

A Study on the Application Algorithm and Change of Art Field according to NFT Technology

Chun Hyunjin^{1,a}, Jiaqin Sun^{1,b}

tough4324@naver.com^a, SUNJIAQIN@88.com^b

Arts College, Nanjing University of Aeronautics and Astronautics,
No. 29 Jiangjun Road, Jiangning District, Nanjing 211106, Jiangsu, China ¹

Abstract. In the era of the 4th Industrial Revolution, various new technologies such as artificial intelligence are developed. Among these various technologies, NFT technology is used in the art field. So NFT technology is expected to bring about new changes in the art world. In addition, the development of information and communication technology leads to digital transformation in various industries. Recently, art transactions through online distribution are increasing. For this reason, many artists are interested in NFT technology. Despite these rapid changes, research on the art field through NFT technology is still insufficient. Therefore, in this paper, the application algorithms and changes in the art field according to NFT technology were studied. In NFT, PoW consensus algorithm is generally applied. PoW consensus algorithm has many problems with transaction cost and processing time. Therefore, NFT is highly inefficient because it uses PoW consensus algorithms. Therefore, the algorithms used in NFT technology should be studied in a way that can increase efficiency. In addition, NFT art is highly likely to equate the artistic value of the work and the economic value. In this way, the meaning of the unique artistic value of the artwork can be eliminated. Therefore, NFT technology gives artists many opportunities, but it also has problems. In the future, methods that can solve various problems of NFT art should be studied. These research results can be used as theoretical basic data for future NFT art.

Keywords: Algorithm; NFT; NFT art; artificial intelligence

1. Introduction

1.1. Research Background and Purpose

In the era of the 4th Industrial Revolution, new technologies are combined in various fields. With the recent development of blockchain technology and metaverse technology, NFT technology is drawing attention. In particular, as NFT technology develops, it is also innovated in the art field. In addition, various sectors are converted to digital due to the development of information and communication technology. In this situation, online distribution in the art market also increases. For this reason, many artists are very interested in NFT technology. As a result, NFT art has become a genre in the art world. Despite these rapid changes, research on the art field through NFT technology is still lacking. Therefore, in this paper, the application

¹ Associate Professor ,Arts College ,Nanjing University of Aeronautics and Astronautics

algorithms and changes in the art field according to NFT technology were studied. These research results can be used as theoretical basic data for future NFT art.

1.2. Literature Review

As information technology develops, there are many changes in the art field. In particular, with the recent development of NFT technology, NFT art is recognized as an important concept. Therefore, investment in NFT art based on NFT technology is increasing mainly in developed countries. Therefore, interest in NFT art increases in research institutes. Therefore, in this study, the research on NFT art is as follows. Choi, Sung Wone et al. (2021) proved that blockchain games can provide business model innovations through interoperability among NFT based game items [1]. Roh Tae Hyup (2022) analyzed new opportunities for change by converting digital, expanding the online art market, expanding virtual space using VR(Virtual Reality) and AR(Augmented Reality) technology, and expanding the trading area of digital works NFT based on blockchain technology [2]. Kang Hye Rim (2022) analyzed cases related to the jewelry industry, focusing on the social phenomenon triggered by NFT in the Web 3.0 era [3]. Cho, Kwang Hyun et al. (2022) analyzed the relationship of variables that affect intention to use NFT based on the UTUAT model, additionally, moderating effect of NFT types and crypto investment experience [4]. Min, Youn A et al. (2022) analyzed as a method to increase the transaction cost and processing time during NFT transactions and to increase the transaction stability requirements that occur during smart contract execution [5]. Cheon Mi Lim et al. (2022) analyzed the future and genre sustainability of NFT art through the case of NFT project "Cryptopunks" and "PUNKISM" advocating a new art genre [6]. Lee, Sang Hoon et al. (2022) found that individual innovativeness, profitability and reliability of NFT, and FOMO factors significantly influence purchase intention [7]. Kim, Hye Sung. (2022) analyzed and investigated the new properties and changing characteristics of digital images in order to anticipate the characteristics of artworks that the public produces, enjoys, and consumes [8]. Li, Haijing. (2022) considered the most compatible combination between NFT and metaverse [9]. Most of the existing studies are on NFT technology and blockchain. Compared to the importance of NFT art, there is a lack of research. Therefore, in this paper, the application algorithms and changes in the art field according to NFT technology were studied. These research results can be used as theoretical basic data for future NFT art.

2. Research Method

In this paper, we conducted a study on applied algorithms and changes in the art field according to NFT technology. The research method for this paper is as follows. The research method in this paper is a qualitative research method. First, this paper conducted a literature study. Papers, newspapers, books, and magazines were used as data for literature research. Literature research was conducted on NFT technology and NFT art. A case study was conducted based on these literature studies. The case study was analyzed focusing on various artworks using NFT art. After conducting a case study, participant observation and interviews were conducted with experts and artists on NFT technology and NFT art. Through this qualitative study, changes in the art field according to NFT technology were analyzed. These research results can be used as theoretical basic data on how to use NFT technology in the art field.

3. A Theoretical Study

3.1. Blockchain

In the era of the 4th Industrial Revolution, various new technologies such as artificial intelligence are developed. Among these various technologies, the representative technology is the blockchain. Blockchain is a technology that stores data on multiple computers. Blockchain technology has blocks connected through chains. These blocks contain all transaction details and are connected to each other. Therefore, several computers ensure uniqueness through data review with each other. These multiple computers serve as public transaction books. In this way, all virtual transactions are stored on multiple computers to review and monitor each other. The development of blockchain technology began in 2007 due to the global financial crisis. At that time, the limitations of the centralized financial system were recognized and developed as a response to these problems. This blockchain was developed by Satoshi Nakamoto in 2007. Blockchain technology can put various information in blocks. Through this technology, it can be used in various fields.

3.2. NFT

NFT is a concept of owning digital assets through blockchain technology. A photo or image is put into a virtual token to become a digital asset. Therefore, these digital assets can be recognized as ownership. It has uniqueness and cannot be replicated. Previous digital assets were very easy to replicate and were very difficult to be recognized for their uniqueness. However, as blockchain technology develops, the problem of replication of digital assets can be solved. So digital assets using NFT are very secure. Therefore, various digital artworks are traded using NFT technology. NFT assets are traded through virtual currency. Cryptocurrency is diverse, such as Bitcoin and Ethereum. Until now, it is difficult to use virtual currency as an exchange value in general life. So, recently, virtual currency is used to trade NFT assets. NFT assets are organized in various forms. Typical types of NFT assets include NFT art, NFT photography, NFT metaverse land, and NFT characters. As the NFT asset market has grown recently, NFT assets are traded at a high price in the market. NFT technology began to attract attention in 2017. In 2017, Cryptokitties, a blockchain-based game, became popular with the public (figure. 1). In this game, users can create and own new cat characters. Therefore, since these cat characters are based on NFT technology, the public's interest in NFT has increased.

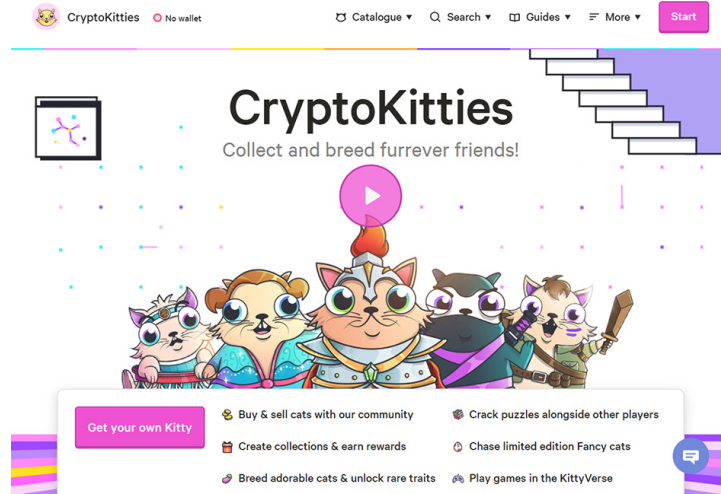


Fig. 1. Cryptokitties [8]

3.3. NFT art

As blockchain technology develops, interest in NFT is also increasing. NFT art is a representative field that utilizes NFT. Digital images that could not be recognized as art gained artistic value through NFT technology. Thanks to blockchain technology, digital images can distinguish between original and copy. So far, NFT art has not been popularized. However, as technology develops, NFT art is expected to become an important art field in the future. Currently, NFT art is traded in the market. In 2021, NFT artwork was sold for about \$70 million at a global online auction company. Through these practical transactions, NFT art is regarded as an important genre in the art field.

4. NFT Art Consensus Algorithm

4.1. Definition of consensus algorithm

NFT technology is based on blockchain technology. Blockchain is operated through consensus algorithms. Consensus algorithm refers to an algorithm that requires the consent of the whole of new records or verification through a network. The consensus algorithm is a method of adopting the same record through communication between each other. These algorithms are algorithms for forming blocks. There are various types of consensus algorithms. Types of these algorithms include PoW, PoS, Paxos, etc. Among these algorithms, PoW is used the most. PoW is a consensus algorithm that proves this process when adding a new bullock to a blockchain. The calculation equation of the hash function for mining PoW is as follows (figure. 2). The hash value is set to be smaller than the M/D . D means difficulty, and M means the maximum value in difficulty.

$$\text{hash} - f < M/D$$

Fig.2. Calculation Formula of Hash Function for PoW Mining [5]

PoW is repeatedly performed to verify the block. So the processing time is very long. After the block work, the new block is included in the blockchain. This blockchain serves as a transaction book. Anyone can check this blockchain. In addition, PoW can secure the reliability of the block through continuous verification of the blockchain. The operation process of the blockchain using such PoW is as follows (figure. 3).

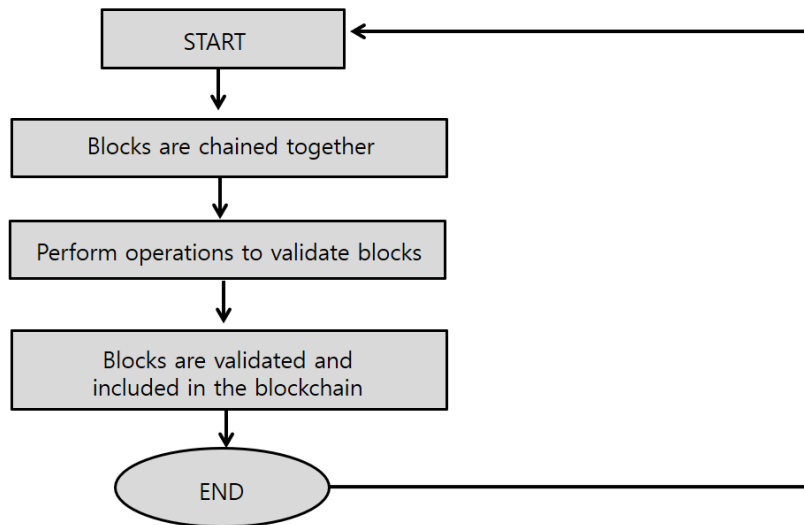


Fig. 3. Operation process of PoW

4.2. Application of consensus algorithms

With the recent increase in NFT transactions, NFT art will be a very important factor in the online asset market. In NFT, PoW's consensus algorithm is generally applied. PoW's consensus algorithm has many problems with transaction cost and processing time. Therefore, NFT is highly inefficient because it uses PoW consensus algorithms. Therefore, the algorithms used in NFT technology should be presented with ways to increase efficiency in the future. In addition, transaction stability is very important when NFT transactions occur. N is the number of all nodes participating in the consensus algorithm. δ means the proportion of honest nodes that occur at the time of transaction. So δ is the number of all nodes divided by the number of honest nodes. Therefore, the execution stability evaluation formula of the PoW consensus algorithm used in NFT is as follows (figure. 4). In the future, it is necessary to find a way to increase the execution stability of the PoW consensus algorithm.

$$\delta * (N / 2) + 1 \text{ time}$$

Fig.4. Assessment Formula for Execution Stability of Consensus Algorithms [5]

5. Changes in the Art Field with the Introduction of NFT Technology

The development of NFT art affects the decentralization of the art field. So NFT is expected to expand the scope of all artists. Existing artists worked through physical spaces such as exhibitions. So artists without money had limitations in their work. However, with the activation of NFT technology, artists will be able to easily work online. Therefore, this NFT art makes it easy for even unknown artists to work. Artists can also trade works through these online platforms. So NFT technology allows artists to be economically active. NFT art will reduce the need for critics or curators to evaluate works. Instead of these critics and curators, artistic value is determined as economic value through online. Therefore, NFT art is highly likely to equate the artistic value of the work with the economic value. In this way, the artistic value of the work can be lost. In addition, works imitating famous NFT works are sometimes sold. There are still difficulties in controlling these works. Therefore, research on ways to solve these problems is needed. Despite these problems, NFT art will become an important art genre in the future. Therefore, it is necessary to study the development direction of NFT art.

6. Conclusion

As new technologies are developed, these new technologies are used in various fields. In particular, as blockchain technology is drawing attention, NFT technology is also used in various ways. So NFT technology is expected to bring about new changes in the art world. In addition, due to the development of information and communication technology, various industrial sectors are converted to digital. Therefore, in this paper, the application algorithms and changes in the art field according to NFT technology were studied. In NFT, PoW's consensus algorithm is generally applied. PoW's consensus algorithm has many problems with transaction cost and processing time. Therefore, NFT is highly inefficient because it uses PoW consensus algorithms. Therefore, the algorithms used in NFT technology should be presented with ways to increase efficiency in the future. And NFT art is considered an important genre in the field of art. And the development of NFT art also affects the decentralization of the art field. Therefore, this NFT art provides access to even unknown artists. These research results can be used as theoretical basic data for NFT art in the future.

References

- [1] Choi, Sung Wone et al. 2021 A Study on the elements of business model innovation of non-fungible token blockchain game : based on 'PlayDapp' case,an in-game digital asset distribution platform. *Journal of Korea Game Society*. Vol 21 No. 2 pp 123-138
- [2] Roh, Tae Hyup. 2022 Digital Transformation and Introduction of NFT in the Art Market. *The Journal of the Convergence on Culture Technology*. Vol 8 No. 1 pp 261-269
- [3] Kang, Hye Rim. 2022 A Situation Analysis of NFT on the Jewelry Industry in Web 3.0 Era. *Journal of Digital Convergence*. Vol 20 No. 3 pp 439-445
- [4] Cho, Kwang Hyun et al. 2022 A Study on Influencing Factors on Intention to Adopt NFTs Using UTAUT. *The Journal of the Korea Contents Association*. Vol 22 No. 3 pp 17-34

- [5] Min, Youn A et al. 2022 Performance Analysis of Consensus Algorithm considering NFT Transaction Stability. The Journal of The Institute of Internet, Broadcasting and Communication. Vol 22 No. 2 pp 151-157
- [6] Cheon, Mi Lim et al. 2022 The Future and Prospects of NFT Art: On the basis of Actor-Network Theory. The Journal of the Convergence on Culture Technology. Vol 8 No. 4 pp 397-405
- [7] Lee, Sang Hoon et al. 2022 An Empirical Study on Factors Affecting NFT Purchase Intention. Journal of the Korea Industrial Information Systems Research. Vol 27 No. 4 pp 93-104
- [8] Kim, Hye Sung. 2022 A Study on Formative Characteristics of Digital Images: Focused on NFT Arts. Journal of Information Technology Applications & Management. Vol 29 No. 2 pp 1-15
- [9] Li, Haijing. 2022 Characteristic analysis of Metaverse applying NFT Maslow's Hierarchy of needs Theory. Konkuk University Master degree dissertation.