

# Analysis of NFT Virtual Fashion in the Era of Metaverse

Nana Ba<sup>1</sup>, Lingling Hou<sup>2</sup> \*

2429710682@qq.com<sup>1</sup>, 841459720@qq.com<sup>2</sup>

Dalian Polytechnic University Fashion School Xingcheng Swimwear Industry Association - Liaoning Provincial Department of Education graduate joint training demonstration base, Liaoning, China

**Abstract:** When the metaverse era evolved, NFT (non-homogenized tokens) had become a popular digital asset. In metaverse, virtual fashion is also a popular form of NFT, which provides personalized dressing for digital characters. In this thesis, the aim is to analyze the trends and characteristics of NFT virtual fashion development in the metaverse era. The basic concepts of NFT and metaverse, and the application of NFT in metaverse are introduced first. Then, the characteristics of NFT virtual fashion are analyzed, including its personalization, scarcity and interactivity. NFT virtual fashion can be personalized according to users' needs and tastes. Meanwhile, it has scarcity and collector's value due to its limited edition. In addition, NFT virtual fashion is not only displayed in games and art platforms, but can also be "worn" and interacted with by users. Finally, the future development of NFT virtual fashion is analyzed in this thesis.

**Keywords:** metaverse, NFT, virtual fashion

## 1 Introduction

With the continuous expansion and upgrading of the metaverse, the design of virtual fashion will become more diversified and complex, involving more technical applications and creative elements. At the same time, NFT virtual fashion will further integrate gaming, socialization, art and other aspects to provide people with richer experience and creative space. As digital technology continues to evolve, people are entering a digital age. Digital assets and digital identities became more and more popular. In this digital world, metaverse and NFT have become hot topics.

## 2 Metaverse and NFT

### 2.1 Definition and Development of the Metaverse

There is no authoritative definition of metaverse yet, but the development of metaverse cannot be separated from the support of science and technology. From the technical point of view, metaverse integrates many different technologies, such as virtual reality technology, block-chain technology, artificial intelligence, human-computer interaction technology and so on. It is a huge fusion of technologies. From the perspective of the NFT virtual fashion discussed in this thesis, the metaverse is a virtual space created by digital technology that

contains a variety of digital assets and applications in which users can interact, communicate and create. In the metaverse, people can build their digital identities, publish their digital artefacts, and interact, communicate and create with others. The concept of metaverse originated from science fiction novels and films such as "The Matrix" and "Star Trek". However, with the development of virtual reality, artificial intelligence, block-chain and other technologies, the concept of metaverse is gradually moving closer to reality.

At present, major tech companies around the world are actively investing in the metaverse, such as Facebook's Horizon Workrooms (a collaboration platform that uses virtual space for meetings and events, mainly using virtual reality), and Facebook's official change of name to Meta in 2021, causing a wave of metaverse boom, and Tencent's metaverse initiative etc. These companies see the metaverse as an important part of the future digital world.

## 2.2 Definition and Application Scenarios of NFT

NFT (Non-Fungible Token non-homogenised token) is a digital asset based on block-chain technology. Each NFT is unique and irreplaceable<sup>[1]</sup>. Unlike traditional digital assets, NFT is unique and scarce, which can be traded on the block-chain as digital assets. NFT has a wide range of applications in the fields of art, music and games. In the field of art, NFT is used for the sale and trading of digital artworks. Many artists convert their digital works into NFT in order to better protect their copyrights and interests. In the music field, NFT can be used for music copyright management and distribution. In the gaming field, NFT can be used for the sale and trading of virtual items, where players can purchase NFT to acquire ownership of virtual items.

Digital collections exist in a variety of forms, covering a wide range of artefacts, collections and virtual objects in digital form<sup>[8]</sup>. Among them, NFT, as a specific type of digital collection, assumes the role of characterizing and verifying the uniqueness and ownership of digital works<sup>[2]</sup>. Therefore, NFT can be regarded as a unique form of expression of digital collections. In recent years, the field of digital collections has attracted much attention. The related topics have become more noticeable, and the number of digital collection enterprises has gradually increased (as shown in **Figure 1**). This development trend undoubtedly foretells that digital artwork and virtual art will have great development potential in the future.



**Fig. 1.** Number of digital collection companies in China in 2012-2022     Source: iimedia Data Centre

## **2.3 Application of NFT in the Metaverse**

The metaverse is a virtual world made up of various digital assets and applications. NFT, as a digital asset, naturally plays an important role in it.

### **2.3.1 Ownership of Digital Goods**

In the traditional physical world, ownership can usually be confirmed and proved through the possession of physical objects or relevant legal documents. However, in the digital realm, the identification and verification of ownership becomes more complex, especially for reproducible and distributable digital content.

The use of NFT is a common way to ensure ownership of digital items. When a digital item is made into an NFT, that NFT records the item's owner information and transaction history, which is stored on the block-chain in a way that is open, transparent and tamper-proof. This allows ownership transfers and transactions to be tracked and verified<sup>[4]</sup>. In the metaverse world, users can buy, sell and exchange a variety of digital items, such as virtual houses, virtual cars, virtual fashion and so on. Since NFT is irreplaceable and unique, it can be used to represent the ownership of these digital items. Users can purchase NFT to acquire the ownership of digital items and thus enjoy a better experience in the metaverse.

### **2.3.2 Transactions and Protection of Digital Artefacts**

The metaverse era has seen the emergence of a growing number of NFT marketplaces and platforms for artists and collectors to trade digital artworks. These marketplaces provide a decentralized environment that allows artists to shelve and sell their NFT works, while allowing collectors to browse and purchase works of interest. Throughout the NFT's transaction process, its transaction records are stored on the block-chain, ensuring transparency and traceability<sup>[6]</sup>. In addition, NFT helps to protect artists' digital artwork copyrights. By making their works into NFT, artists can record and verify their ownership on the block-chain. This decentralized protection prevents unauthorized copying and copyright infringement as well as provides artists with a legal basis to defend their rights<sup>[3]</sup>. NFT also provides revenue opportunities for artists and creators. With the help of smart contracts and block-chain technology, artists can set a percentage of dividends or royalties. When their works are resold on the secondary market, they can earn a percentage of the proceeds. In the metaverse, digital artworks can be displayed and interacted with in a variety of ways. Artists can create virtual galleries or exhibition spaces for users to visit and enjoy virtually. By using NFT, the artist can also control how and with what permissions the work is displayed as well as provide special interactive experiences for the audience.

### **2.3.3 Game Props and Virtual Currency Trading**

In the progress of the metaverse era, games step into the footsteps of metaverse development, and these games are called chain games. NFT is applied in chain games for game props and virtual currency transactions, providing players with brand new paradigms and opportunities. With NFT technology, game developers can make virtual props into unique digital tokens and introduce them into the game. These props have unique properties, scarcity and ownership. Players can acquire, trade or collect these special props in the game. In Chainplay's secondary market, players can freely buy and sell game props on a decentralized platform. NFT records

the props' uniqueness and ownership information, ensuring transparency and credibility of transactions<sup>[5]</sup>.

With NFT, game developers are able to build an organic and sustainable in-game economy. Players can earn rare virtual items or virtual currency by completing quests, defeating enemies, or participating in specific activities. These items and currencies can be used to upgrade characters, unlock new content, or exchange items with other players. With NFT, game props and virtual currencies can be inter-operated across different games. Players can take props acquired in one game and continue to use or trade them in another game. This interoperability increases player freedom and choice and promotes cross-game socialization and trading.

### **3 Characterization of NFT Virtual Fashion**

With the development of metaverse and the application of NFT technology, NFT virtual fashion is receiving more attention as an emerging digital asset. Different from traditional fashion, NFT virtual fashion has many unique features and advantages.

#### **3.1 Individualized Design**

A distinctive feature of NFT virtual fashion is personalized design. Due to the application of digital technology, the design and production process of NFT virtual fashion is more flexible and free. Fashion designers can design more personalized fashion works according to users' needs and preferences<sup>[9]</sup>. This kind of personalized design can not only meet the users' needs and aesthetics, but also improve the artistry and culture of fashion design.

The personalized design of NFT virtual fashion can also bring more business opportunities. Due to the digital attributes of NFT virtual fashion, fashion designers can target their designs and launch more popular fashion pieces through more accurate market analysis and user data, thus achieving higher business value and revenue.

#### **3.2 Limited Issues and Scarcity**

The limited edition and scarcity of NFT virtual fashion is also one of its features. Unlike traditional fashion, NFT virtual fashion is usually released in limited quantities. This limited release can bring higher value and scarcity to the fashion pieces.

In addition, the application of NFT technology can also provide technical support for the scarcity of NFT virtual fashion. Through the application of block-chain technology, the ownership and circulation records of NFT virtual fashion can be closely protected and tracked, ensuring the uniqueness and scarcity of fashion works. This scarcity not only brings higher commercial value, but also enhances the value and recognition of fashion works by users.

#### **3.3 Interactivity with Other Elements**

NFT virtual fashion can also interact with other elements. In some virtual fashion platforms or marketplaces, it can not only integrate with other digital assets to create a more unique and interesting user experience, but also interact with the users themselves to enhance the personalization and artistry of the fashion pieces<sup>[10]</sup>. In some virtual games or social platforms, users can purchase or own NFT virtual fashion to interact and communicate with other users,

as well as show their personality and taste. Similarly, NFT virtual fashion can be integrated with other digital assets, such as combining with virtual furniture, decorations, props and other elements to create a more unique and rich virtual world. In addition, NFT virtual fashion can also provide a new mode of operation for other digital assets. In some virtual games, NFT virtual fashion can be used as a new type of substitute for in-game props, designed and launched by fashion designers. Users can purchase or exchange NFT virtual fashion to obtain special in-game abilities or experiences, thus realizing a more interesting and diversified gaming experience.

Overall, NFT virtual fashion, as a new type of digital asset, has many unique features and advantages. Through personalized design, limited edition and scarcity, as well as interaction with other elements. NFT virtual fashion can bring users a more personalized and richer experience of the virtual world, as well as more business opportunities and revenue for fashion designers and digital asset operators.

## **4 Application Analysis of NFT Virtual Fashion**



### **4.1 NFT Virtual Fashion in the Numbers Game**


Digital game is one of the most widely used areas of NFT virtual fashion. In traditional games, players usually only have access to virtual fashion within the game. These virtual fashions usually cannot be traded or circulated. In contrast, NFT virtual fashion based on block-chain technology can give players ownership and circulation rights, which greatly enriches the player experience within the game. In digital games, NFT virtual fashion is usually designed as a kind of decorative item, which is used to dress up the game character and enhance the character's attribute value and appearance, thus better reflecting the player's personalized needs. At the same time, NFT virtual fashion can also be regarded as a kind of game asset with scarcity and trading value, which can be traded both in-game and out-of-game to realize asset value-added and income, such as "The Sandbox", "Decentraland" and "Stepn". In these games, NFT virtual fashion can not only provide players with a richer and more unique gaming experience, but also serve as a kind of in-game props with certain commercial value. At the same time, game developers can also get some income through the sale of NFT virtual fashion. "Decentraland" is a decentralized virtual world game based on Ether, in which players can purchase virtual land (known as "LAND"), as well as freely create and display content on it, including buildings, artwork, games, and social venues. Players can create or purchase virtual items created by other players, such as virtual art, virtual fashion, etc. These virtual assets are stored on the block. These virtual assets are stored on the block-chain and can be freely bought, sold and exchanged by players, thus enabling true digital asset ownership. Virtual fashion in "Decentraland" exists in the form of NFT. In this virtual world, players can buy different NFT virtual fashion to dress up their characters. These NFT virtual fashions are scarce and limited edition, so some NFT virtual fashions are very expensive. In addition, "Decentraland" has also released some limited time NFT virtual fashion, which players can get by grabbing them and so on. On the other hand, "The Sandbox" is a sandbox-style virtual world game based on NFT and block-chain technology. In this virtual world, players can create their own virtual scenes, buildings and characters as well as items, and can use different NFT virtual fashion to dress up their characters. These NFT virtual fashions are also scarce and limited edition. Some NFT

virtual fashions are very expensive. "Stepn" is a Web3 fitness game based on the Solana block-chain that combines elements of play and fitness to create a new type of game known as move and earn. In-game virtual fashion is mainly virtual sports shoes. NFT trainers are purchased in-game and rewarded with in-game coins when walking, running or jogging outdoors using GPS and motion sensor technology. This innovative game mechanism combines real-world exercise with virtual-world rewards, encouraging players to actively participate in fitness activities while enjoying the fun and rewards of the game. NFT sports shoes are a digital representation of sports shoes, which exist only in the digital world and are not limited by the physical world, as well as can be rendered in infinite 3D effects. In "Stepn", different types and levels of NFT trainers can be purchased, each with unique attributes and effects, such as speed, distance, and rewards. NFT shoes with higher speed and higher rewards are relatively more expensive. With the support of Solana block-chain, "Stepn" is able to provide an efficient transaction and record system to ensure the uniqueness and ownership of NFT trainers. Players can freely buy and sell NFT trainers in the game and showcase their unique collections. As a Web3 fitness game based on the Solana block-chain, it provides players with a new experience combining fitness and gaming through the innovative motion-earning gameplay and the digital design of NFT trainers. This creative fusion brings more fun, motivation and interaction to players, as well as promotes the innovative application of NFT in the gaming field.

The following summarizes "Decentraland", "The Sandbox" and "Stepn" in relation to in-game virtual fashion (**Table 1**).

**Table 1.** Summary of in-game virtual fashion analyses  
Photos in the table Credit: Games "Decentraland", "The Sandbox" and "Stepn"

Name of game	Style of play	Types of virtual fashion	Design style of virtual fashion	Example of virtual fashion
"Decentraland"	Using advanced 3D graphics technology, the picture is detailed and vivid.	Basic clothes and accessories, high fashion and jewelry, and rare and limited edition fashion.	In-game virtual fashion is created by players themselves or in collaboration with well-known designers in a variety of styles. These include futuristic styles with a strong sense of technology, traditional art and cultural elements.	
"The Sandbox"	Features pixel-style 2D graphics that are retro yet original and colourful.	Free common models, rare limited editions.	Regular designs are simple jackets, t-shirts and pants in different colors and patterns. Limited edition fashion is more complex and innovative.	

"Stepn"	A sports and fitness based game that includes mechanics such as virtual digital shoes as well as token rewards.	NFT Sneakers	Digital virtual shoes with most styles, cartoon models and fashion models.	
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Overall, the application of virtual fashion in games can enhance the playability and fun of the game, and give players more incentives to collect and purchase different virtual fashions. In addition, through the NFT technology, virtual fashions have the characteristics of scarcity and limited distribution, which makes players more willing to invest time and money to acquire them.

#### 4.2 NFT Virtual Fashion in Brand

Brand ANNAKIKI presents a striking NFT virtual fashion capsule collection for Autumn/Winter 2022 (as shown in **Figure 2**). Modeled on the new collection, the capsule collection cleverly incorporates the 3D wave silhouette sleeves of the brand's iconic design and maintains the brand's usual style of creating a techno-futuristic, liquid metal texture. ANNAKIKI's exploration of the NFT virtual fashion space is a harbinger of the diversity that lies in the future of the art of apparel. At present, covering the body is no longer limited to physical garments, but also to virtual fashion created by more brands and artists. This trend also demonstrates the great potential of virtual fashion in the future.



**Fig. 2.** ANNAKIKI virtual fashion Photo source: ANNAKIKI brand's website

Some brands have also started to explore the use of NFT virtual fashion as part of their offline activities, such as showcasing NFT virtual fashion in fashion exhibitions, fashion shows and other occasions to attract consumers' attention, thereby increasing brand awareness and reputation.

#### 4.3 NFT virtual fashion in the art market

NFT virtual fashion has a wide application potential in the art market. Xiaohongshu, a well-known social platform in China, has launched virtual fashion NFT, attracting many artists and fashion designers to showcase their beautiful virtual fashion designs on the platform. These unique designs are sold in limited quantities on the art market. Although they are virtual fashion, they still have wearable features. On the other hand, the foreign virtual

fashion platform DRESSX provides designers with the opportunity to display and sell their digital works of virtual fashion, which have textures and whimsical shapes that cannot be presented by traditional clothing (as shown in **Figure 3**).



**Fig. 3.** DRESSX virtual fashion and how it looks on the body Photo source: DRESSX official website

In addition, some designers and artists have started to sell their digital works and virtual fashion on the NFT marketplace, where they can sell their works to collectors and investors around the world, enabling them to circulate and resell their artworks. These NFT virtual fashions are characterized by their uniqueness and scarcity, which makes them a sought-after object by investors. Overall, NFT virtual fashion is highly personalized and scarce, which can play a huge role in digital gaming, branding and the art market. With the development and popularity of the metaverse, the NFT virtual fashion market will continue to expand and innovate, bringing users a richer and more diverse virtual fashion experience.

## **5 The Future of NFT Virtual Fashion**

### **5.1 Technological Innovation and Application**

With the continuous development of block-chain technology, the design and application of NFT virtual fashion will also continue to innovate. The current technological innovation focuses on the interactivity and wearability of virtual fashion. For example, the use of reality and virtual reality technology allows users to "wear" virtual fashion on their own bodies for a more realistic experience. In the future, the scope of application of NFT virtual fashion will continue to expand, especially in social networks, virtual worlds, digital games, film and television productions, in order to further promote the market value and artistic value of NFT virtual fashion.

### **5.2 Diversity and Complexity of Design**

In the process of technological development, the design of NFT virtual fashion will be more diversified and complex. Designers can make use of 3D design software to create more refined creations, and design virtual fashion to be more three-dimensional, textured and rich in details. In addition, designers can also create more unique and novel virtual fashion works by integrating different design elements, such as digital art, sci-fi elements, and cultural symbols.



### 5.3 Trends in the Integration of Games, Socializing and the Arts

Virtual fashion in the metaverse era holds promising prospects. Its unique features enable designers to exhibit diverse creativity using 3D design software and vibrant elements. This freedom fosters boundless possibilities for fashion designers. NFT virtual fashion, with its rarity and collector's value, has gained significant attention and popularity in the digital art market. Each piece of NFT virtual fashion is a unique artwork, driving the expansion of the digital art market and providing income sources for digital creators. Currently, NFT virtual fashion finds utility in gaming, socializing, and art. Players can showcase and wear virtual fashion, enhancing social interactions in games. Artists create exclusive artworks with NFT virtual fashion, promoting wider artistic expression and dissemination. Social platforms facilitate the display of virtual fashion, enriching social experiences<sup>[7]</sup>. In the future, NFT virtual fashion will be seamlessly integrated into real life, offering intriguing lifestyles. Its interactivity will be further intensified to provide a more immersive experience for users. NFT virtual fashion will continue to play a vital role in gaming, socializing, and art, contributing to the advancement of the digital economy. With ongoing technological progress and innovation, NFT virtual fashion is poised to demonstrate even greater growth potential.

## 6 Conclusion

With the development of the metaverse and the popularization of NFT, NFT virtual fashion is emerging as a new form of digital fashion and showing great potential. It is not only a decorative item in digital games and social platforms, but also a digital asset with collection value and cultural connotation. The emergence of NFT virtual fashion brings us unlimited creative possibilities. It will continue to stimulate our imagination and promote the innovation and development of fashion design and digital art. At the same time, NFT virtual fashion will continue to integrate with gaming, social, art and other fields in order to become a more diverse and complex digital fashion ecology. Therefore, NFT virtual fashion will show a broader prospect and a more desirable future in the future development.

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