

Transparent charity-based Crowdfunding platform using Blockchain and Smart Contract

Project report submitted for
5th Semester Minor Project-1

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Department of CSE/ECE

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CERTIFICATE

This is to certify that the project titled “Transparent charity-based Crowdfunding platform using Blockchain and Smart Contract for Web 3.0” by “Soham Banerjee and Anubhav Garg” has been carried out under my/our supervision and that this work has not been submitted elsewhere for a degree/diploma.

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Approval Sheet

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ABSTRACT

The charity organizations in India lack proper transparency and co-incidentally the supervision of them is difficult to achieve, which certainly has a negative impact on the willingness of the people to perform donations. Blockchain as an underlying technology of the Bitcoin system provides a new solution for the charity system using technology. This paper actually proposes a charity system based on blockchain technology and expounds the design pattern besides the architecture and operational process of the platform. Some core functions of the charity platform have simultaneously been realized and verified on Ethereum in this current article. We hope to increase the transparency in future charities to enhance the public's trust in charities and promote the culture and development of philanthropy by blockchain-based charity system.

CHAPTER 1 : INTRODUCTION

1.1 Introduction :

With the development of Internet technology, there are more and more information sourcing channels for people and philanthropy has become more open and transparent. Many problems in the process of philanthropy have been exposed one after another. Media reports blatantly show the confusing daily management of charitable funds and commodities. These factors result in a decline in willingness to donate and a reduction in donations is observed. At the same time, internet crowdfunding has become a new way for the public to take part in public welfare undertakings. The crowdfunding platform has set up a database for the project, a proper monitoring of the project is also an crucial part of the risk automatic control mechanism of the public philanthropic crowdfunding platform. Improving the transparency of philanthropic data is an important way to improve dependability for traditional donation and online crowdfunding. Using Internet technology, a traceability system can be established to increase the transparency of charities technically. For this purpose, this paper proposed a new model of charity system based on blockchain technology.

In this industrial era 4.0, almost all industrial models apply technology to support their business, from businesses that are for-profit to businesses that are non-profit. Non-profit organizations (non-profit) have certain characteristics/signs that are almost the same as profit-oriented organizations (profit) profit-oriented, but between these two vastly different organizations have different problems.

In the current situation of the Covid-19 plague, almost every country has the same problem in dealing with this scenario, especially in terms of the funds needed. Many strategies/methods performed by the government on how to manage government funds in tackling this Covid-19 plague outbreak. This situation also triggered the community to raise funds to help the government in tackling this Covid-19 plague outbreak.

In the process of raising funds, which is of course not easy, because it requires trust between many parties, both the funders, intermediaries or organizations as a place to store temporary funds to the recipient of funds. That trust is the main resting capital for fundraising organizations to attract funders to donate their funds to recipients of funds.

Lots of non-profit organizations play a role as fundraisers, especially when the Covid-19 plague hit. Trust is their challenge in attracting donors to donate their money to the organization. Not a few also a non-profit organization that uses technology to make it easy for prospective donors to donate funds through these measures. So from this it can be concluded that in addition to trust which is the main factor to get as many funds as possible, technology also plays a big role in this as well.

Based on this, the author tries to analyze the processes that are generally contained in this fundraising organization by applying a blockchain framework that can be an alternative solution to increase the trust of funders which will certainly affect how much funds will be raised by the fundraising organization. These funds as well as smart contract technology that

makes it easy for recipients to receive these funds if all the conditions are met. Based on previous research, this technology can be used in the telecommunications and medical industries[14, 15]

The application of blockchain technology not only increases trust in fundraising organizations, but can also be used as tools for validation from funders to ensure that funds are obtained from reliable sources and also to validate recipients of funds, whether the recipients can be trusted or not.

1.2 Definitions :

1.2.1 Crowdfunding :

Crowdfunding is a process of establishing connection between entrepreneurs and investors to invest in small amounts with an internet-based platform. Crowdfunding is divided into three categories according to the funding base offered through the crowdfunding platform. The three categories are:

1. Donate, 2. Pre-selling, 3. Equity Crowdfunding

In crowdfunding, entrepreneurs, crowdfunding platforms and investors or funding institutions are the main criteria. The main stakeholders have their respective roles and interests. The first flow starts with entrepreneurs (businesses or startups) proposing thoughts and ideas, funding requests through crowdfunding platforms and then promising returns to investors. Backers or investors will look at investment opportunities offered by entrepreneurs and then give their commitment to fund or give advice. to bring together investors and supporters, a platform that acts as an intermediary is needed.

1.2.2 Smart Contracts :

Smart Contract is an digital agreement that can be executed automatically and needs to be done in accordance with the agreement that has been made. Smart Contract can run automatically using a computer while some parts still require input and control from manual intervention. Can be enforced both legally in the enforcement of rights and the implementation or execution through computer code that cannot be changed or approved. Smart Contract can be deployed on top of blockchain technology to automate complex transaction. The Smart Contract is a code that can be executed and executed on a blockchain platform that is used to facilitate, execute and enforce the terms of a contract or agreement. The main purpose of the Smart Contract is to fulfill the agreement after the terms of a contract have been fulfilled. Smart Contract (figure 1) consists of account balance, personal storage and an executable code. the smart contract status is stored in one interconnected block and is updated every time the contract is called. the code in the blockchain cannot be entered into after the contract is entered. The contract can be executed by sending a transaction to a unique address 20 bytes from the contract. Subsequently the contract is executed by the miners present in the network to reach consensus then the status of the contract will be

renewed. Here renewal basically means additional block attachments as data can't be rewritten. Contracts can read or write/ transactions to personal storage and save money into their accounts and receive messages or money from other users or can make new contracts.

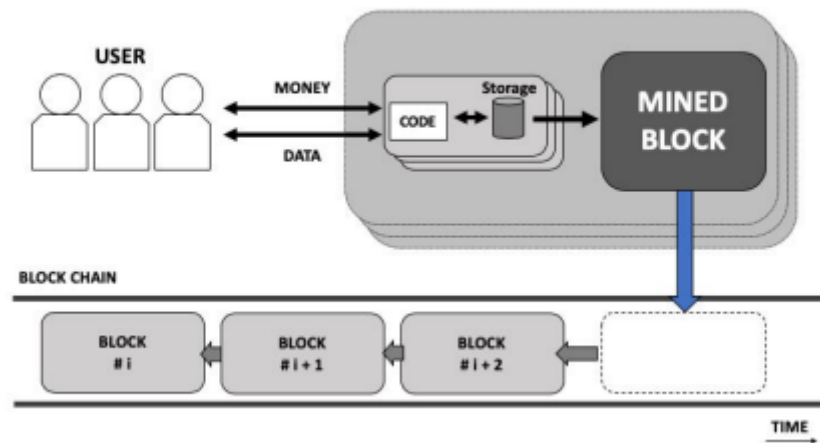


Figure 1. Smart Contract

Deterministic and non-deterministic are 2 types of smart contracts. Deterministic Smart Contract is a contract that when executed does not require information from external sources (from outside the blockchain). Non-deterministic contracts are contracts that depend on information are contracts that depend on information (ex: Oracle or data feed) from external sources. For example a contract to get weather information which is one example of information that is not available on the blockchain.

1.2.3 Blockchain :

The main purpose of the blockchain is to overcome the everincreasing problems especially on how to build trust[15]. Blockchains are digital ledgers which are resistant to damage applied in a distribution mode [1]. Blockchain is a distributed database of a general ledger of all transactions which have been carried out which are verified by a majority of consensus in the system that will be shared with all parties concerned. And, once entered, information cannot be deleted. Blockchain contains certain records besides the fact that users can verify every single transaction that has ever been carried out [2]. Blockchain is a database of transaction records that are distributed, validated and managed by computer networks around the world Based on the definition above, it can be concluded that the blockchain is a distributed database technology with a guaranteed security system that is considered to be able to increase the trust of the parties involved in a project or in long-term collaboration. Blockchain has 2 categories namely Permissionless, and Permissioned. Permissionless (figure 2) can be interpreted as a decentralized ledger platform open to anyone publishing a block, without requiring permission from any authority.



Figure 2. Permissionless Blockchain

While permissioned blockchain on the contrary (figure 3), Permissioned, where the network where users publish the block must be authorized by several authorities.

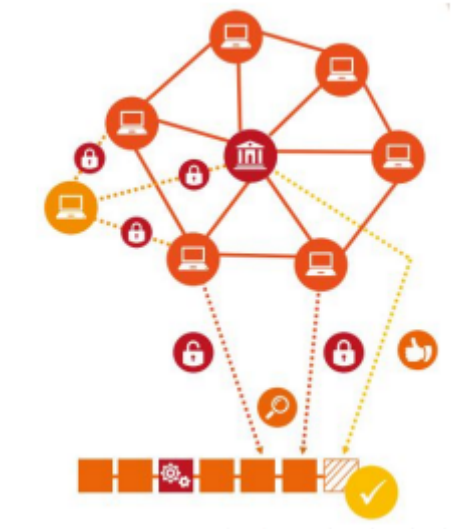


Figure 3. Permissioned Blockchain

Based on other references, there is one additional category of blockchain, namely the consortium one is open to the public but not all data is available for all participants.



Figure 4. Consortium Blockchain

Data in a blockchain is stored in a standard structure called a block. The most important part of the block is:

1. Header : It contains unique reference number information, the time when the block was created and a link with the previous block.
2. Content : Consists of a set of digital assets and the number of instructions that have been validated (transactions, number of transactions and addresses of those transactions)

Blockchain structure also can be illustrated as figure 5 below

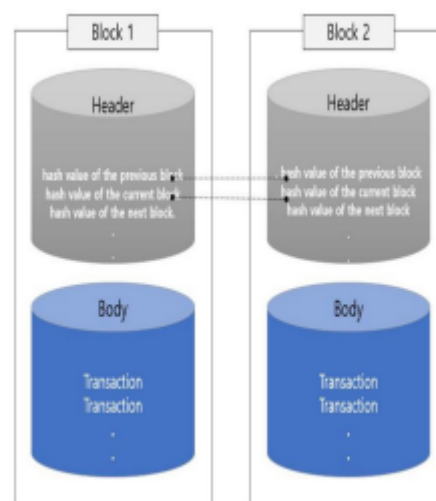


Figure 5. Structure of Blockchain

Blockchain has 4 main characteristics, namely:

1. Immutable - (permanent and tamper-proof) blockchain is a ever-growing record of transactions that cannot be changed thereby increasing the trust of the transaction record.

2. Decentralized - (network copies) all blockchains are stored in a file that can be accessed by any network.
3. Consensus Driven - (trust verification) blockchain is independently verified with certain rules that use unique resources to show evidence of efforts that have been made
4. Transparent - (complete transaction history) all transaction data can be accessed and audited by all parties.

CHAPTER 2 : LITERATURE REVIEW

In order to increase credibility of charity organizations, Liu Na [8] performed study of the supervision system of charity in China and suggested to supervise charity in law, administration, industry and society. Bi Ruixiang [9] concluded that the financial information disclosure of Chinese charity organizations is relatively low. Yu YuXi [10] suggested to restrict the power of charity organizations by improving the liability system and government supervision. Wang Jian [11] and Xu Yuchao [12] designed the charity donation information management system with ASP.NET technology to complete the management and publicity of charity donations. Yang Qilin [13] realized the core business system of charity fund management through LAMP architecture, which unified the management of charity foundation data and the release of charity information. Jia Hongwei and Deng Xiuquan [14] proposed the use of blockchain technology to solve problems in social emergency assistance. Wang Jia and Chen Haifeng [15] also analyzed the application of blockchain technology in China's philanthropy and affirmed the advantages of blockchain technology in philanthropy. Li Qi, Li Wei [16] and others gave the application model of the charity platform, and realized the charity application platform based on Bubi blockchain. At the same time, Rizal Mohd Nor [17] proposed to use blockchain technology to manage the assistance funds in disaster area and establish the entire platform on Ethereum. Danushka Jayasinghe et al. [18] built a Bitcoin charity platform based on blockchain to realize online and offline bitcoin transactions respectively, which provides a safe and convenient way to donate to difficult areas without Internet by GSM network. Based on these studies, we proposed a new model of charity system with blockchain technology.

Other comparable literature reviews are shown in form of a tabular comparison below.

S.No.	Charitable foundation / projects	Blockchain platform / cryptocurrency	Blockchain technology using
1.	GiveTrack	BTC	GiveTrack is a platform nonprofits use to collect donations, and share updates with owners about how their contributions are used.
2.	GiveCrypto.org	BTC/BCH/ETH/LTC/ZEC/XRP	The platform for raising funds for charitable purposes in different cryptocurrencies.
3.	Coin 4 Clothes	BCH	Offers earn BCH for donations in the form of clothing. The project provides education and support to each clothing donor by reaching them how to store their coins, how to send and receive transactions, and where they can spend them. The charity fund provides clothing to the needy.

CHAPTER 3 : PROPOSED SOLUTION

3.1 Research Methodology :

A literature study is another term for literature study, literature review, theoretical study, theoretical foundation, literature review, and theoretical review. What is meant by library research is research conducted only based on written works, including research results both those that have been and that have not been published.

Based on the explanation above, the methodology used in this paper is the method of library research. This writing relies on sources from journals that have been published both internationally and nationally along with other relevant articles so that they can be used as a reference from this writing.

3.2 Proposed solution :

To build a crowd chain which will be a simple ethereum based charity platform and fundraising decentralized application where a user can create a new cause and a user can fund the cause independently. The cryptocurrency that the app use is Ether as a medium of exchange because it will be deployed in the ethereum network.

3.3 Charity System model / Smart Contract model :

The charity system mode proposed is shown in Figure 6. There are four roles assigned to participants: donors, beneficiaries, charity organizations and cooperative stores [19]. The charity organizations get

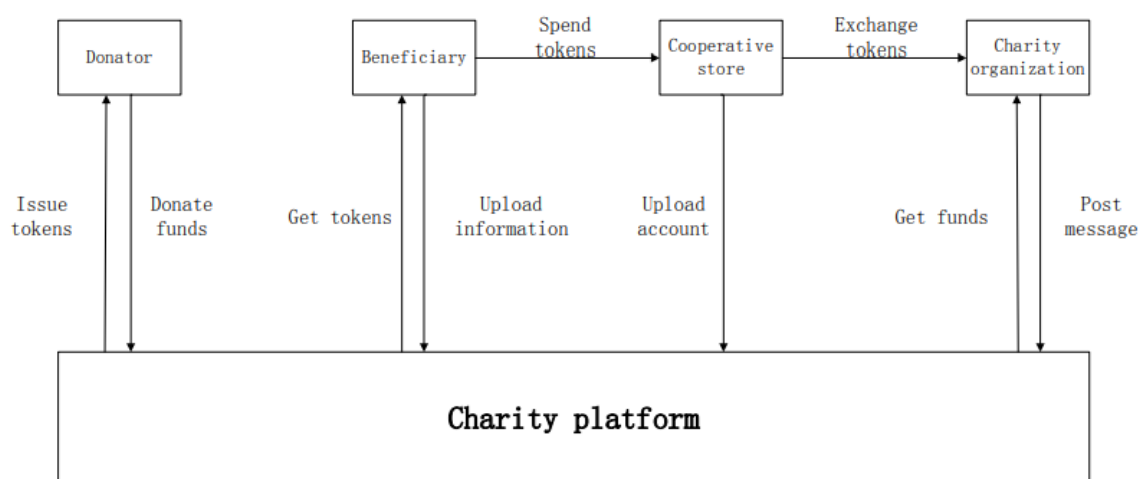


Figure 6. Proposed Model

the information of seek help and create charity projects through the platform. Donors learn about charity projects on the platform, to which then they donate to beneficiaries or the charity organizations. Beneficiaries have to upload their information to the platform for help, they can get and spend tokens in cooperative stores. The transactions happened in the stores will be uploaded to the charity platform. The cooperative stores supply services or goods to the beneficiaries to obtain tokens. The tokens can be exchanged for real money by charity organizations. The flow of funds has been fully recorded and managed on the blockchain, which allows transactions to be tracked and funds prevented from being abused. Thus thus allows tracking of funds where they come from, where they go. Moreover a calculation match of incoming and outgoing value across the decentralized organisation is very much possible now.

3.4 Proposed Platform Architecture :

We divide the platform into four layers, as shown in Figure 7. The application service layer encapsulates a variety of applications, including account registration, post charity information, donate funds, and inquire message, provides users with the methods of the platform directly. The smart contract layer consists various scripts and smart contracts. It encapsulates query methods, transactions process and other details. The blockchain service layer implements the functions of distributed accounting of the charity platform, including package block, get consensus on transaction, broadcast block, and synchronize data to a local database. The storage layer is used to store data, including blockchain storage and local storage.

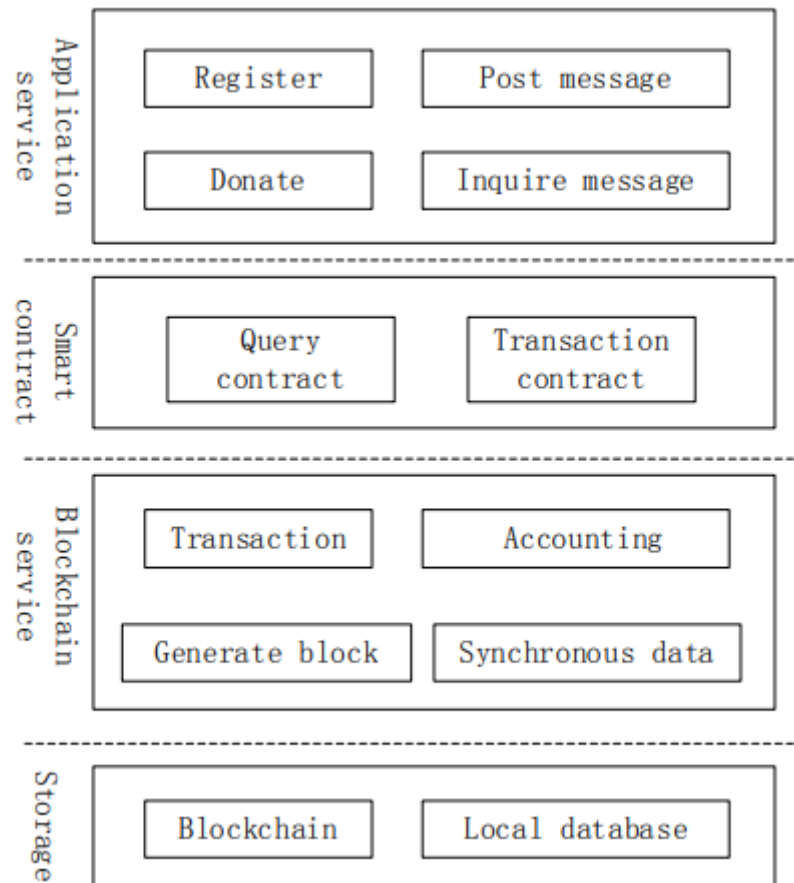


Figure 7. proposed architecture

3.5 Platform usage process :

Figure 8 shows partial operation of the charity platform, as follows:

1.Donor

After successful login, the donor has the functionality of browsing the charity projects and selecting one project which is suitable. The system will check the balance of donor account. If the balance is insufficient, the user will be reminded to deposit. Donation can be completed only the balance is sufficient.

2.People in need

The people who need help should fill in the rescue information which will be uploaded to the charity organization for review, and the approved projects will be posted on the charity platform. The beneficiary or people in need can check the account balance to know the project status, and then use the tokens in cooperative shops to obtain services or products.

3.Cooperative shops

The shops provides the corresponding services or goods such as medicines or books to the beneficiaries to obtain tokens. They can exchange tokens for real fungible money by charity organizations.

4.Charity organization

The organization can get donation from the platform to help other people and apply money to the cooperative shops for token exchanging. Now understand the working from the figure below.

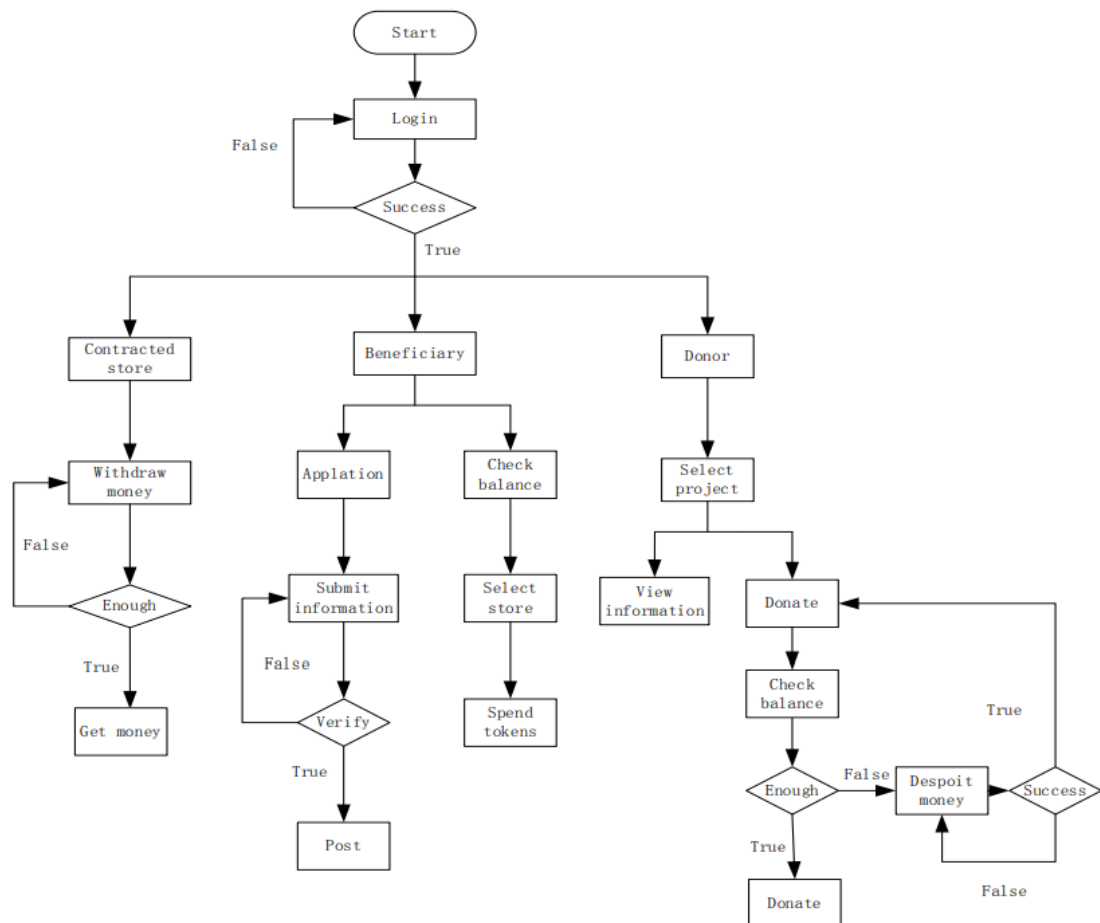


Figure 8. Proposed Process

CHAPTER 4 : RESULTS AND DISCUSSION

We have developed a charity fundraiser Dapp which is based on Ethereum to verify our system and demonstrate some core functions of the charity platform. MetaMask Browser Extension has been used to test our system and Solidity was used to build smart contracts. The functions of creating project, donating, approving funds and transferring funds could be verified as well after testing of the application along with the Dapp.

4.1 DAPP front end model :

Following functions have been met:

1. Beneficiary initiates a charity project in the DApp.
2. Beneficiary requests funds from the charity project initiated by himself.
3. Donor can donate to the charity projects which he chooses.
4. Donor is able to vote on the funding request for the charity project already participated.
5. After the request for funds is approved, the funds are automatically transferable to the beneficiary's account in form of tokens and not non-fungible money. Token system is used so that the capital can be given to use only for the purpose specified by the token whereas non-fungible money can be used in uncontrollable applications. This adds a added layer of security to the already secured architecture developed by blockchain and smart contract.

4.2 Build Smart Contracts :

Smart contracts are value streams based on specific terms and conditions. Different from real contracts, smart contracts are completely digital, they are pre-programmed code stored on the blockchain decentrally. As the expansion of the blockchain, the smart contracts adapt well to the decentralization of the blockchain which can run in the whole network node. The transactions using the smart contract will be recorded on the blockchain without the need of managers. Once conditions are met, the smart contract will be executed automatically and transactions will ensure balance is updated. Smart contracts can be used to define transaction logic for charity platform.

In the Dapp, we have built smart contract to meet the functions described in the previous section, smart contracts structure is shown in Figure 9. Users can create a charity project using The ProjectList Contract which also supplies the view of all projects recorded on the blockchain. The Project contract is used to describe and store specific charity project, which provides an interface to operate the charity project and its funds. The structure of tokens expenditures is designed separately.

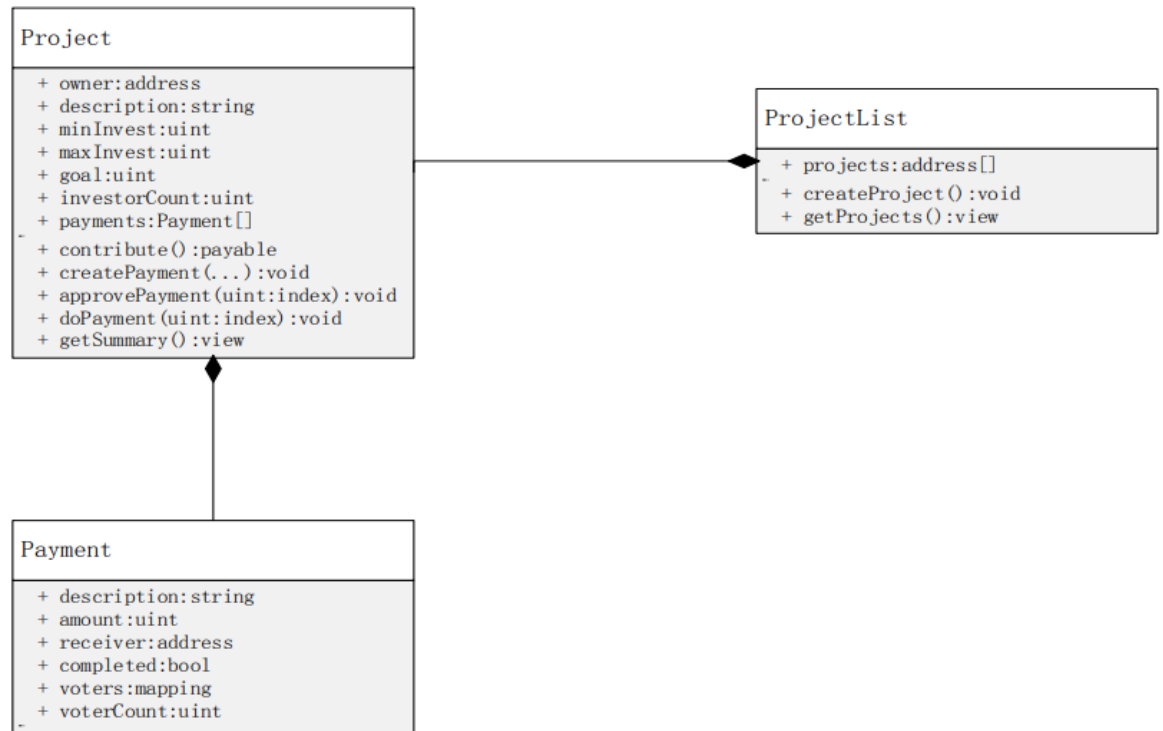


Figure 9. Dapp smart contract structure

CHAPTER 5 : CONCLUSION

We studied the combination of blockchain technology and philanthropy, a new charity platform model based on blockchain was proposed. In this system, users complete the donation and use funds with smart contracts. All transactions are recorded on the blockchain to realize traceability of funds, which increase the transparency of charities. The lack of transparency in charity activities could be solved technically with this blockchain charity system, which could increase the public's trust in charity organizations. Some core components have been realized and verified by a Dapp we have developed. A complete charity system based on blockchain in the future is the next step for us.

REFERENCES

1. Dylan Yaga., et.al .Blockchain Technology Overview, 2018.
<https://doi.org/10.6028/NIST.IR.8202>
2. Michael Crosby., et.al. BlockChain Technology Beyond Bitcoin, 2015.
3. Simanta Shekhar Sarmah, Understanding Blockchain Technology, 2018.
4. Pauline Adam-Kalfon & Selsabila El Moutaouakil, Blockchain, a catalyst for new approaches in insurance.
5. Satoshi Nakamoto, What is a blockchain.
6. Karim Sultan., et.al, Conceptualizing Blockchains: Characteristics & Applications, 2018.
7. Annisyah Paradhita Sari., et.al, Pengaruh Brand Awareness, Kualitas Proyek Dan Kepercayaan Terhadap Keputusan Berdonasi Secara Online Pada Platform Crowdfunding Kitabisa.Com, 2019.
8. Melfianora, I., & Si, M. (n.d.), Penulisan Karya Tulis Ilmiah Dengan Studi Literatur, 2012.
9. C. D. Clack, V. A. Bakshi, and L. Braine, Smart Contract Templates: foundations, design landscape and research directions, pp. 1–15, 2016, [Online]. Available: <http://arxiv.org/abs/1608.00771>.
10. M. Alharby and A. van Moorsel, Blockchain Based Smart Contracts : A Systematic Mapping Study, pp. 125–140, 2017, doi: 10.5121/csit.2017.71011.
11. Dictio, Apa itu crowdfunding?, 2018, [Online]. Available: <https://www.dictio.id/t/apa-itucrowdfunding/35242>.
12. Todor Branzov & Nelly Maneva, Crowdfunding Business Models and Their Use in Software Product Development, 2015.
13. August Thio-ac1, Alfred Keanu Serut, et al. Blockchain-based System Evaluation: The Effectiveness of Blockchain on E-Procurements, International Journal of Advanced Trends in Computer Science and Engineering, vol. 8, no.5, pp. 2673-2676, 2019.
<https://doi.org/10.30534/ijatcse/2019/122852019>
14. Sang Young Lee, Medical Data Framework Using Blockchain Technology, International Journal of Advanced Trends in Computer Science and Engineering, vol 8, no.5, pp. 2353-2358, 2019. <https://doi.org/10.30534/ijatcse/2019/75852019>
15. Mark Renier M. Bailon, Lawrence Materum, International Roaming Services Optimization Using Private Blockchain and Smart Contracts, International Journal of Advanced Trends in Computer Science and Engineering, vol 8, no.3, pp. 544 - 550, 2019.
<https://doi.org/10.30534/ijatcse/2019/32832019>

16. Sun Xiaoshu, A Brief Analysis of 2012 China Charity Donation Data, China Development Brief, 2013(4).
17. Ke Xiang, Analysis on the Operation of Internet Public Welfare Crowdfunding Platform and Its Risk Control Mechanism, Hainan Finance, 2016(11)64-68+83.
18. Zhang Peng, Li Ping, Zhao Wenbo, Resolving the Dilemma of Charity and Credibility: The Theory and Evidence of the Application of Traceability System Principles, Social Sciences Research, 2016(03)40-46.
19. Hong-wei JIA, Xiu-quan DENG, A Preliminary Analysis of the Application of Blockchain in Social Emergency Relief, Proceedings of 2018 2nd International Conference on Education, Management and Applied Social Science(EMASS 2018), doi: 10.12783/dtssehs/emass2018/20436.
20. Wang Jia, Chen Haifeng, Application Analysis and Research of Blockchain Technology in China's Philanthropy, Computer and Information Technology, 2017(6).
21. Li Qi, Li Wei, Zhu Jianming, Guan Xiaoyao, Wang Hui, et al. Charity application model and platform based on blockchain technology, Journal of Computer Applications, 2017(A2).
22. Daniel Macrinici, Cristian Cartofoeanu, Shang Gao. Smart contract applications within blockchain technology: A systematic mapping study, Telematics and Informatics. Volume 35, Issue 8, 2018, pp. 2337-2354.