

# Meta-verse Based on Architectural Perspective

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## Abstract

Meta-universe appears frequently in the eyes of the public and gets more and more attention, making the life and production mode based on the virtual digital world. At present, the concept of meta-universe has been applied in education, business, industry and other fields. With the wide application of the building information and digital technology, the intelligent level of the construction industry is constantly improved, and the virtual digital technology is playing an increasingly important role in the development of the construction industry. There are already VR house viewing and other meta-universe architectural applications in the market.

**Keywords:** meta-universe, building information, VR

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## I. INTRODUCTION

The science fiction novel Snow Crash The Avalanche, [1]<sup>i</sup>, published in 1992 by American novelist Neal Stephenson (Neil Stephenson), depicts a "virtual world" parallel to the real world. This virtual world is known in the novel as Meta-verse (the meta-universe in Chinese), and every human living in Meta-verse also has an address. As a representative of Stephenson's cyberpunk genre work, the science fiction novel covers the knowledge of history, linguistics, anthropology, and computer science. Since Facebook (Facebook) changed its name to Meta last year, Meta-verse has become a new buzzword among the public. As the source literature of the word Meta-verse, the virtual world life described by The Avalanche has an important reference value for the current human understanding and study of the meta-verse. From the perspective of citation, the novel has been ranked first in the related research of the meta-verse[2]<sup>ii</sup>. In order to have a more comprehensive understanding of the spread of Avalanche in academic research, it is very valuable to analyze the spread of Avalanche in scientific and technological literature.

The traditional 3D building modeling methods mainly include procedural building modeling: building modeling based on point cloud or aerial data, and image-based building modeling[3]<sup>iii</sup>. Process building modeling method refers to the realization of three-dimensional building modeling through a specific shape grammar or rules, which can produce high-precision scene models on the scale of the individual building and the whole city. In the modeling process, the shape grammar in architecture is successfully used in the design and analysis of buildings, realizing the assembly and construction of buildings through specific grammar rules[4]<sup>iv</sup>. With the help of shape grammar, Mülle. proposed a process modeling system for building surface modeling[5]<sup>v</sup>. Based on the appearance layout of the building given by the user, such as Bao use the heuristic search algorithm to semi-automatically generate multiple building models similar to the given appearance layout[6]<sup>vi</sup>. Li Shanglin and so on. proposed a component-based multi-layer parameter modeling method[7]<sup>vii</sup>, using the probabilistic network to describe the high-level parameters of the building and components as the user interaction interface, while using the rule library to describe the component low-level parameters and describe the building construction process in combination with the building template. Preterite building modeling using shape grammar usually requires specialized knowledge and is difficult to expand grammar rules effectively.

We provide a new perspective based on architectural for the development of the future meta-verse.

## II. RELATED CONCEPTS

### 2.1 The concept of the meta-verse

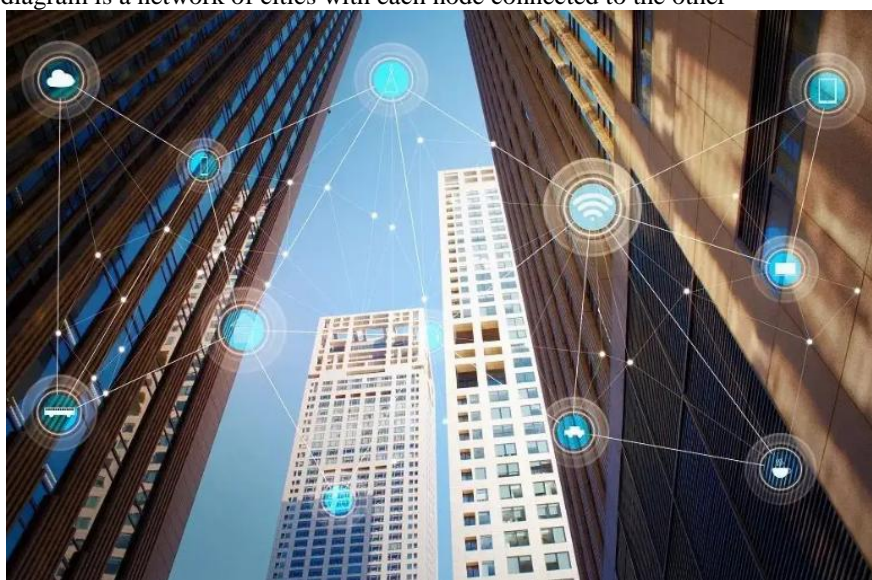
The meta-universe in the novel is a parallel digital world that is divorced from the real world but always online, where people can live freely virtual. The 2018 movie, Ready Player One, is considered the most visual presentation of the Meta-verse.

With the continuous improvement of VR, AR, AI, 5G and other technologies, the connotation of the meta-Universe is also expanding. On the one hand, the meta-verse can be a parallel universe completely

independent of the reality, or in a "game" way, pleasing the spiritual life of people through immersive experience; on the other hand, the meta-verse can also be the integration and interaction. All events in the real world are synchronized into the virtual world, and their behaviors and experiences in the virtual world will be projected into and affect the real world. This category can be called the "integrated meta-universe" [8,9]<sup>viiiix</sup>, which promotes 5G,AI ,XR and other information technologies for more extensive (scope) and deeper (complex) information collaboration, and then feeds back the development of the real economy, and actively promotes the reform and innovation in industry, governance and scientific research.

Meta-verse concept is vague for many. In daily life, there are multiple scales in the whole world, to the scale of microscopic particles, to the large scale of objects, the planets as particles, and our meta-verse is a daily engineering scale. The universe is not a video game is not virtual world, he is a integration of a variety of new technologies and the new integration of Internet applications and social form, it is based on expanding reality technology to provide immersive experience, based on digital twin technology mirror of the real world, based on block chain technology economic system [10]<sup>x</sup>, the virtual world and the real world in the economic system, social system, identity system, and allow each user to content production and world editing. The project our group studied on the meta-verse to restore reality to the meta-verse and build buildings and sites in the meta-verse.

Figure 1: This diagram is a network of cities with each node connected to the other



**Figure 1:City network**

In our understanding, the universe is like a blind man feeling an elephant. Everyone has a preliminary understanding of the universe, and everyone's understanding and the threshold of the verse are different. We believe that the earliest yuan universe can be traced back to the ancient times, such as Nordic mythology, the legend of ancient Greek culture, this is what people thought in front of the world concrete, yuan universe essence is so, people want to see the heart thought in front of the world, in our ancient times also have such legend culture, this is the yuan universe first appeared in our country.

## **2.2The framework of the meta-verse universe**

### **2.2.1 The path to the meta-verse: immersion vs superposition**

(VR) Make people become more and more introverted, and the whole civilization becomes more and more introverted. We are more and more a very introverted civilization, rather than to explore the civilization.

Immersive path: VR, virtual digital person (immersive interaction, mimicry company)

Overlay path: AR, simulation robot

The path to the meta-verse: Progressive vs radical

Progressive path: Fortniteattracts users in a traditional game mode, by constantly adding meta-cosmic elements such as social and economic elements.

Radical path: Roblox doesn't offer games from the very beginning, it only offers development platforms and communities to motivate users and create a decentralized world created entirely by users.

### 2.2.2 Path to the meta-verse: open vs closed

Once we give up control of our self-perception and the nervous system and leave it to private manipulation, "by those trying to profit by leasing our eyes, ears, and nerves," we are a pauper without any rights. Letting our eyes, ears and nerves to make money is as outrageous as "teaching private companies how to talk everyday," or "giving the earth's atmosphere to a company monopoly."

Closed path: Horizon, meta-verse game ecosystem; Facebook virtual reality headset manufacturer.

Open path: Epic Games And The Meta-verse

### 2.2.3 The Physics of the Meta-verse: A selective liberation

On the one hand, the meta-universe realistically simulates the space-time regulation in a part of the real world, and on the other hand, it transcends and liberates the space of the space-time regulation in a part of the real world. Players sometimes need to move by simulating real-world walking, running, and jumping, and sometimes they can fly or undergo an instantaneous geographic migration. It is this selective liberation that brings a sense of freedom.

### 2.2.4 Meta-verse geography: AI generation, user participation

Meta-verse has a huge geographical space for users to choose and explore. One direction is for AI generating maps that are not available in the real world. The other is to generate a map that is completely consistent with the real world[11]<sup>xi</sup>. Meta-verse is an open editable world where users can buy lease land, build buildings, and even change terrain. The coincidence of the Meta-verse and real geography can produce a large number of virtual-real fusion scenarios.

## III. TECHNICAL ANALYSIS

### 3.1 City Brain

Brain in the universe is really hierarchy is the top of echelon industry change, and the top is the government public services, and what we do is the underlying technical support more detailed visualization and digital twin, from the perspective of industrial economics, it has a relatively long industrial chain, including from basic software tools, system platform, algorithms, such as soft power, such as chips, sensors, wearable devices, hard power, also opened the 5G and the next generation of communication technology market. From this perspective, we should pay attention to it and systematically plan its development in advance. From the perspective of national competition, the meta-universe may open a new round of industrial layout and scientific and technological game of the digital economy, providing a track for China to layout a new round of information reform. We need to rearrange, focus on the underlying technology, the underlying hardware, and avoid or reduce the development dilemma of being twice subject to people, like mobile phones. From this sense, we need to develop it, strategic planning and forward-looking layout.

Figure 2 represent the industry represented by each stage of the meta universe era

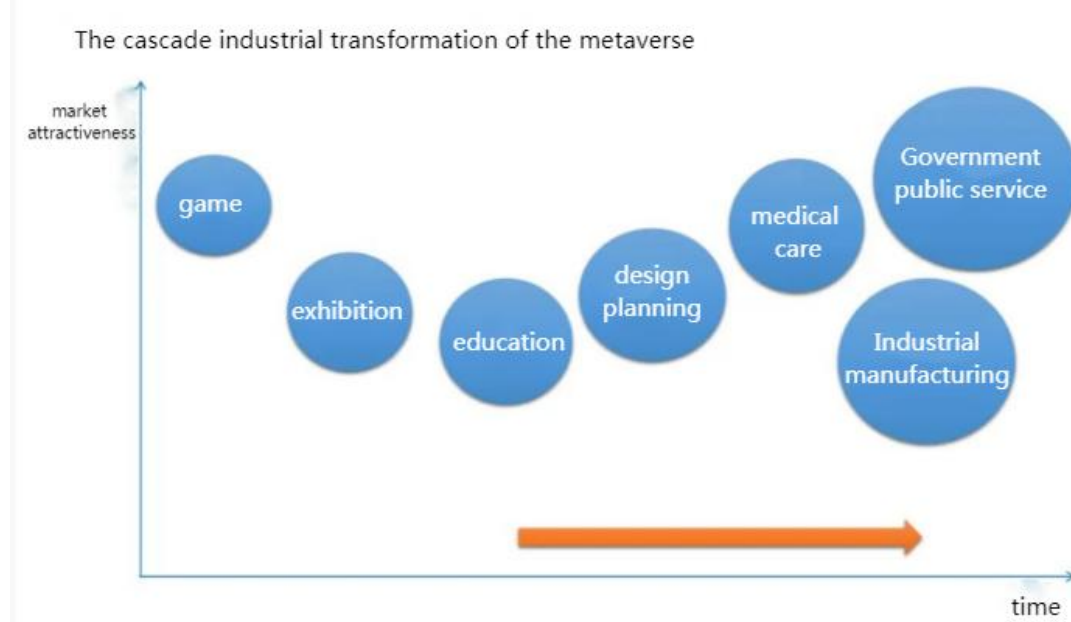


Figure 2: Industrial gradient change

Today, the meta-universe is still not a rigorous academic concept. The current meta-verse is more of an exploration, which may be more grounded in the gaming, social and entertainment fields, and the meta-verse may change the traditional mode of gaming and entertainment. In the future, the meta-verse may drive the gradual digitization of individuals, forming an existence in the digital world, and thus forming the digital assets and digital identities of individuals. As Laura Lara, an extended reality expert at the Spanish School of Technology, Art and Design, said, " The Meta-Universe will be a digital reality [12]<sup>xii</sup>, in which we will reproduce many of the social dynamics of everyday life. Another feature of it is a sense of immersion."

ByteDance Zhang Yiming spent billions to acquire VR producer [13]<sup>xiii</sup>, into the bureau yuan universe. On August 29, several media revealed that ByteDance would buy Pico for 5 billion yuan to enter VR news dominated the headlines, adding to the original concept of Meta universe. ByteDance's move also shows his confidence in the meta-verse concept, just after Zuckerberg made it clear that he wanted to build Facebook into a meta-verse company within five years. Similar to Facebook's acquisition of Oculus, ByteDance wants to apply Lark to the next generation of mobile disruptive terminal devices, to build its own "meta-universe".

ByteDance's ambitions for the meta-verse were revealed earlier this year. In April, ByteDance invested 100 million yuan in the Meta Space Concept company. According to its official website, It was founded in 2018, with the youth creation and social UGC platform Restart the world,

In fact, not only Facebook and ByteDance, but also other domestic and foreign technology giants such as Google, Microsoft, Apple, SONY, Ten-cent, Huawei have laid out the most popular concept "meta-verse", which is considered to be the new form of the next generation of Internet. With the continuous development of new technologies, the virtual reality meta-universe related industries may usher in an explosion. China Merchants Securities believes that at present, VR technology is constantly expanding in the industrial application field, and the industrial chain is constantly improved. According to the IDC forecast, the average annual growth rate of the global virtual reality industry will reach about 54%. According to WIND data, the market value of the entire virtual reality sector is currently as high as 1.8 trillion yuan.

From the PC Internet to the mobile Internet to the meta-verse, it will reshape how each of us works, learns, shop, travel, socialize and access information.

The meta-verse can be understood as the virtual digital world of human consciousness, [14]<sup>xiv</sup>, which corresponds to a whole new identity, where people can move between different devices and communicate in a virtual environment.

In fact, the meta-universe is a science fiction concept that existed 29 years ago. In recent years, with absorbing the increasingly mature big data, algorithms, AI, AR,VR, block-chainand 5g technological achievements, it has suddenly attracted the attention of the capital market and entrepreneurs.

It's not hard to imagine that our world is a three-dimensional world, but all mainstream display devices are two-dimensional planes. Therefore, the change of terminal form is an understandable trend. At the same time, the change of terminal form will also lead to the change of the industry pattern and accelerate the pace of human migration to the digital world [15]<sup>xv</sup>. The Meta-universe is a virtual space and time for people to entertain, live and even work. Will bring us a rational position of unmoving, but wandering.

So the development of VR / AR devices is accelerating into our lives and promises to end the flat world of mobile phones. We experience the reality in the digital world, and we feel the integration of reality in the physical world.

That's why tech companies like ByteDance and Facebook are betting on meta-verse. The future is a brand-new era, is a meta-cosmic era.

In about 15 years, the Internet could undergo a major change. Just as the transition from PC as the main Internet terminal to mobile phone, now it will also transition from mobile phone to VR / AR devices, starting the next 15-year evolution cycle of the Internet, human beings will usher in the eve of the great changes of the Internet.

The core of the meta-universe is digital creation, digital asset [16]<sup>xvi</sup>, digital trading, digital currency and digital consumption, especially in terms of user experience, which reaches the realm of difficult to distinguish between real and false, and the combination of virtual and real.

Figure 3:This picture shows the fields and characteristics of the meta universe



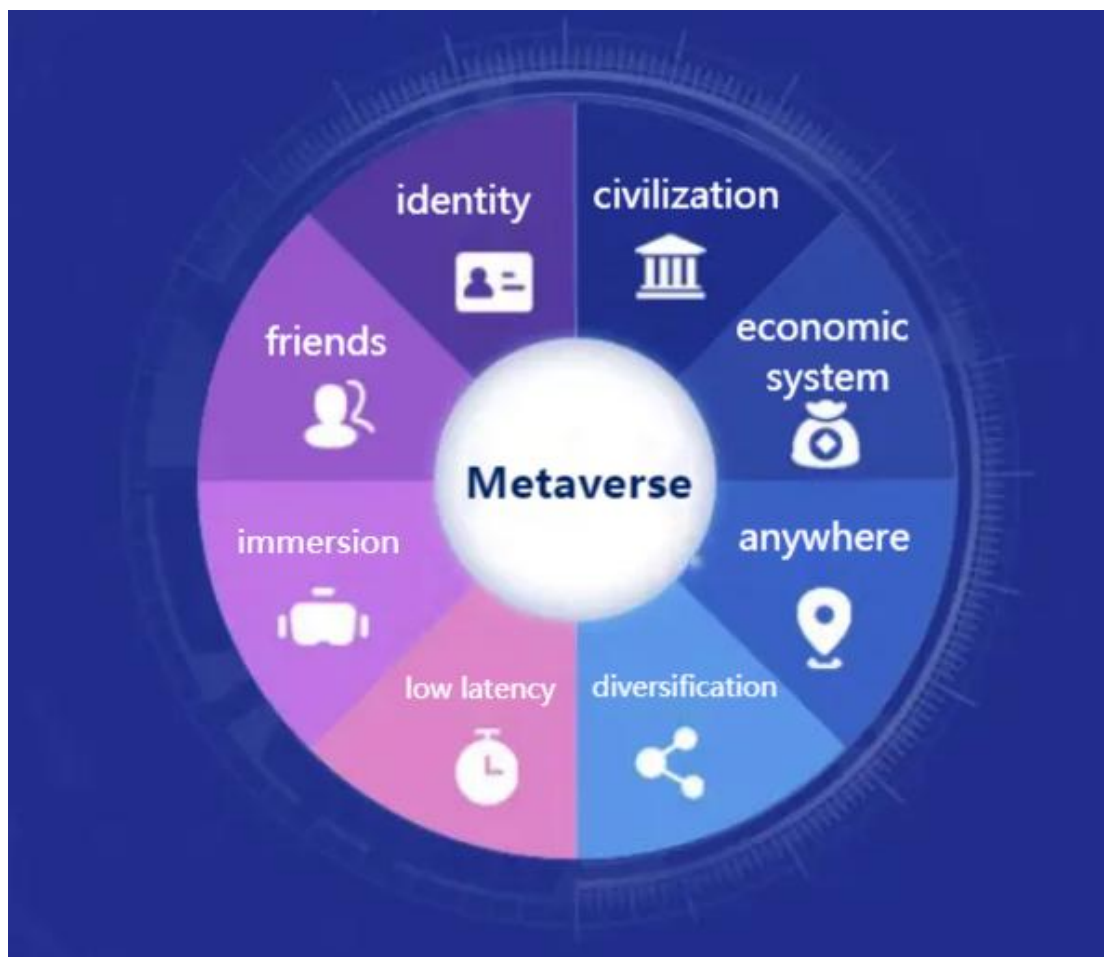


Figure 3: The fields and characteristics

Co-creation, sharing and co-governance are the basic values of the meta-verse. Living and working in the meta-verse is becoming part of the subculture of Generation M (Generation Meta-verse)[17]<sup>xvii</sup>, thus creating social trends of thought, thus reshaping the meta-verse society and influencing the real society. In the infiltration and integration of traditional culture and meta-verse culture, human civilization may be reshaped.

### 3.2 Technical characteristics

The main use of the meta-verse in the current market is through the scenes that have been built by others and then we move in it. Such scene activities are often fixed, and such scenes can be bought and sold because they are created by others.

And what we propose is that our meta-verse can be created according to our ideas, everyone's thought is different, everyone's meta-universe is different. A meta-verse that allows for fantastic ideas but also conforms to the ethics of society. Many art writers show their mental images, which may be a stage of computer mapping, and the meta-verse may be a more advanced form of this stage.

The development of the human development has reached a new stage of [18]<sup>xviii</sup>, the current universe has three layers, the first layer according to two-dimensional images, the second layer according to the mouth of the universe, the mouth describes the characteristics of the house can immediately show the house, as the more detailed oral description house presents the more specific, it is used to our core technology rapid modeling. The third level presents the picture immediately through the mind. Our app is mainly in the first level but also in the second level of rapid modeling, generating a part of the meta-universe matter immediately based on two-dimensional images.

At the same time, our meta-universe is not only a static meta-universe, but a dynamic meta-universe [19]<sup>xix</sup>, human modeling and car dynamic modeling and other rapid modeling of all moving matter. This is all the basis for the modeling of the second and third layers. The meta-verse is the immersive experience of hearing, vision and feeling, so it can be said that the drama is the 0.0 version of the meta-verse is the bud of the meta-verse; the emergence of TV movies represents the meta-verse into the 1.0 version, as long as you live in the

immersive experience. VR is now traditionally used, games are the current mainstream, We-chat interface can be said to be the cross section of the meta-verse, the interactive social cross section with us as the starting point.

The game world is the local corner of the meta-verse[20]<sup>xx</sup>, our subsequent development can enter the new version, the current is the manufacturer definition we go in just experience, what we have to do is that each of us can create the meta-verse. We fast modeling technology not only static and dynamic, our is a time axis in the meta-verse, time can leap is able to do, the specific implementation path may be according to the formation of the dream mechanism is equivalent to daydream technology to implement, but it also has great limitations calculate power resources are limited, power does not support, generate slow accuracy is not high, improvement is without the person face is not to see the same house some details are not, only pay attention to appear. There are also business opportunities, which we can charge according to the precision of the meta-universe rapid modeling, which believes will be one of the main sources of revenue.

In the future, the digital ecology will be a huge digital ecology, which can attract more users to consume information, so as to promote industrial digital, and further promote the development of digital economy through the promotion of industrial digital and digital industrialization. In this process, it is not difficult to find that the block-chain and the new generation of information technology are the infrastructure, while the meta-universe is a digital consumption ecology, which jointly promotes the development of the digital economy through "one push, one pull".

#### IV. CONCLUSION

The universe reflects the transformation of the world, and now the value of the universe has been discovered in many cases, such as games, making friends circle, with the progress of technology will have more forms. In the future, the quantum world of quantum entanglement may be directly related to the meta-Universe, and the meta-universe we show are all determined states in the quantum world. The entangled states is a higher form of the fourth layer[21]<sup>xxi</sup>, and the entangled states are two different spacetime matter that change one and the other changes. We can restore the fragmented fragments, which is the core of our technology, the story torn fragments to restore the incomplete painting and so on. We can restore the building according to the side of the building.

The core technology of our system is splicing technology, just like a dream, a dream is through some incoherent fragments and then linked together to complete an experience. Our system is by taking pictures of buildings, stitching and predicting, and then building a display in the meta-verse. In real life, many scenes are broken and incomplete with regret. Through the meta-verse, life can be connected and make up for many defects in life, because the fragmented life brings an imperfect feeling, people pursue truth, goodness and beauty, if the reality is happy will not participate in the meta-verse.

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