# Non-Fungible Tokens (NFTs) with Intellectual Property Rights (IPR) proved by digital signature

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## Abstract

As the technology advances, more services are embedded in the digital world. Citizens tend to use these digital services to exchange information or to share their digital creations. As the data are increasing rapidly on the internet, it is getting more complicated for the citizens to claim the ownership of their digital creations. Efforts have been made to implement measures to enforce copyright claims by governments, but they are more complicated to implement on the internet. In this work, a decentralized system that enables citizens to create digital evidence for their creations is presented. This system is based on the blockchain technology and allows the citizens to claim the ownership of their digital art, as well as, the verification of who owns a particular digital piece of art.

## Introduction

Monetary transactions between entities such as people or companies, are usually controlled centrally by a third party authority. For example, in order to carry out a monetary transfer or an electronic payment, an intermediary such a credit card company, is needed to verify it and then carry out the transaction. This process is not only applicable to the financial sector but is also similar in other sectors, such as music or software distribution etc [1]. Thus, it is observed that this transaction system has a common point, both on the side of the transactor and on the side of the buyer. A central third party authority responsible for gathering the data and information in order to control and manage it appropriately to decide the outcome of the transaction. This is slow and costly because the transaction must be verified by a third party entity that is required to be trustful for both entities involved in this transaction [2].

Blockchain is a technology that has evolved to solve the problem of the intermediary. The main purpose of developing this technology is to create a decentralized environment in which no third party authority needs to be responsible for overseeing transactions between two entities. The Blockchain is a distributed database that records in an ever-growing list of data records consisting of transactions and confirmed by the nodes that make up this network. The data is recorded in a public ledger. The ledger is tamper-resistant containing information about every transaction that has taken place in the network. Once a transaction is recorded in the ledger, it cannot be tampered with or deleted. In January 2009, Bitcoin introduced as the first blockchain ecosystem. The paper that introduced Bitcoin first appeared in a 2008 publication titled "Bitcoin: A Peer-to-Peer Electronic Cash System" [3]. After five years from the first block of the Bitcoin blockchain, a second generation of blockchain named Ethereum was introduced [4]. In 2014, Ethereum blockchain enabled developers to execute smart contracts. Smart contracts, are in essence, programs stored on a blockchain that executes when predetermined conditions are met. Once these conditions are satisfied, a transaction is executed. With the integration of smart contracts on blockchain, developers can create financial applications that use tokens such as cryptocurrencies. As the technology of the distributed ledger advances, more notions have been developed and came to the foreground. In the recent time, anyone holding digital or even physical assets, can convert them into a digital token using the blockchain technology. This cost effective concept simplifies the process of exchanging any value between entities [2].

According to the laws designed for the internet in the decade of 2000, concerning the intellectual property licensing, people who buy digital goods do not actually own them but instead they are simply users [5]. One of the concepts of Ethereum blockchain technology that has been developed, is the ERC-721 (Ethereum Request for Comments) standard for Ethereum-based tokens. The ERC-721 specifies the standard token interface with providing a model implementation for non-fungible tokens (NFT) [6]. NFT can represent the ownership of physical or non-physical assets in a decentralized way [7]. One of the first application of NFTs that made this standard viral, was digital art such as CryptoPunks [8].

In the current work, an application concept is proposed that enables users to create NFTs for their digital art. The digital art is stored in a decentralized way and also, users are able to verify the validity of the owners’ NFTs with the use of cryptographic techniques.

The work is structured as follows: Section II presents the main architecture of the proposed solution. In Section III the implementation of the solution, as well as, the complete protocol is analyzed. In Section IV results and future work will be discussed.

## References

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