Donation Tracking System using Blockchain

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Abstract - *The proposed work is a decentralized blockchain-based donation tracking system that is designed to incorporate transparency, authenticity and verifiability in an online donation process. The system provides transparent accounting of operations for donors for direct access to the intended beneficiaries in the form of charitable foundations or individual recipients. Smart contracts are written and stored using the Solidity programming language on the Ethereum public blockchain which is programmed to run automatically when described conditions are met.*

In our model, we also present the novel idea of storing the donated amount in an escrow contract which releases the amount only for use by an authorized payment gateway. Once the payment is processed, the details of the transaction are visible to both parties.

Key Words: **Blockchain, Ethereum, Smart Contracts, Transparency, Security, Decentralized.**

1. INTRODUCTION

The current charity and donation processes are opaque. Due to improper record keeping and the involvement of some dishonest individuals within the organization, people have lost trust in organizations that work towards social causes since the donors are unaware of how well their contributions are being used. The suggested system enables social organizations to manage various projects for social causes in a transparent manner without the involvement of third parties, using a smart contract that helps to confirm their impact, and at the same time, is open to everyone. Donors may easily track an organization's transactions, helping them reclaim their faith in such social groups. The system assures that the donation reaches the intended recipient while lowering overall administration expenses and increasing administration speed and efficiency. It will also assist to foster confidence among donors and recipients involved in the charitable process. Our proposed method tries to implement the following key features in the current donation processes:

1. Transparent
2. Global
3. Decentralized
4. Secure

1.1 Transparent

As Ethereum is a decentralized, open-source blockchain with smart contract functionality, it allows the participation of any individual, and all the transactions are stored in a public ledger which can be viewed by any donor of that specific campaign. As all the transactions are available to the participants, our system is wholly transparent and prevents misuse by intermediate parties.

1.2 Global

Due to the peer-to-peer nature of the network, funds can be delivered instantly to any location in the world (given that they are a participating node), which, in the case of conventional international bank transfer services, is a hassle.

1.3 Decentralized

Since there is no centralized authority controlling transactions on a blockchain, they happen quickly. Transactions involving traditional currencies must pass via numerous middlemen and centralized exchanges, etc.

1.4 Secure

The funds need to be safer as they grow in size. E-payments are still vulnerable to hackers despite having rigorous security measures in place, like symmetric/asymmetric encryption. Despite strict security measures being in place, e-payments are still susceptible to hackers.

Numerous crowdfunding frauds have come to light, with some still away from the spotlight. There is no way to keep track of how the donations are being used. To prevent financial theft, we wanted to make the entire cash flow visible at every level.

2. LITERATURE REVIEW

Various proposals in relation to donation systems supported by different multiple blockchain systems exist. In E. Shaheen *et al.*, a new track donation model was proposed which introduced several new participants that control the

process of donation and remove suspicion of the charity. All donations could be tracked to Blockchain, allowing donors to know where and how their money is being used. The proposed model was implemented using Hyperledger composer [1]. In [2] the authors propose a system consisting of users that play a major role which is classified as the donor/beneficiary, NGO and the Government entity. These users will be account holders in the blockchain network and each of them can be uniquely identified in the network through their 160-bit account address. They can access their accounts, and perform and sign transactions using their 256-bit private key.

In [3], the author suggests that traceability management is a major field which is influenced by Blockchain Technology and shares its experience of building OriginChain. Tracing the source of the products across the supply chains is important, in order to verify the authenticity of products and supply a source of trust within the product to the purchasers. The blockchain uses a smart contract which is a set of rules defined to carry out any transactions. The smart contract keeps track of all transactions occurring and stores them within the blockchain as state transitions, for this purpose Ethereum blockchain is employed. So, this is often helpful in tracking the varied products within the supply chain. The author claims that the proposed system that is OriginChain, is a more secure traceability system for products as compared to the physical system which included a team of members performing quality checks to verify the merchandise. They have used blockchain technology which stores the transactions in a distributed ledger. The distributed ledger database technology is spread across several nodes (devices) on a peer-to-peer network, and whenever there is an update in any data it is stored as a state transition of a transition. This permits the blockchain to trace any transaction when required.

In Proceedings of the Future Technologies Conference (FTC) 2020, Volume 2 [4], Sergey *et.al* propose a system where donations and movements of charitable funds will have to be registered through the REST API. Also, the Telegram bot is included in the system, which interacts with the user when they create a new donation. This bot receives from the user the amount that they want to donate to charity and gives the ID for a donation. Then the user can enter this ID and get detailed information about the donation on the website or in the Telegram bot to track where exactly the funds were spent. The functionality of this bot is similar to the functionality of the website.

There exist numerous deployed applications which are currently running online using decentralized or distributed blockchain networks. One of them is AidChain[5] which provides a blockchain-based crowdfunding platform. It allows donors to make a traceable charity donation via blockchain technology and provides its own crypto coin known as AidCoin to make donations. Another is BitGive [6]

which is the first Bitcoin and Blockchain technology-using organization, for nonprofits and humanitarian work. It uses the platform for nonprofits to provide transparency and accountability to donors by sharing financial information and direct project results in real time. NGOs like Save the Children, Code to Inspire and Heifer International have all partnered with them.

However, the widest and most recognizable use of blockchain for donation was seen by the World Food Programme which employed a blockchain network named 'Building Blocks' which is currently the world's largest implementation of blockchain technology for humanitarian assistance; currently assisting 1 million people in Bangladesh and Jordan, enabling them to securely access and receive multiple forms of assistance from different organizations via one access point. [7] The technical blockchain infrastructure to operate the network is based on open-source software and is freely accessible to participating organizations. The applications deployed on the Building Blocks network are also available for free to the network members. Fundamentally, Building Blocks is a collection of blockchain nodes which are computer servers independently operated by each participating organization. Together, they connect to form a humanitarian blockchain network that provides a neutral space to collaborate, transact and securely share information in a real-time. The network is neutral without a hierarchy of ownership: all member organizations are 100 per cent equal co-owners, co-operators, and co-governors of the network and all members play an equal role in its upkeep.

3. PROPOSED SOLUTION

Blockchain technology bypasses the central system and connects each block to every person. The implementation presents a novel technique for leveraging blockchain technology in an existing contribution system. In the existing system, the donor has no notion or estimate of whether his/her money, which was designated for a certain purpose, is being utilised for that cause and not being diverted for other purposes. Furthermore, cryptocurrency donations (for example, Ether for the Ethereum Blockchain) may be easily cashed out for any national currency, rendering the payments untraceable. In this scenario, we can resolve the issue by using blockchain, which allows the donor to see how the money is used and allows everyone to view the account history. To create a blockchain-based virtual fundraising box, the donor transfers money to the receiver, which is first kept in the form of an escrow contract. When the terms of the escrow contract are satisfied, the money is released to the receiver. Furthermore, we ensure that all transactions are processed through a single, authorised payment gateway to better facilitate and trace these transactions. The donations are managed through a secure and transparent blockchain mechanism in this suggested scheme.

4. SYSTEM DESIGN

The use case diagram below describes the functionalities in control and tasks which are needed to be performed by both actors; the donor and the recipient. *(Figure 4.1)*

5. IMPLEMENTATION

5.1 Registration Process

5.1.1 NGO/Recipient and Donor Registration

The organization or the individual who wants to request funds from the donors would first need to register themselves on the application. On similar grounds, the donors who need to browse available campaigns to donate to would register themselves by entering their email identification and creating a new password.
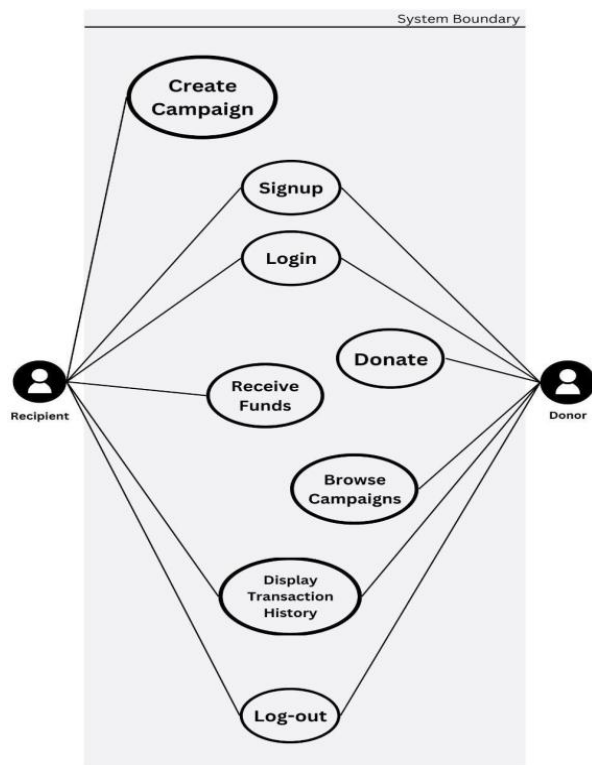

Figure 4.1- Use Case Diagram

5.1.2 Campaign Creation by the NGO/Recipient

Once the organization or the individual has logged in, they can access the 'Create Campaign'

Tab to initialize a new campaign. For registration of a new campaign the recipients are asked to provide:

The Metamask-linked wallet account address.

The target amount.

Minimum acceptable donation.

Their contact details.

Figure 5.1 – Campaign Creation

5.2 Donation Process

5.2.1 Campaign Browsing by the Donors

Once the donor has registered and logged into his/her account, they can browse from the available list of campaigns and select the one they want to donate to. The details provided by the recipients while creating the campaign are displayed here.

5.2.2. Donation

The donor after selecting the campaign of their choice presses the fund campaign button to enter the amount they wish to donate in ETH currency. They are then prompted to log in to their Metamask account using their private key. Once logged in, the Ethereum wallet automatically shows the total amount of ETH going to be donated along with the added gas fees. After finalizing the payment, a successful payment message is displayed on the screen.
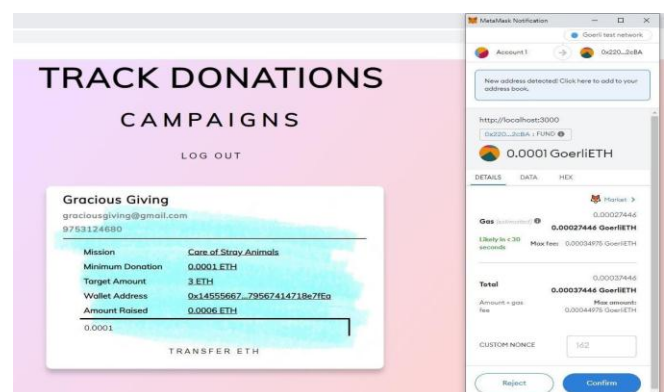

Figure 5.2- Donation Process

5.2.3 Accessing Transaction History

After donating, the donor can access the transaction history of the campaign. To be noted that only the donors of a campaign can access its' transaction history. If a non-donor tries to access the campaigns' transaction history, an alert saying "not a donor" appears. This feature is enabled by the smart contract that powers the platform. It has a function which maintains a mapping which maps the campaign wallet address to the donor's wallet address. This mapping returns true if the donor has donated to the campaign. The transaction history displays the following details:

From	The Campaign's Wallet Address
To	The Vendor's Wallet Address
Vendor's Name	Name of the Vendor
Location	Location of the Vendor
Value	Amount Transferred
Date	Date of Transaction (DD/MM/YYYY)

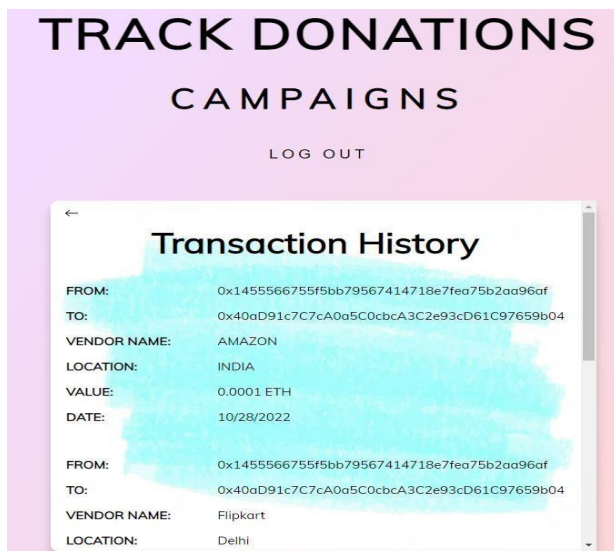*Table 5.1 – Transaction History*

Figure 5.3 – Transaction History UI

5.3 Payment Gateway and Transaction Results

The funds that the donor donates to the campaign do not go directly into the campaign's wallet address. Instead, they are held in escrow by the smart contract. The smart contract has a mapping which maps the campaign's wallet address to the total donation received so far. These funds are not wallet-accessible. To use these funds, the campaign has to use the payment gateway which is provided by the smart contract.

The smart contract has a function "pay (receiver address, vendor address, amount)" which transfers the amount to the vendor's wallet, and deducts this amount from the balance of the campaign. Before transferring, the campaign has to provide the following:

Transfer To	Vendor's Wallet Address
Vendor Name	Name of the Vendor
Vendor Location	Location of the Vendor
Amount	The Amount to be Transferred

Table 5.2 – Payment Gateway Details

These details will be pushed onto the blockchain and are displayed when the donor requests the transaction history of the campaign. After providing the details, the campaign-admin must click on the "TRANSFER ETH" button, or else the transaction will not proceed further. After clicking on the "TRANSFER ETH" button, a metamask pop-up prompting the campaign-admin to approve the transaction appears. The campaign-admin must "confirm" these transactions. The status of the transaction is signalled by the text of the "transfer eth" button, which shows "transferred" after the successful completion of the transaction. The gas fees of the transaction are deducted from the wallet balance of the campaign. However, the vendor receives the full "amount". The same change will be reflected in the "current balance" on the profile page of the campaign.

Figure 5.4 – Payment Gateway

6. CONCLUSION

The Donation Tracking System, which is built on the Ethereum blockchain, aids in keeping track of the transactions of those who make donations and obtaining information on how those funds are used. Smart contracts with blockchain implementation assist in directing the movement of ethers

between the end parties engaged in the transaction directly without the intervention of a third party. The system accepts donations in the form of ETH. Because each transaction is distinct, it is simple to monitor it along the blockchain. A high degree of transparency and integrity in such systems may offer people trust and cooperation, encouraging them to donate and enhance the reputation of generous giving.

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