), the language communication period (100,000 years ago—6,000 years ago), the writing communication period (6,000 years ago—early 19th century), the electronic media period (1850s—1950s), the internet communication period (1950s—early 21st century), and the metaverse conceptual period (1960s—present).

The earliest analog communication period corresponds roughly to the emergence of *Homo sapiens* 2 million years ago and their mastery of language 50,000 years ago. During this era, humans gradually shed their animality, evolving toward bipedalism and learning to communicate through body language and gestures—shouting and waving arms constituted their primary means of interaction. Throughout this period, communication partners remained in close proximity, with objects, methods, and content all existing in three-dimensional space.

Language represents the second epoch in communication history, invented when *Homo sapiens* migrated out of Africa for the second time. As brain capacity expanded and labor complexity increased, the evolution of vocal functions became necessary for communication. Language progressed from simple descriptions of singular objects to increasingly complex content, linking logical thinking with linguistic logic to mature the language system. At this stage, humans not only reconstructed three-dimensional scenes of the real world in their brains but also began constructing three-dimensional images of things that might not exist externally through the abstract medium of language—a tremendous advancement. Language enabled people to exchange understandings of these three-dimensional images, enriching their content and abstracting their structures.

The writing communication period began with Sumerian cuneiform 5,500 years ago, followed by Egyptian hieroglyphs and Chinese oracle bone script. The electronic media period saw steam power replaced by electricity, and after the telegraph enabled long-distance synchronous communication, inventions prolif-

erated: Marconi's radio waves, Levy's radio, Antonio and Bell's telephone, and Baird's television. Electronic media became the primary means of information transmission.

By the mid-20th century, the earliest forms of the internet emerged and embarked on rapid development. During the internet communication stage, media advanced simultaneously in hardware, software, and application systems. Centralization weakened, and the severely asymmetrical structure between senders and receivers collapsed, with audiences assuming their role as masters of information.

Although the metaverse appeared in 1992 science fiction and was successfully popularized by Roblox in 2021, its origins can be traced back to the 1960s. In 1968, Ivan Sutherland, the father of American computer graphics, and his students developed the world's first computer-driven head-mounted display and head position tracking system—the first virtual reality device. In 1981, American mathematician, computer scientist, and cyberpunk author Vernor Vinge published *True Names*, creatively conceiving a virtual world accessible through “brain-computer interfaces” that provided sensory experiences. In 2003, Linden Lab launched *Second Life*, aiming to create a user-defined virtual world for interaction, gaming, and commercial activities. In 2009, Satoshi Nakamoto officially ran the Bitcoin program on a Helsinki server, creating Bitcoin as a digital asset and bringing blockchain into public view. In 2014, Facebook acquired VR equipment manufacturer Oculus for \$3 billion. Until 2021, when Roblox listed on the NYSE, Epic Games invested \$1 billion in the metaverse, South Korea announced the formation of a “Metaverse Alliance,” and Facebook rebranded as Meta, humanity entered the “first year of the metaverse.”

2. Core Connotations of the Metaverse

2.1 Characteristics of the Metaverse

Roblox CEO Dave Baszucki identifies eight key characteristics of the metaverse: Identity, Friends, Immersive, Low friction, Variety, Anywhere, Economy, and Civility. Summarizing perspectives from researchers worldwide, the metaverse can be characterized in eight dimensions.

First, **multi-dimensional media**. As a product of the deep integration of internet technologies, the metaverse represents not only the convergence of media technologies but also the fusion of real and virtual communication environments or scenarios. Beyond media and directly related technologies, the metaverse involves numerous underlying technologies and frameworks such as 3D engines, distributed storage, NFTs (non-fungible tokens), and blockchain. Without these technologies and frameworks, the metaverse would remain an ethereal concept. The metaverse is multi-dimensional: it inherits technologies from “old” media while possessing its own new media; it encompasses both media nature and media technology; it comprises both device-based media groups and 3D-constructed landscapes and environments.

Second, **virtual reality**. The origin of the term “metaverse” —the 1992 science fiction novel *Snow Crash*—is about virtual reality. The popularization of the term—the 2021 Roblox gaming platform—concerns a virtual reality gaming company. Without the conception and development of virtual reality, the metaverse would not exist. Although current virtual reality remains limited to VR or AR headsets, in the future it may develop toward its true meaning: “the mutual superimposition of virtual and real worlds.”

Third, **spatial interface**. The interface is the junction between humans and media. The interface of the “logosphere” is the human itself; the interface of the “graphosphere” is various text carriers; the interface of the “videosphere” is various screens known as human-computer interfaces. Of course, this interface refers not merely to the surface of media but also to the means and methods of accessing it. In the era of intelligent media, it includes the medium’s ability to perceive human needs. On one hand, the metaverse encompasses various interface modes of media; on the other hand, as various media and related technologies become highly integrated, it becomes an “atmospheric, pervasive medium” possessing an interface without periphery or four-sided frames. Space is saturated not only with information and media but also with interfaces, to the extent that space itself becomes interface.

Fourth, **immersive experience**. Immersion has long been a core characteristic of the metaverse. The most intuitive feeling the metaverse provides is entering a virtual spacetime—that is, the metaverse constructs a virtual world parallel to the real world, where everyone has a new identity, embraces a new life, and experiences a lifelike, “non-fictional” sensation.

Fifth, **pluralistic centers**. Many predict that the metaverse can achieve complete decentralization, but this is fundamentally impossible. The metaverse can only achieve relative decentralization, never absolute decentralization. No government or nation would permit the existence of “extraterritoriality”; as long as state power exists on Earth, this situation will not occur. As the pluralistic pattern of the internet continues to expand and individual centers strengthen, the metaverse will inevitably present a condition of pluralistic centers, but cannot accomplish true decentralization in the complete sense.

Sixth, **complete ecosystem**. The metaverse possesses its own complete ecological space and will most likely construct its own social structure in the future. Whether the virtual world formed by the metaverse or the global world encompassing virtual reality will be constrained by the real world. Humans will not and do not wish to allow silicon-based life to replace carbon-based life. Humans may move between virtual and real worlds but must always return to the real world.

Seventh, **infinite expansion**. The future visage of the metaverse mostly derives from human imagination, such as a sense of physical presence. For the metaverse society to resemble real society necessarily requires more advanced technology. Humanity believes this goal will certainly be achieved, but not now.

This is a characteristic of the metaverse, but not of the current metaverse. For the metaverse, its infinitude is absolute: it provides unlimited expandability. Imagination about the metaverse is infinite, as is its construction, technology, and applications.

Eighth, **first-person perspective**. In the metaverse, everyone is a subject, and entering it necessarily requires exploring the new world from the “I” perspective. Here, individuals redefine their identity and gain new experiences and perceptions. The metaverse is a human “universe”—not a product of natural evolution but of the joint action of humans and technology, the result of humanity’s exploration of future multi-dimensional space and of human self-transcendence. If the metaverse cannot exist in first-person perspective, it becomes indistinguishable from science fiction films. In comparison, virtual games achieve this: although games allow switching between first-person and third-person perspectives, players’ immersion truly fulfills the function of the virtual world.

2.2 Attributes of the Metaverse

Communication and technological attributes constitute the two most important properties of the metaverse. Communication represents its most important characteristic. The metaverse is not a single media form but a new field, a new media-sphere. Pierre Bourdieu defined field as “a network of objective relations between positions” and “a space where the effects of the field are exercised.” Bourdieu viewed field not only as a spatial environment but also as a mediation: “The field is a key mediating link between the practices of social agents who partake in it and the surrounding social and economic conditions” [2]. Thus, field itself is a medium, a network and system composed of many media and enabling technologies. In French media scholar Régis Debray’s work, field appears directly as the “embodiment” of the mediasphere. Debray argued that “the term mediasphere refers to an environment for the transmission and transport of information and people, including corresponding methods of knowledge processing and diffusion...Each mediasphere produces a specific space-time combination, that is, a different realism” [3]. Debray’s mediasphere emphasizes the relationship between “people and information.” As a mediasphere, the metaverse connects people and information, achieving dual significance in information dissemination and individual experience. Communication attributes manifest not only in information transmission but also in entertainment, social interaction, and interactive transactions [4]. Today, the metaverse began with gaming media, realizing social, transactional, and entertainment functions on virtual gaming platforms. The metaverse breaks traditional two-dimensional social methods where online chats relying solely on linguistic symbols inevitably lead to improper expression of meaning. Traditional internet only extended human eyes and ears to new heights for vision and hearing. As human sensory organs, touch, smell, and taste have remained at the real-world level. In future metaverse worlds, extensions of other sensory organs may become possible, enabling people to “touch” each other through special devices.

“The metaverse concept is an inevitable product of human tools developing to a certain stage.” Tools represent technological levels; thus, the metaverse is an inevitable product of technological development. As Brian Arthur stated, “It is technology that separates us from that way of life we have had for 50,000 years and more. Technology, incomparably, creates our world; it creates our wealth, our economy, and our way of being” [5]. Continuous development of human science and technology has progressed from oral language to writing and printing, from steam engines to electricity, to the internet and mobile phones, arriving today at an explosive state of improvement and integration of internet technology, digital technology, artificial intelligence, bionics, virtual technology, brain-computer interfaces, and more. The metaverse is precisely such a technological assemblage, which may be termed the “metaverse domain.” Technological development inevitably leads to the birth of the metaverse as a form of deep mediatization and the “ultimate form” of the internet. Simultaneously, the metaverse must rely on various technologies for its construction and maintenance. Blockchain technology builds the metaverse’ s economic system; high-speed bandwidth technology enables low latency; interface technology constructs lens-based landscapes. Without these technological implementations, there is no metaverse, or at least no true metaverse. Therefore, the current metaverse form is merely a beginning; present technological levels cannot establish the ultimate metaverse. Everything remains in the realm of human imagination. However, we can envision that future scientific and technological levels will certainly reach a new height, and the ensuing metaverse will usher humanity into a new world.

3. Media Technology of the Metaverse

Brian Arthur defined technology as “a means to fulfill human purposes” [6]. All technologies invented throughout human history serve humanity itself. To enhance communication, humans invented language; to record intellectual achievements, they invented writing; to transmit information over distances, they invented telegraph and telephone; to visualize and concretize information, they invented television and computers. The internet’ s birth subsequently satisfied deeper interactive needs. Therefore, the metaverse’ s construction benefits from support by various technologies, including media technologies. One authoritative industry perspective identifies six major technology pillars of the metaverse, abbreviated as BIGANT (“big ant”): Blockchain, Interactivity, Game, AI intelligence, Network, and Internet of Things [7].

Blockchain technology forms the economic foundation of the metaverse. On October 31, 2008, an individual using the pseudonym “Satoshi Nakamoto” published *Bitcoin: A Peer-to-Peer Electronic Cash System*, describing a peer-to-peer electronic cash payment system using P2P and blockchain technologies. The International Organization for Standardization (ISO) defines blockchain as “a distributed ledger formed by sequentially appending consensus-validated blocks using cryptographic technology.” Put simply, “blockchain can be understood as

a chain structure composed of data blocks containing transaction information linked chronologically” [8]. Blockchain possesses five characteristics: (1) Decentralization: Blockchain operates through distributed settlement and storage, independent of any third-party management institution, with all nodes having equal rights and obligations for self-verification, transmission, and management of information. (2) Openness: Blockchain is a publicly transparent system where all parties can query data and change history through public access. (3) Autonomy: Blockchain operates based on protocols that automatically execute programs according to predetermined content. (4) Immutability: Blockchain information cannot be altered but is traceable; once transactions complete and information is verified, it is permanently preserved. (5) Anonymity: Transaction parties on blockchain possess unique addresses composed of numbers and letters as trader identities, with all personal information remaining anonymous and protected. Thus, blockchain is the underlying technology of the metaverse. Its decentralization reduces intermediary links and improves interaction and transaction efficiency; its immutability and anonymity protect user privacy and system security; its openness and autonomy enhance transparency and flexibility, raising the threshold for corruption and crime, ensuring the metaverse’s self-organizing system can self-correct, self-improve, and evolve benignly.

Interactivity technology refers to human-computer interaction technology—connecting humans with machines, landscapes, virtual worlds, and the metaverse through interfaces. Interactivity includes both output and input aspects. From a device perspective, output and input coincide: devices must both output and input information; otherwise, information transmission would be fragmented. These technological devices include head-mounted displays, microcameras, position sensors, force sensors, speed sensors, holographic interfaces, interfaces that directly input and output signals to sensory organs and nervous systems (brain-computer interfaces), and implanted chips.

Electronic game technology has become a key technology for constructing the metaverse, which initially developed from electronic games. From 2D games to 3D games, increasingly virtual worlds and more realistic operational sensations deeply immerse users, with immersion, interactivity, and realism fully expressed. Several major international technology companies have actively deployed game engine technology. In May 2021, Epic Games launched the upgraded Unreal Engine 5, greatly improving real-time rendering technology to make scenes more lifelike. NVIDIA’s real-time collaborative simulation platform Omniverse introduced the Audio2face function, which intelligently generates realistic lip movements from audio. Omniverse also launched a universal scene description data format, providing an open platform for various independent game engines and modeling software to facilitate interoperability and information sharing. Unity has built an “interactive content creation engine” for the metaverse, launching a cloud-based distributed computing solution that provides users with a platform for free creation, improving game development and iteration efficiency.

Artificial intelligence technology faces higher requirements in the metaverse, such as implementing intelligent interfaces, smart contracts, automatic content generation, interpersonal relationship recommendations, and self-construction of various scenarios. Additionally, AI must communicate with and serve humans in the form of avatars like virtual humans and intelligent robots. Currently, virtual digital humans have been widely adopted, and intelligent robots are ubiquitous in public service venues. AI is rapidly developing in depth.

Network technology and algorithm technology support the generative framework and nervous system of today's internet society and digital society, also facilitating the embryonic form of the metaverse. The **Internet of Things** is built upon the foundation of the internet. "The Internet of Things is the internet connected to physical objects. The internet lacks the gene of connecting things and must rely on embedded systems to connect various physical objects of the objective world to the internet. First, embedded systems transform physical objects into intelligent systems, then connect individual intelligent systems or local area networks of intelligent systems to the internet, forming an Internet of Things system" [9]. Most people consider the metaverse as the ultimate form of the internet, but the Internet of Things actually better fits the metaverse's character; one could even equate the Internet of Things with the metaverse. Without the internet of everything, there is no metaverse.

Understanding the metaverse solely at the technological level appears somewhat narrow and monotonous. From a broader perspective, the metaverse actually represents the unity of opposites with the universe. As the largest world and greatest substance, nature cannot find a corresponding unity of opposites for the universe. Since the universe is material, its corresponding opposite must be consciousness, which originates from the human spiritual world. In *Snow Crash*, the metaverse is a virtual world where the protagonist escapes reality, and Roblox's metaverse is also a gaming product emphasizing immersion and presence. These merely allow human consciousness to enter a virtual world while the body remains in the real world. It can be asserted that all future metaverse businesses, projects, industries, and their structures, environments, and models will be inseparable from human spirit and consciousness. The metaverse is not only the culmination of technology and media but also a more profound and expansive spiritual product of humanity's exploration of future worlds.

References

- [1] China Social Sciences Net. Examining "Metaverse" from an Etymological Perspective [EB/OL]. http://www.szass.com/szskzk/zlk/llyd/xsyj/content/post_{776611}.html. 2022-03-22/2023-02-15.
- [2] [France] Pierre Bourdieu, [USA] Loic Wacquant. *An Invitation to Reflexive Sociology* [M]. Translated by Li Meng, Li Kang. Beijing: Central Compilation & Translation Press, 1998.
- [3] [France] Régis Debray. *Transmitting Culture* [M]. Translated by Chen Weix-

ing, Wang Yang. Beijing: Tsinghua University Press, 2014.

[4] Liu Yue. Preliminary Exploration of the Core Characteristics and Technological Application Prospects of the Metaverse [J]. *China Media Technology*, 2022(10): 61-63.

[5][6] [USA] Brian Arthur. *The Nature of Technology: What It Is and How It Evolves* [M]. Translated by Cao Dongming, Wang Jian. Hangzhou: Zhejiang People' s Publishing House, 2014.

[7] Deng Lili. The Metaverse is an Upgraded Version of the Mobile Internet [EB/OL]. https://m.thepaper.cn/baijiahao_{16064760}. 2021-12-31/2023-02-18.

[8] Yan Yong, Chen Xingying, Wen Fushuan, et al. From Energy Internet to Energy Blockchain: Basic Concepts and Research Framework [J]. *Automation of Electric Power Systems*, 2022(2).

[9] He Limin. Overview of the Internet of Things Part 1: What is the Internet of Things? [J]. *Microcontrollers & Embedded Systems*, 2011(10): 79-81.

Author Biography

Liu Kailong (1999-), male, from Yancheng, Henan, is currently a master' s degree candidate at Henan University. His research focuses on game media and the metaverse.

(Executive Editor: Zhang Xiaojing)

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv –Machine translation. Verify with original.