

Application Research of Blockchain in the Field of Medical Insurance

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Keywords: Block chain, medical insurance, intelligent contract, distributed storage, decentralization

Abstract: In the field of current medical insurance, patients, medical institution and insurance provider have formed a triangular. However, there are inefficiencies and complex services in every interaction. Therefore the idea of applying block chain technology in the field of medical insurance is put forward. Compared with the existing technology, block chain technology has its characteristics which include collective maintenance, time series data, decentralization, programmable, safe and reliable. So it is more suitable for the requirements and development of the field of medical insurance. This method is based on block chain technology. On the one hand, the relevant data records are distributed and stored on the block chain. It ensures that data security and data cannot be distorted, and avoids contract disputes. Secondly, medical institutions and insurance companies share accounts, which realize medical data sharing. It facilitates patients visit and insurance companies check. Finally, automatic claim payment and award can be realized by using intelligent contracts effectively. It is designed to improve the efficiency and reduce the time-consuming of the operation process of medical insurance.

1. Introduction

At present, in the field of medical insurance, patients, medical institutions, and insurance providers form a triangular relationship. In each interaction, there are problems such as inefficiency and complex services. Multi-level insurance intermediaries increase the cost of inefficiency, and the backwardness of the information system requires high labor costs and management costs. For insurance service providers, insurance costs are high, especially the management costs. For patients, most patients and their families are full of fear of the unknown in the face of medical bills and third-party reimbursement processes, and the complexity of insurance reimbursement makes the process cumbersome. For medical institutions, a large part of energy is spent every year on insurance reimbursement, medical record data, and government audits. And because of the serious information asymmetry between the social medical insurance institutions and the direct participants of medical services, medical institutions and patients have hidden dangers of conspiracy between doctors and patients in order to obtain more compensation and may report to medical insurance institutions.

In order to solve these problems, it is usually proposed to improve the system, strengthen the legal system, and increase the review. However, these have the disadvantages of high operating costs and complicated processes, and the old technology also has great limitations. As an emerging technology, blockchain technology has the characteristics of collective maintenance, time series data, decentralization, programmability, security, and credibility. It solves the problems of high cost, low efficiency and weak security that are common in centralized organizations, and points out the way forward to solve the problems existing in the current medical insurance field in China. Therefore, this paper attempts to study the application of blockchain in the field of medical insurance based on existing research.

2. The Development Process of Blockchain Technology

The source of blockchain technology was a groundbreaking paper published by a scholar named Satoshi Nakamoto in the cryptography mailing group in 2008: "Bitcoin: A Peer-to-Peer Electronic Cash System. Blockchain technology has gradually attracted wide attention from all parties. In 2015, it was called "the first year of blockchain development" in the industry, and blockchain technology has entered a rapid development since 2015. In January 2016, the British government released a blockchain special research report. In December 2016, the Chinese government also took action to write blockchain technology into the "13th Five-Year National Informationization Plan". Blockchain technology is included in the strategic cutting-edge technology to strengthen the advanced layout. As time progresses, more and more researchers are engaged in related research.

Most scholars believe that blockchain technology is the fifth disruptive innovation, an innovation that can be compared to mainframes, PCs, the Internet, and mobile social networks. In addition, it is the fourth milestone in the evolution of our human credit history. The application development of blockchain technology is roughly divided into three phases: (a) blockchain 1.0 - programmable currency, our well-known bitcoin is included; (b) blockchain 2.0 - programmable finance, representative Applications have smart contracts; (c) blockchain 3.0 - programmable society, built on smart contracts to achieve more complex automation functions, such as decentralized applications.

3. Definition and Characteristics of Blockchain Technology

3.1. Definition of Blockchain Technology

For the definition of blockchain technology, no industry-recognized definition has yet been formed. In 2016, the White Paper on China's Blockchain Technology and Application Development (2016) issued by the Ministry of Industry and Information Technology of China adopted the definition of Yuan Yong and Wang Feiyue. Pointing out that in a narrow sense, a blockchain is a non-tamperable and unforgeable decentralized shared ledger that combines data blocks in a chronological order into a specific data structure and cryptographically guaranteed. It securely stores simple, sequential data that can be verified within the system. The block structure is shown in Figure 1. Each block is divided into two parts: block head and block body, involving technical elements such as chain structure, Merkle tree, Hash algorithm, and time stamp. Broadly speaking, blockchain technology uses cryptographic chained block structures to validate and store data, utilize distributed node consensus algorithms to generate and update data, and use automated scripting code (smart contracts) to program and manipulate data. A new decentralized infrastructure and distributed computing paradigm.

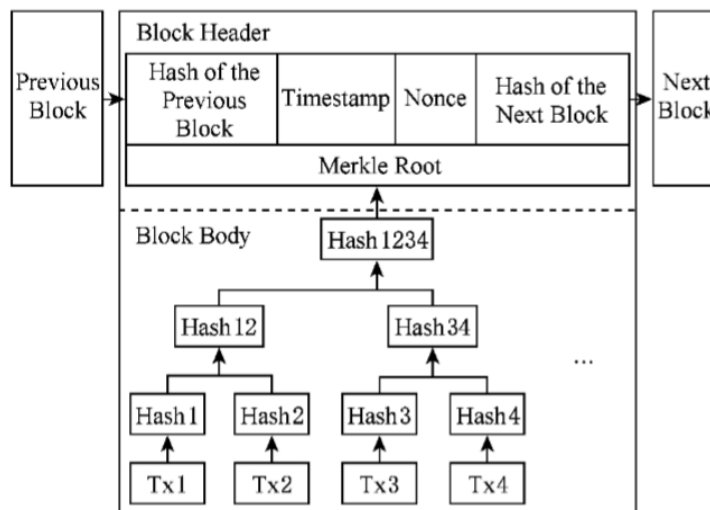


Figure 1 Structure of block

3.2. The Characteristics of Blockchain Technology

The main features of blockchain technology are collective maintenance, time series data, decentralization, programmable, and secure. The first is collective maintenance. The blockchain ensures that all nodes in the whole network can participate in the verification process of the data block through a special mechanism, and apply the consensus algorithm when selecting a specific node, and add new blocks according to the specific nodes that have been selected. Existing blockchain.

The second is timing data. The blockchain uses a chain block structure when storing data. And they are all time-stamped, each block is connected by the hash value of the block header data, this hash value is the unique identifier of all the blocks in the blockchain, through the parent block in the block header The hash value can find the unique block connected to each block in the blockchain, thus forming a chained data structure. These blockchain unique attributes, such as timestamps in the block and hash value check, make the order of each block have very strict rules. Under these conditions constitute the "timeline database". Data can be time stamped to form a block, and multiple blocks can be connected according to chronological order to form a blockchain. Therefore, compared to the traditional database, the data in the blockchain increase the time dimension. This gives it a strong traceability and verifiable feature.

The third is decentralization. The various processes of data in the blockchain are based on a distributed system structure, which is composed of various nodes in the network. Different from the traditional method, when establishing the mutual trust relationship between each node, instead of adopting the traditional central institution, the mathematical method is adopted, that is, there is no central storage database.

The fourth is programmable. One of the highlights of blockchain technology is the introduction of "scripts". The original program of the blockchain is open source and can support the creation of smart contracts and other decentralized applications. This feature can be applied to the medical insurance field through reasonable use.

The fifth is safe and trustworthy. Blockchain technology takes an asymmetric key for encrypting data. Each block contains data for a period of time, and adjacent blocks are connected by cryptographic algorithms. Therefore, if the information is tampered with, the verification information of the preceding and succeeding blocks connected with it will be wrong and will be discarded by the whole network, which will not affect the data.

4. Principle Analysis of Blockchain Application in Medical Insurance

Blockchain is a new type of distributed ledger technology that can perform trusted transactions for decentralized trust in a mutually untrusting environment. Compared with traditional database technology, it has non-tamperable, anti-counterfeiting and trackability characteristics. This also makes the data information on the blockchain have the advantages of high reliability and high security. This is very suitable for applications in the field of medical insurance. In the real application process, the patient's health status, medical records, and medical insurance purchase and claim data are first distributed in the blockchain. When the insured purchases insurance, the insurance company can check the health status of the insured people through the account book shared with the medical institution. It guarantees the accuracy of the information. The medical institution can also view the patient's medical record by sharing the account book and check the policy information of the policyholder. During the treatment, the insurance company receives relevant materials automatically sent by the hospital. Once the payment conditions are met, the smart contract will automatically and compulsorily execute the claims process, paying the insured. It greatly improves the efficiency of the process, reduces the time-consuming of payment, improves the security of the data and can not be tampered with.

4.1. Distributed Data Records on the Blockchain

Blockchain is a combination of nodes in each network. There is no central storage database,

which is a big difference between blockchain and other traditional databases. This achieves sharing of data across all network nodes. It does not affect other nodes due to damage to one or several of the nodes and can be jointly monitored by the entire network. Therefore, based on the blockchain technology, the relevant data records are distributed and stored in the blockchain, which is beneficial to realize data non-tampering, ensure data security, and effectively avoid contract disputes.

4.2. Medical Institutions Share Accounts with Insurance Companies

Information about the patient's health status, medical records, etc. can be shared between medical institutions and between medical institutions and insurance companies through shared accounts. On the one hand, the patient is not required to have unnecessary troubles due to changes in the treatment site during the treatment. On the other hand, it is possible to check the insurance information of the policyholder by checking the data, and effectively guarantee the rights and interests of the insurance company.

4.3. Effective use of Smart Contracts

An important innovation in the blockchain is the introduction of "scripts". This allows the programmability of the program contract to be realized, that is, "smart contract.". Smart contracts contain auto-executed code at the bottom of the code, and cannot be stripped. Forced and automatic, depending on the code definition, can't be intervened midway. The entire life cycle of a smart contract includes three parts: contract generation, contract release, and contract execution, as showed in Figure 2. Applied to the field of medical insurance, when the relevant medical insurance that meets the payment conditions occurs, the smart contract can be automatically executed, and the relevant claims procedure of the next medical insurance is carried out according to the code. In this way, the entire medical insurance-related process can be automatically carried out in the already written code environment, reducing a lot of manual operations. While ensuring authenticity, it greatly improves the efficiency of the entire claims process, shortens the time for claims, and saves many complicated procedures for all three parties.

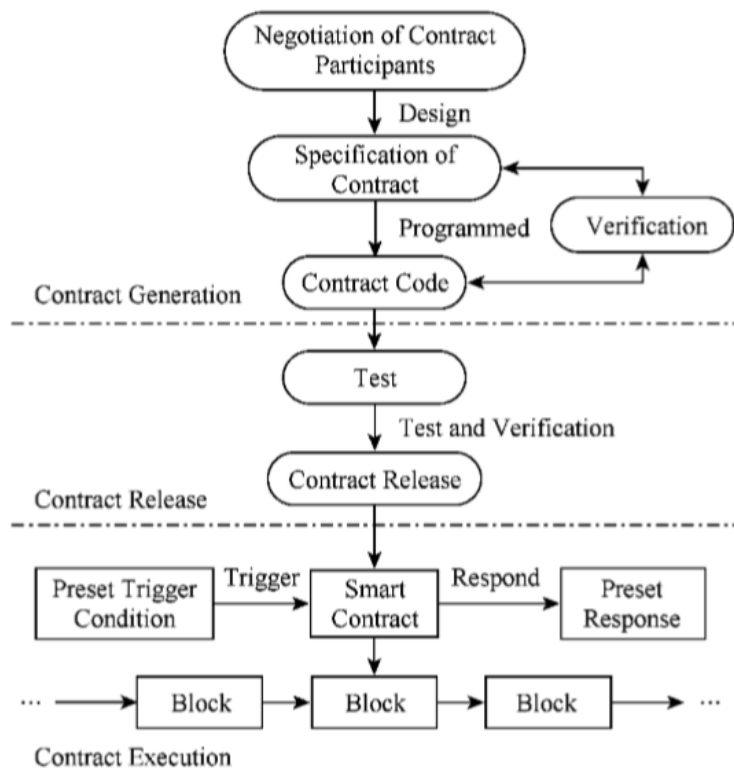


Figure 2 The whole life cycle of smart contract

5. The Problem of Blockchain Application in the Field of Medical Insurance

Although the application of blockchain in the field of medical insurance has many advantages, we must also correctly consider some of the challenges that need to be faced. As an emerging technology, the blockchain has a very broad application prospect. At the same time, however, there are still no successful cases of large-scale application, and it has brought great difficulties to researchers.

5.1. Long-term Preservation Problem

In the application of the blockchain in the field of medical insurance, the relevant data stored in it often needs to be stored for a long time and needs to be properly kept for future activities such as inspection. Therefore, the long-term preservation of relevant data in the blockchain is a problem that needs careful consideration. Should it be saved in an existing system? Or handed over to other systems? Further research is needed.

5.2. Security Issues

Although the blockchain technology distributes the relevant data records in the blockchain, the nodes can still forge and tamper with the data in the blockchain after mastering more than 51% of the computing power in the entire network. Although in reality, mastering 51% of the computing power in the whole network requires extremely high costs, which is often higher than the benefits of completing the modification. But the blockchain is applied in the medical insurance field. The data it holds is often related to important information such as personal privacy. So this possibility and the threat still exist and cannot be ignored.

6. Conclusion

With the advancement of society, the continuous development of blockchain technology, and the increasing number of problems in the field of medical insurance, how to apply blockchain technology reasonably in the field of medical insurance is an urgent problem to be solved. After analyzing the problems existing in the current medical insurance field, this paper expounds the development process, definition and characteristics of blockchain technology, and combines the advantages and characteristics of blockchain technology to propose blockchain technology in the field of medical insurance. The application, and detained three of them, elaborated on its principles and advantages. Finally pointed out the hidden dangers and challenges, and still need our attention and further research.

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