The Application of Blockchain and its Advantage to the Field of Art

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Abstract. This paper describes the application of blockchain technology for the auction market of art and the means to use this technology to solve the problem of authority and the insufficiency of proper trading paths. Blockchain technology displays its usefulness in solving the unfavorable factors in the chaotic auction market include the uneven valuation of the auction items, lack of funds, and other areas. This study introduces blockchain technology as an innovative means to enhance the transparency of art auction.

1. Introduction

Blockchain is an important concept derived from Bitcoin. It is essentially a decentralized database. As the underlying technology of Bitcoin, blockchain is a string of data generated by cryptography, and each data block contains information on a batch of Bitcoin network transactions, which used to verify the validity of its information (anti-counterfeiting) and to generate the next block. Blockchain also plays a crucial role in the future development of payment settlement. Decentralized blockchain technology has a significant influence on simplifying the process of payment settlement and improving the efficiency of business processing.

Blockchain technology allows the transaction of artwork to become more digital and more measurable in today’s art market [1]. Nowadays, the art market of China is facing the following dilemmas: entangled in the identification of authenticity, confusion and valuation of authority, lack of technical methods to determine the proper traditional trading path, and shortage of funds as well as low-risk resistance. The assessment of a single artwork is contingent on various factors such as the author’s factors, historical factors, turnover factors, holder’s factors, auctioneers, etc. The impact of each element will make a fundamental difference in its valuation.

Moreover, the high-priced threshold of a single art product is one of the main reasons for the difficulty in its value recognition. However, the value-added attribute and value recognition of cultural artwork is essential for today’s society, since the artwork is human-recognized cultural heritage and the public has acknowledged it. The circulation of art and its financial value will reach unprecedented popularity and height under the assumption that there is a value that can assess the entire art category. By using painting as an example, this paper develops a set of intelligent contracts for painting and forms a blockchain system suitable for evaluating the scores of paintings, eventually to provide a decentralized new painting evaluation system for the art market.
2. Literature review
The previous research demonstrates the possibility of applying the technology of blockchain in the field of art. However, the question of how the distributed ledger system used among artists has not been answered by the former scholars [2]. Mylrea and other scholars verified the usefulness of blockchain in solving problems “related to integrity and trustworthiness of rapid distributed, complex energy transactions and data exchanges”. Lotti (2016)’s article provides a great deal of information about the implication of blockchain for the art market and the automatic transaction tracing ability. However, the means to conduct book transactions and the way to use executive contract in painting transactions have not been widely discussed yet [3][4].

3. Advantages of blockchain

3.1. Distributed database
Blockchain provides a new means for evaluating the identification and traceability of artworks. The emerging blockchain technology in recent years is a distributed database developed by the underlying technology of Bitcoin. Database protocols can help to maximize the transparency of the artwork’s source, which is one of the most valuable aspects of artworks. The source of art is the history of the ownership of art. At present, the traceability of art is a long process and difficult to identify. In general, people use paper documents and receipts to screen, however, there are many uncertainties in this process [5].

3.2. Formatting author names
The significant advantages of smart contracts are autonomy, self-sufficiency, and distribution. These advantages can evaluate the traceability of the object. The content of the contractual agreement between the two parties is digitized and written into the blockchain to formalize the contractual content. The occurrence of the conditions agreed in the contract will automatically trigger the execution of the contract. In this way, real-time transaction settlement can be realized, tamper-proof verifiable sources can be created, and transparency of art transactions can be improved. This generates the simplification and automation of processes in financial service and reduces the time of interaction between the front office and the back office. Thus, a large amount of workforce and material resources can be saved, thereby improving competitiveness in the art market [6].

3.3. Formatting author affiliations
Transaction management includes block-based painting transaction management, blockchain supported dynamic P2P trading, and the potential benefit of applying blockchain technology to the smart grid. The adoption of blockchain technology will transform the smart grid into transaction management that no longer overly dependent on the management and decision-making of the central organization. However, once an error occurs in any one of the models, include self-execute smart contracts, decision-making, and the traditional centralized management method, a wide range of power service will be affected by this error. This is due to the fact that data include statistics, transactions, control services, and payment settlement are all calculated and verified by each node in the network [7].

4. Technique skills and suggestions in assessment

4.1. The philosophy of the application of blockchain
The mainstream research directions of blockchain technology include (1) decentralized and distributed architecture; (2) blockchain governance to provide decentralized service without relying on the state or government bureaucracy; (3) blockchain security system; (4) digital currency (smart contracts).
Blockchain represents records (transaction records, document records, etc.), which are no longer recorded by individuals, computers or companies, but by the network instead. Changes to these records must be approved and validated by the network to avoid arbitrary tampering. It has the following characteristics: (1) distributed storage, not tamper; (2) sharing data, everyone has the ability to use; (3) each other supervision, everyone has the ability to maintain. These characteristics ensure that the management process is no longer overly dependent on individuals but mutual credit endorsement. Once the scale of such endorsement is formed, a consensus of trust will empower everyone. Consequently, the saboteur will be screened out automatically.

In addition, blockchain creates incentives that allow participants to work honestly, with the rules as seen by their peers. Under the constraint of the smart contracts, participants will have the opportunity to obtain a certain token reward like the reward of this behavior by mining and participating in the blockchain record. In this way, a large number of distributed and decentralized participants (miners) compete for the blockchain record, so that the competition can be carried out in a fair and open environment, ensuring the fairness and effectiveness of the incentive mechanism. Blockchain technology has now been applied in the fields of finance, copyright, data transaction, and other fields. However, there is still a large space of application in the incentive of users’ behavior.

4.2. The process of portrait assessment

4.2.1. Portrait assessment. The original data collected from Can data are auctioned according to the author’s factors, historical factors, circulation factors, and the holder’s factors. The portrait data is extracted through the portrait assessment and analysis module. When the application begins, the formation of portrait assessment, setting of elements, and parameter setting need to be determined by the management based on the original data [8].

4.2.2. The author’s artistic attainments. According to the original data, the value range of the behavioral variables and each component dimension of the portrait evaluation can be determined. For example, the larger the value of each variable in Table 1, the higher the evaluation score of the
corresponding painting, the higher the starting price of the auction. After the normalization of variables, the evaluation score of paintings can be calculated by the formula (1), where the weight is determined by the management and adjusted in the process.

\[
w = w_i r \times [1 - (w_i a_1 + a_2 + a_3)] / 3 + w_i b_1 + b_2 + b_3 / 3 + w_i c_1 + c_2 + c_3 + c_4 / 4 \]  

(1)

| Portrait evaluation dimension | Characteristics | Value range |
|-------------------------------|-----------------|------------|
| The author's artistic attainments | Master level painting \(a_1\) | 0-9 |
| | Statue level painting \(a_2\) | 0-9 |
| | cities and districts levels painting \(a_3\) | 0-9 |
| Quality of work | The number of artist's work \(b_1\) | 0-9 |
| | appearance \(b_2\) | 0-9 |
| | The size of the ruler \(b_3\) | 0-9 |
| Special added value factor | Factors of special subject matter \(c_1\) | 0-9 |
| | The special background of creation \(c_2\) | 0-9 |
| | description \(c_3\) | 0-5 |
| | important postscript and evaluation \(c_4\) | 0-5 |

4.2.3. Times. Chinese calligraphy and painting art has a long history. The longer the history is, the more historical value and market value the artwork has. Taking calligraphy as an example, the first-class artworks from the Song and Yuan dynasties have already produced high prices in today’s art auctions. For instance, an artwork named Yan Shan Ming, created by Mi Fu, the Chinese painter and calligrapher from Song dynasty, sold in the auction of Zhongmao Shengjia with the hammer price of 32,989,000 yuan [9].

4.2.4. Final score of the portrait evaluation. The portrait forms of the final score can be evaluated through the above two indicators. It is necessary to notice that different indicators need to be set according to the original data and parameters, and the record of flow account need to be retained.

4.3. Blockchain incentive framework and functional components

![Blockchain incentive system level functional components](image)

Figure 2. Blockchain incentive system level functional components
4.3.1. User access layer. The user layer is the user-facing population. Through this population, customers can use blockchain services to interact with the providers of blockchain service, performing customer-related functions of management to maintain and use blockchain services. The user layer can also export the blockchain service to other resource layers to provide support for the cross-layer blockchain services. The functions to be developed include transaction broadcast acceptance, social dialogue module, transaction verification token transaction, and mining module.

4.3.2. Application service layer. The service layer provides efficient and reliable blockchain access and monitors services for application, namely, invoking intermediate layer functional components and infrastructure layers, providing unified access and node management services, balancing the load to provide users with efficient and reliable services through practical caching strategies and reliable storage. This layer mainly implements functions such as user portrait, transaction broadcast and transaction verification, and token wallet.

4.3.3. Intermediate protocol layer. The intermediate protocol layer is the core functional layer of the blockchain system. The consensus mechanism among nodes, data, and book records formulated the foundation of the blockchain system. The timing service module provides uniform timing for the blockchain system; modules such as encryption, digest and digital signature ensure the security of the blockchain system and prevent tampering. In addition, depending on the scenario of application, a smart contract that automatically executes the preset logic can be selectively added. The intermediate protocol layer implements the corresponding functions based on the hardware or network infrastructure provided by the basic layer, and thereby to support the service layer.

4.3.4. Infrastructure layer. The underlying layer provides the operating environment and basic components required for the normal operation of the blockchain system. This is also the resource on which most software systems operate, such as data storage and running container communication networks. This layer can be considered as the basic support of the blockchain system. This layer mainly realizes the docking of Can data and blockchain database, and the communication network with blockchain [10].

5. Problems exist
Blockchain is not a flawless concept. It has defects such as 51% attack security risks, problems of work efficiency and resource consumption, and block games as well as conflicts. Since the supervision of the blockchain relies on all the nodes in the network to complete together, theoretically, people who mastered more than 51% of the computing power of the entire network have the capability to tamper and forge with blockchain data.

Due to the distributed storage used, each node in the blockchain needs to maintain a database, and any other nodes in the network need to be authenticated and recorded. When data exchange occurs frequently, the system does not work efficiently during the process of application. Therefore, before promoting and applying blockchain technology on a larger scale, it is necessary to figure out the solution for the inefficiency of the work system.

Blockchain is a novel technology. Investment and improvement of blockchain require a great deal of research funding. However, blockchain has the potential to create challenges to artistic aesthetics and facilitate the emergence of new technologies in the future of the art market. Additionally, blockchain has global influence in management and verification. At the same time, there are still a group of artists who believe that digital processing will decrease people’s perception of the beauty of art. The future of blockchain in the mainstream art world is still unclear at the moment [11].

6. Conclusion
This paper mainly introduced the pattern of address updated between Bitcoin nodes and blockchain, which is used for trading paintings. This study also formulated the triangular relationship among the
evaluations of paintings, the intelligent contract, and decentralization of blockchain. This new technology can protect the privacy of the buyers better than the previous methods. In conclusion, this article suggests the prospective scenario of blockchain in the future world fulfilled with high technology.

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