

Copyright Protection to Digital Art using NFT in Blockchain Technology

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Abstract: *One of the current problems artists face regarding the use of their digital art without their consent. With the increasing accessibility and ease of sharing digital content online, it has become more challenging for artists to protect their work from unauthorized use or reproduction. Digital art can be easily copied, shared, and manipulated without the artist's permission or proper attribution. This can lead to no recognition for the artist or even in some cases, individuals may even profit from the unauthorized use of an artist's work, further exacerbating the issue. To prevent this we have proposed block chain based platform with the implementation of NFT, where digital artist can create an NFT for their art and can claim the ownership and the authenticity of the digital art and their copyrights without any issue, and also sell their art using Crypto currencies.*

Keywords: Blockchain, Non-Fungible Tokens, Digital Art, Copyright Protection, Crypto Currency, Transaction, Ownership Verification, Authenticity

I. INTRODUCTION

The current problem with this generation of artist is that every art piece is made digitally using tools like Photoshop, Procreate, etc., and being uploaded into sites like Etsy.com to sell their art piece. But these platform are not designed in a way where people can just download the images of the website without any purchasing or any permission from the creator. This poses a serious threat to the artist as his/her work is being used without any consent which is also the issue of copyright infringement.

Digital art can be easily be manipulated without the creators knowledge. This can lead to widespread dissemination of the artwork without any benefit or recognition for the artist. Another challenge is the difficulty in tracking and monitoring the unauthorized use of digital art. With the vastness of the internet and the ability to quickly disseminate content across various platforms, artists may find it challenging to discover instances of infringement or take appropriate action.

While copyright laws exist to protect artist rights, enforcing those rights in the digital realm can be complex and time-consuming. Artists may need to employ various strategies, such as watermarking their artwork, registering their copyrights, or actively monitoring online platforms for unauthorized use. To prevent this we have come up with a solution where we have created a platform for all types of digital art creators where they can publish their art and have unique hash generated for that specific image and a time line on when and how the art was created and the method used to make the image into NFT. Our platform also shows the age of the NFT, so that one can claim the ownership of the art. Displaying the age of the NFT enhances transparency, accountability, and trust within the digital ecosystem, providing both creators and buyers with confidence in the provenance and ownership of the artworks.

literature survey

“Study on Non-Fungible Tokens (NFT) by Rahul Dattaram Belose, Yogesh Ramesh Mhadgut [2022]”. In this paper the author has depicted how block chain technology is used to create Non-Fungible Tokens (NFTs), which are digital assets that are one-of-a-kind and cannot be copied or duplicated. They have gained acceptance as a means of making money off of digital artwork and other digital assets, but they have also come under fire for the amount of energy they use and the possible harm they may do to the environment. They could revolutionize the market for digital art, but they also bring up issues with ownership, legitimacy, and the environmental impact of block chain technology.[1]

“Virtual arts and non-fungible token, Lawrence J. Trautman [2021]”. In this paper the author gave use of non-fungible tokens (NFTs) to represent and exchange ownership of digital goods, including virtual art, has grown in popularity. They sell artists' work in a digital format while assuring that the ownership and validity of the artwork can be verified by using blockchain technology to produce unique, one-of-a-kind digital assets that cannot be duplicated or replaced. Despite the difficulties, NFTs have the potential to change the virtual art market and other sectors. However, in order for the NFT industry to grow sustainably and succeed, these difficulties must be taken into account and addressed.[2]

“The treachery of images: non-fungible tokens and copyright, Dr Andres Guadamuz [2021]”. The author has discussed the case that NFTs, which employ block chain technology to produce one-of-a-kind digital assets, pose significant issues regarding the ownership and veracity of digital art. NFTs can be an effective tool for artists to sell their creations, but they also present legal issues related to copyright infringement, moral rights, and the extent of copyright protection for digital art. It also draws attention to the moral dilemmas raised by the management and exploitation of digital art as well as the possibility for technology abuse. In spite of the fact that NFTs have the potential to alter the way we view digital art and ownership, the paper's conclusion stresses the need to weigh the moral and legal ramifications of this technology and to create a framework that strikes a balance between the rights of creators, owners, and users.[3]

“NFT ownership and copyrights, Micheal D. Murray [2022]”. The author investigates the connection between copyright law and non-fungible tokens (NFTs). It makes the case that NFTs present significant problems regarding copyright infringement, moral rights, the control and manipulation of digital art, and the possibility for technical misuse. It also contends that NFTs raise major considerations concerning the ownership and validity of digital art. The article makes the case that it's crucial to think about the moral and legal ramifications of this technology and to create a framework that strikes a balance between creators', owners', and users' rights. [4]

“Semantics and Non-Fungible Tokens for copyright management on the metaverse and beyond, Roberto García, Ana Cediél, Merce Teixido, Rosa Gil [2022]”. The author examines the use of NFTs and semantics to manage copyright in virtual worlds and digital environments. It argues that while NFTs can provide a way for creators to monetize their work and ensure authenticity, they raise important questions around copyright management in the digital age. The paper suggests that using semantics in conjunction with NFTs can improve the management of copyright by effectively identifying and tracking rights holders and their works. It argues that NFTs and semantics combination can revolutionize the way copyright is managed and enables creators to be fairly compensated for their work while also providing access for users to enjoy digital content.[5]

“Mapping the NFT revaluations, Matthieu Nandini, Laura Alessandretti, Flavio Di Giacinto, Mauro Martino, Luca Maria Aiello, Andrea Baronchelli [2021]”. The author examines how Non-Fungible Tokens (NFTs) fluctuate in value in the market for digital art. In order to comprehend market trends and patterns, it provides an overview of historical data on NFT sales and prices. The research also looks at the variables that influence the revaluation of NFTs, including the reputation of the artist, the originality of the piece, and the general level of NFT demand. The article comes to the conclusion that the NFT market is speculative in nature and that supply and demand factors determine how valuable NFTs are. It also acknowledges that the industry is still very young and that additional investigation is necessary to properly comprehend the variables influencing the revaluation of NFTs. [6]

“NFT market and its relationship with Bitcoin and Ethereum, Lennart Ante [2021]”. The author analyses the correlation between the Non-Fungible Token (NFT) market and the cryptocurrency markets, specifically Bitcoin and Ethereum. It reviews historical data on NFT sales and prices, as well as the price movements of Bitcoin and Ethereum to understand the relationship between the three markets. The paper also examines the factors that affect the value of NFTs, such as the artist's reputation, the uniqueness of the work, and the overall demand for NFTs. The paper concludes that while there is a correlation between the NFT market and the cryptocurrency markets, the relationship is complex and influenced by various factors. It also notes that the NFT market is relatively new and more research is needed to fully understand the relationship between NFTs, Bitcoin and Ethereum. [7]

“Non-fungible token: A systematic review and research agenda, Hong Bao, David Roubaud [2022]”. The author has explained non-fungible token, a systematic review, and a research agenda in this study. The research on non-fungible tokens (NFTs) that has been published in publications that have been indexed by Web of Science and Science Direct up until April 2022 is reviewed systematically in this article. According to the findings, there have been 13 articles published that primarily discuss asset price. The authors outline a research agenda for the future in the fields of asset

pricing, tokenomics, risk, and regulation, as well as research gaps in the literature. NFTs are frequently employed in areas such as gaming, collectibles, and art, among others, and have become a prominent application in the Fintech industry. The development of COVID-19 and the lockdown measures that increased digital participation are linked to the expansion of NFT. [8]

“Non-Fungible Tokens (NFT). The Analysis of Risk and Return, Mieszko Mazur [2021]”. This author discusses the risk and return analysis of NFT-based firms listed on cryptocurrency exchanges is conducted in the study. The authors suggest a novel classification of NFTs and discover that over the long run, NFTs produce large returns with an average investment multiple of 40 (or nearly 4,000%). Additionally, they discover that the NFT market segment of cryptocurrencies drives market recovery and delivers returns of almost 350%. The authors discover that NFTs can be used to document, confirm, and trace the ownership of a special item in addition to serving as evidence of provenance and authenticity. NFTs are protected against being taken or altered by malicious actors since they are stored and exchanged on a blockchain. The analysis comes to the conclusion that adding NFT infrastructure to current blockchains raises their market prices. [9]

“What is Non-Fungible Token (NFT)? A short discussion about NFT Terms used in NFT, Diptiben Ghelani [2022]”. The author said that NFTs (Non-fungible Tokens) are distinctive digital objects secured on the blockchain and frequently associated with unique digital content such as music or art. With well-known companies and artists producing NFT collections that may sell for millions or tens of millions of dollars, the NFT market has quickly attracted public attention. NFTs have changed the ticketing system by offering a more secure and memorable alternative to paper tickets, and the application of machine learning algorithms in NFT trading is growing in popularity. Additionally, NFTs can act as a decentralized domain, enabling them to send and receive cryptocurrency payments. [10]

“NFT marketplace design and market intelligence, Pavel Kireyev [2022] “. In the paper, market intelligence for Non-Fungible Tokens (NFTs), which have produced billions of dollars in sales, is examined in relation to the effects of marketplace architecture. Bidding expenses are highlighted by the authors as a crucial component of marketplace design that can impact market intelligence. They conduct their case study on the CryptoPunks marketplace and discover that while a reduction in bidding costs raises listing and sales prices, it has no impact on the volume of transactions. The findings imply that variations in bidding costs among marketplaces may alter market data and affect how NFT market information is interpreted. The study emphasizes how crucial it is to take market design into account when examining NFT market information. [12]

“Non-Fungible Tokens (NFT's): The Future of Digital Collectibles, Yashika Nagpal [2021]”. Using blockchain technology, Non-Fungible Tokens (NFTs) are digital certifications of validity that distinguish each token by its particular signature. In recent years, the NFT business has expanded quickly, and India has also experienced a growth in interest in this digital industry. The NFT ecosystem is still in its infancy, and India lacks a regulatory legal framework to oversee such digital crypto assets, creating legal difficulties and obscuring the NFT ecosystem's legal standing. The purpose of the study is to examine the idea of NFT, as well as the opportunities, risks, and difficulties the Indian legal system may encounter. Cryptocurrencies and digital investments have risen with the development of technology, but the original artists have suffered as a result of the lack of security and validity for digital works. By connecting ownership of a special item to a token via blockchain, NFTs address this problem. The demand for NFTs has increased dramatically in recent years, drawing millions of artists and investors from around the world. However, there are still questions concerning the legitimacy of such digital assets, and there are worries about their durability and sustainability under Indian law. [13]

“NFTs and copyright: challenges and opportunities, Pinar Caglayan Aksoy [2021]”. The author focuses on how non-fungible tokens (NFTs) are becoming more and more common and how this has affected the blockchain revolution. It outlines the salient characteristics of blockchain technology and how it affects NFTs, including how popular they are and how they work with smart contracts. The article's second section examines the legal ramifications of NFTs, notably with regard to copyright law and the difficulties involved in creating and dispersing NFTs. It also talks about the effects of buying NFTs. [11]

II. METHODOLOGY

NFT based System

To construct and manage the NFTs, select an NFT standard like ERC-721 or ERC-1155.

- 1: Create your digital art.
- 2: Prepare the metadata: input the title, description, artist details or any attributes associated with the art.
- 3: Set up a digital wallet: Connect the MetaMask wallet to the platform
- 4: Minting NFT: By calling the function (CCNFT), generates a unique token ID of your NFT.
- 5: Pay gas fees: Pay certain gas fees to execute the make item function (MKNFT).
- 6: Deploy the NFT: NFT is deployed onto the BCN

Whenever any art creator wants to register his/her art for copyright, as a first step he has to determine the type of image. The rights of the copyright holder, and any restrictions on how the NFTs can be used are all part of this. Then we need to connect our digital crypto wallet, Meta mask in our case, which stores our NFT's and facilitates transactions. After connecting our wallet, we can initiate the process of converting the image into NFT using create crypto NFT[CCNFT] function which uses smart contract to create the unique hash for that image. After generation of Hash, we need to pay gas fees which allows the execution of the function make NFT [MKNFT] to convert the digital art into NFT. Next, we can deploy the art onto the block chain network which stores the attributes of an image in the Block chain network [BCN].

Hashing Algorithms

The algorithm used in the "CCNFT" function for generating a unique token ID and creating the Non-Fungible Token (NFT) would likely involve cryptographic hashing algorithms. These algorithms are commonly used in blockchain technologies to create unique identifiers for digital assets, ensuring their uniqueness and security.

While the specific cryptographic hashing algorithm may vary depending on the implementation details of the system, commonly used algorithms include:

SHA-256 (Secure Hash Algorithm 256): This algorithm generates a 256-bit (32-byte) hash value, providing a high level of security and collision resistance.

Keccak-256: This algorithm is a variant of the Keccak family of cryptographic hashing functions, commonly used in Ethereum-based blockchain networks.

Blake2b: This algorithm is a cryptographic hash function designed for efficiency and speed, often used in various blockchain protocols.

These algorithms are designed to produce unique hash values for each input, making them suitable for generating unique identifiers for NFTs in blockchain-based systems.

SHA-256(Secure hash Algorithm 256)

In this NFT based platform which provides copyright protection, SHA-256 (Secure Hash Algorithm 256) is implemented. It is a cryptographic hashing algorithm that generates a fixed-size 256-bit (32-byte) hash value from an input data of arbitrary size. Here's an overview of how SHA-256 works:

Input Data: SHA-256 takes an input message of any length and processes it in fixed-size blocks.

Padding: If necessary, the input message is padded to ensure its length is a multiple of 512 bits. Padding includes adding a single '1' bit followed by a series of '0' bits, along with appending the length of the original message in bits as a 64-bit representation.

Message Digest Calculation: The padded message is then divided into blocks of 512 bits each. SHA-256 operates on each block sequentially, using a series of logical operations (such as bitwise operations, addition modulo 2^{32} , and rotations) to process the data.

Compression Function: Within each block, SHA-256 employs a compression function that operates on a 256-bit state and the current block of data. The compression function applies a series of bitwise operations, mixing the input data with the current state to produce a new state.

Final Hash value: After processing all blocks of the input message, SHA-256 generates a 256-bit hash value known as the message digest. This hash value uniquely represents the input data and is typically represented as a hexadecimal string.

SHA-256 is widely used in various cryptographic applications due to its strong security properties. It offers collision resistance, meaning it is computationally infeasible to find two different inputs that produce the same hash value. Additionally, it is resistant to pre-image attacks, making it suitable for generating unique identifiers like those used in blockchain-based systems such as NFTs.

In the context of your system, SHA-256 is likely used to create a unique hash value for each digital artwork, providing a secure and verifiable identifier for the associated NFT. This hash value serves as a digital fingerprint for the artwork, ensuring its uniqueness and integrity within the blockchain network.

Implementation

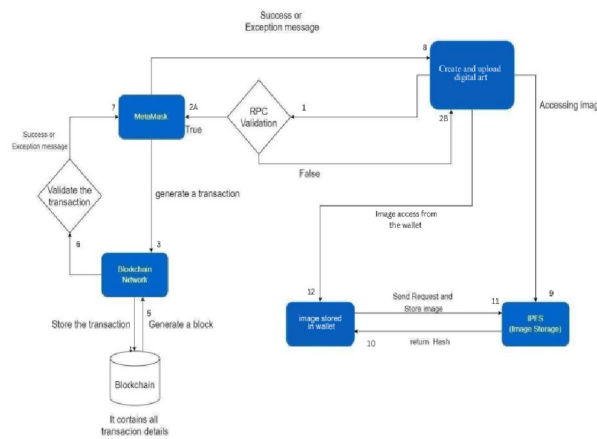


Fig 1: Block diagram of working of the NFT based platform for providing copyright protection and transaction.

III. RESULTS AND DISCUSSION

The proposed idea of NFT based secure platform for copyright protection and crypto-transactions has been successfully developed using the key features including NFT minting, smart contract integration, and safe digital markets throughout the course of the work. Together, these elements create a strong ecosystem that protects the rights of creators and artists while fostering trust and transparency among consumers and collectors.

The NFT-based safe platform for copyright images presents a viable overall solution for the digital art market, solving the issues of provenance, fair pay, and copyright infringement. Results have proved that platform creates a safe and transparent ecosystem that benefits artists, collectors, and the larger creative community by utilizing block chain technology and NFTs.



Fig 2: NFT based system for copyright protection digital art

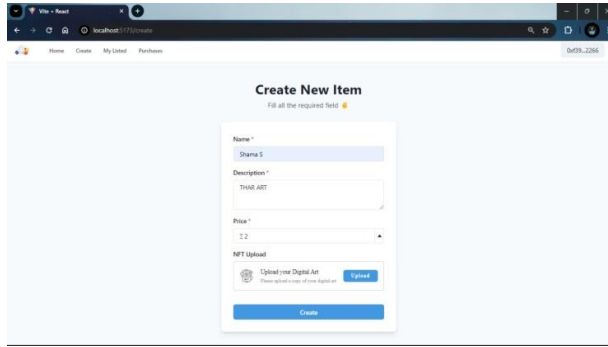


Fig 3: Home page create new item

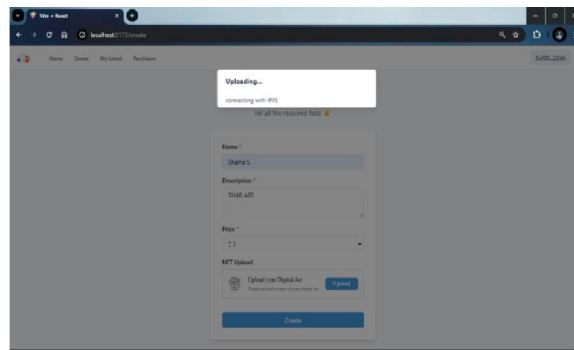


Fig 4: The seller uploading the art

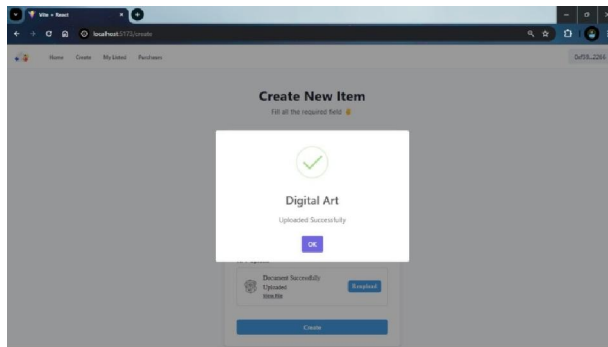


Fig 5: The art uploaded successfully

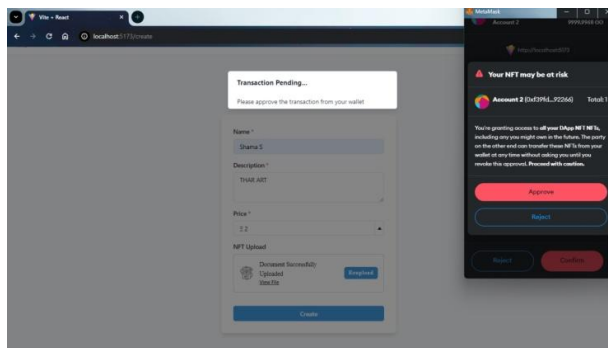


Fig 6: Transaction pending

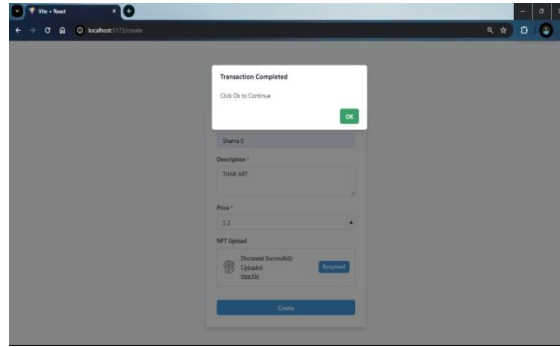


Fig 7: Click ok to continue after transaction completed

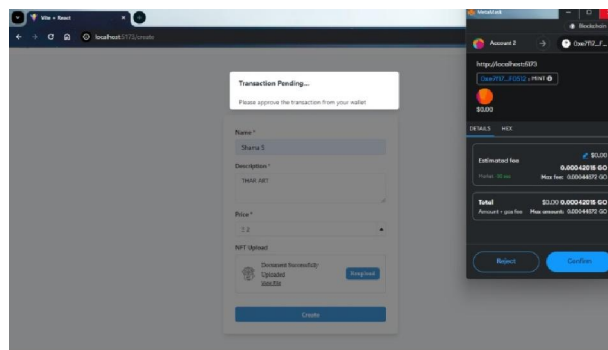


Fig 8: Transaction pending, ready for completion

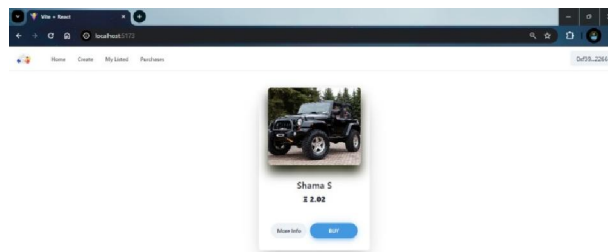


Fig 9: Home page from buyer's view, ready to buy

IV. CONCLUSION AND FUTURE ENHANCEMENT

The propose idea of NFT based platform has been successfully developed using the key features including NFT minting, smart contract integration, and safe digital markets throughout the course of the work. Together, these elements create a strong ecosystem that protects the rights of creators and artists while fostering trust and transparency among consumers and collectors. The NFT-based safe platform for copyright images presents a viable overall solution for the digital art market, solving the issues of provenance, fair pay, and copyright infringement. Results have proved that platform creates a safe and transparent ecosystem that benefits artists, collectors, and the larger creative community by utilizing block chain technology and NFTs.

Expanding support for multimedia content involves enabling artists to create and showcase a broader range of digital artworks beyond static images. This enhancement allows artists to explore new forms of expression such as animations, videos, music compositions, and interactive experiences. By diversifying the types of digital art available on the

platform, collectors and enthusiasts can discover and acquire more immersive and dynamic pieces. This enhancement not only increases market opportunities by attracting new audiences but also provides artists with additional monetization opportunities. Implementing support for multimedia content distinguishes the platform from competitors, positioning it as a leader in the evolving landscape of digital art and NFTs.

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