SMART CHARITY FUND DISTRIBUTION

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Abstract: Today, blockchain technology is emerging as a tremendous instrument for restoring faith in philanthropy and promoting its global expansion. Blockchain provides a transparent and immutable record of all transactions within the philanthropic ecosystem. It offers a decentralized and tamper-proof ledger system that can address these concerns effectively. Blockchain can revolutionize the philanthropic landscape by eliminating fraudulent activities that adversely affect both beneficiaries and donors, while also forging stronger connections among philanthropic entities to support charitable endeavors. A straightforward blockchain application serves as a robust solution to monitor charity registrations and expenditures, enabling transparency on every dollar's journey from donation to utilization. Transparency issues in charity-based transactions have eroded trust among donors, leaving them concerned about the proper utilization of their contributions. This uncertainty has led to a decline in trust towards charitable organizations.

Keywords: Charity-based transactions, Donor trust, Transparency, Fraud Prevention, Decentralized Ledger System

CHAPTER 1

Planning and Research

1.1 Scope of the Project:

The high cost of transferring funds around the world is another challenge faced by the charitable giving sector. Each year, over US$600 billion in aid finance is distributed globally to address development and humanitarian challenges. Traditional banking systems charge high fees to transfer funds, especially across borders, and these transactions can take weeks, even during a crisis response. As funds cross borders into countries with poor or corrupt systems, it can be almost impossible to trace funds from end-to-end, creating the potential for mismanagement and losses. Blockchain technologies features of immutability, accountability and security make it a promising technology to improve transparency and efficiency for charities. Blockchain can solve all of these problems and help elevate the confidence in non-profit in utilizing the funds.

1.2 Timeline:

1. **Planning:**
   Defined project goals, requirements, and features. Identified technology stack and blockchain platform. Assembled the development team. Developed a detailed project plan, including milestones and deadlines.

2. **Design and architecture:**
   Created wireframes and mockups for the user interface. Designed the architecture of the blockchain system. Defined smart contracts.

3. **Development:**
   Implemented the core functionality of the blockchain application. Developed smart contracts. Integrated with the chosen blockchain network. Implemented features for charity registrations, and donating to the registered organizations. Conducted regular testing throughout the development phase.

4. **Alpha Testing:**
   Conducted internal testing among the development team. Identified and fixed bugs and issues. Gathered feedback for improvements.

5. **Beta Testing:**
   Release a beta version to a limited group of external users. Collected user feedback on functionality and usability. Addressed issues and make necessary adjustments

6. **Documentation:**
   Created user manuals and documentation. Provided training sessions for users and organizations.

7. **Deployment**
   Setting up the production environment. Deployed the application to the development blockchain network. Performed data migration.

1.3 Resources:

Technical Resources:

Blockchain Developers: It is imperative to have proficient developers with knowledge of blockchain technologies, such as Ethereum, Hyperledger, and Binance Smart Chain. They should be able to create and execute smart contracts, create decentralized apps (DApps), and maintain the blockchain network's security.

Smart Contract Auditors: It is important to engage outside auditors or specialists in smart contract security to guarantee the security and dependability of smart contracts.

Financial Resources:

Funding: Sufficient financial resources are needed to pay for the blockchain solution's creation, implementation, and continuing upkeep.

Budget for Audits: Provide funds for independent third-party audits of the blockchain system in order to find and fix any security flaws.

Collaborations & Partnerships:

Cooperation with Charities: It is essential to form alliances with nonprofits that are open to implementing blockchain technology. Pilot initiatives, cooperative development efforts, and shared learning opportunities are a few examples of collaboration.
Interaction with Regulatory Bodies: Getting in touch and working together with the appropriate regulatory bodies can guarantee that the project complies with all applicable laws.

1.4 Estimated Costs:

Amount Requested in Dollars: $40,000

Industry Focus: Blockchain-based Philanthropy and Charitable Giving

Venture Stage: Early Growth

Timeline to Achieve Profitability: Projected to achieve profitability within 12 months

Monthly Burn Rate: $15,000

CHAPTER 2

Feasibility Analysis

Feasibility study of blockchain technology's ability to boost philanthropy's global expansion and restore trust in it.

Problem:

Giving money to charitable organizations brings with it a number of challenges and concerns for donors. Their willingness to contribute and confidence in the effectiveness of their donations could be affected by these problems.

Lack of Transparency:

In particular, the lack of transparency as to how their contributions are used has been a major concern for donors. Donors may question the effect of their generosity in a situation where there is little clear information about how funds are allocated and distributed

Privacy and Data Security:

Donors want to be sure that the nonprofit organizations they fund have strong data security safeguards in place to safeguard their private data. Potential donors may be discouraged from making a donation if they lack confidence in the organization's data handling procedures

Administrative Overhead:

Donors may be concerned that, rather than directly benefiting the cause, a significant proportion of their donation goes to administrative costs.

Solution:

Blockchain technology is a promising tool to solve the issue of charity distribution. There are a number of advantages to this approach compared to traditional charity distribution systems, such as transparency, efficiency, accountability, and security.

Transparency:

Implementing a blockchain-based platform for donations that offers accurate, transparent, and real-time tracking of funds. By recording transactions on a blockchain and automating the distribution of donations, smart contracts promote transparency and enable donors to monitor their contributions in real-time.

Privacy and Data Security through Blockchain network:

Concerns about data security and privacy in philanthropic giving can be effectively addressed with a blockchain architecture. It provides a controlled environment where sensitive data may be safely managed and transactions can be carried out with confidence, ensuring that donor data is kept secured and protected.

Smart Contract Automation:

By Automating processes through Smart Contracts, providing transparency, and optimizing the allocation of resources, Blockchain technology offers a holistic solution for reducing administration costs in charity organizations. This enables a higher proportion of donors' contributions to be used for charitable purposes, in order to maximize the impact of giving.

Software Requirements:

- Any Chromium based browser (like google chrome)

- Metamask

- Ganache: Local Blockchain
- Truffle suite
- Reactjs
- Solidity compiler
- Web3
- Npm (Node package manager)

Hardware Requirements:

- **Ram:** 4GB and Higher
- **Processor:** Intel i3 and above
- **Hard Disk:** 10 GB and above

CHAPTER 3

Design And Prototyping

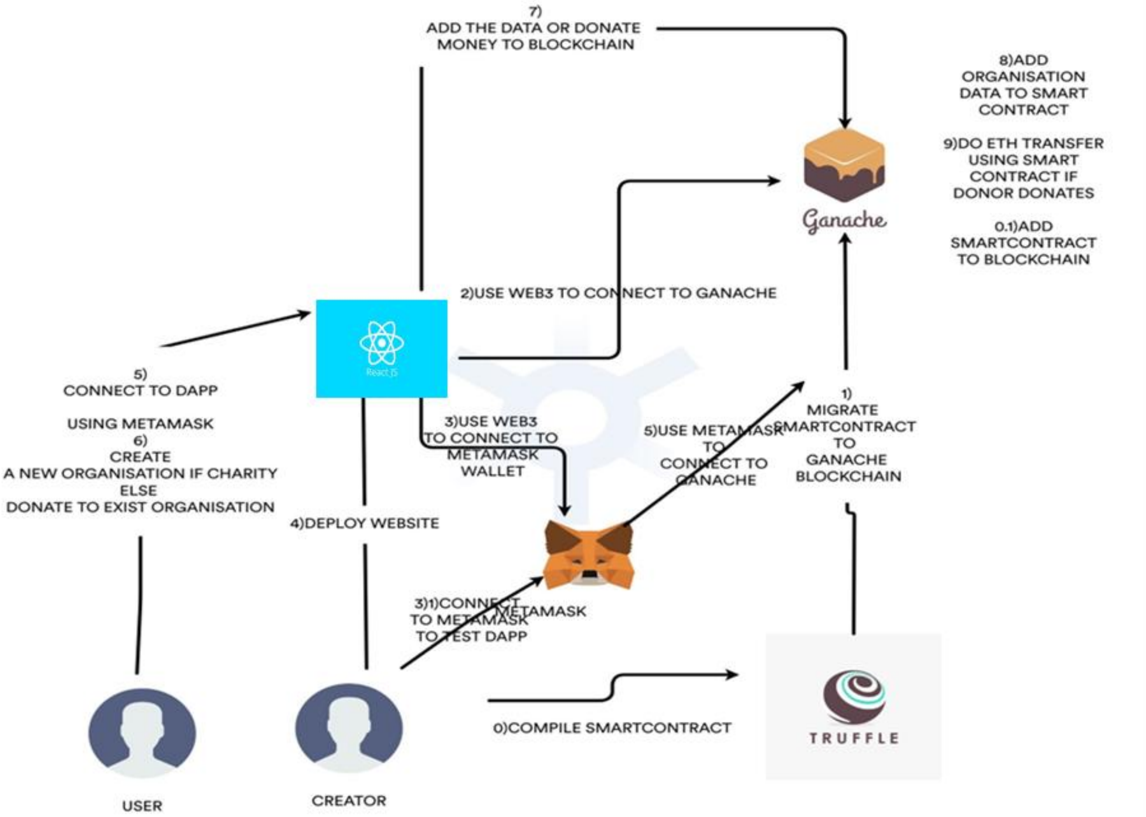
3.1 Architecture:

The proposed system uses a decentralized process to record all transactions made by the donor which ensures transparency in the network. If a donor makes a donation, a smart contract is used to record the transaction by doing an Ether (ETH) transfer.

It uses a decentralized storage such as IPFS to manage all the donations and distributions made by the donor including donor ID, donation amount, and distribution information.

This data will be stored across all the nodes in the network. The system uses decentralized authentication to identify the donor and the beneficiary.

We use ethereum blockchain for the project Smart charity fund distribution. It is because there are organizations and donors involved in this and some organizations have strict regulations that require data to be stored and processed in a certain way. A public blockchain can help various users to donate to the system or charities.



3.2 Modules:

The **Web3 package** is used within react application to establish a link between the website's user interface (UI) and the blockchain network, leveraging the capabilities of the Metamask wallet.

The **App module** plays a crucial role in designing the website's user interface (UI) and facilitates its connection to the Web3 service. This module is an integral part of the React framework.

The **CharityChain.sol module**, also referred to as a smart contract, serves as the interface for interacting with the blockchain. It is implemented using the Solidity programming language.

We use the **Proof of Work(PoW)** consensus mechanism for our project because it is very difficult to attack a PoW network as an attacker would need to control a majority of the mining power on the network. This makes it a good choice for a smart charity distribution project because it protects the funds from theft and hacking.

3.3 UML Diagrams:

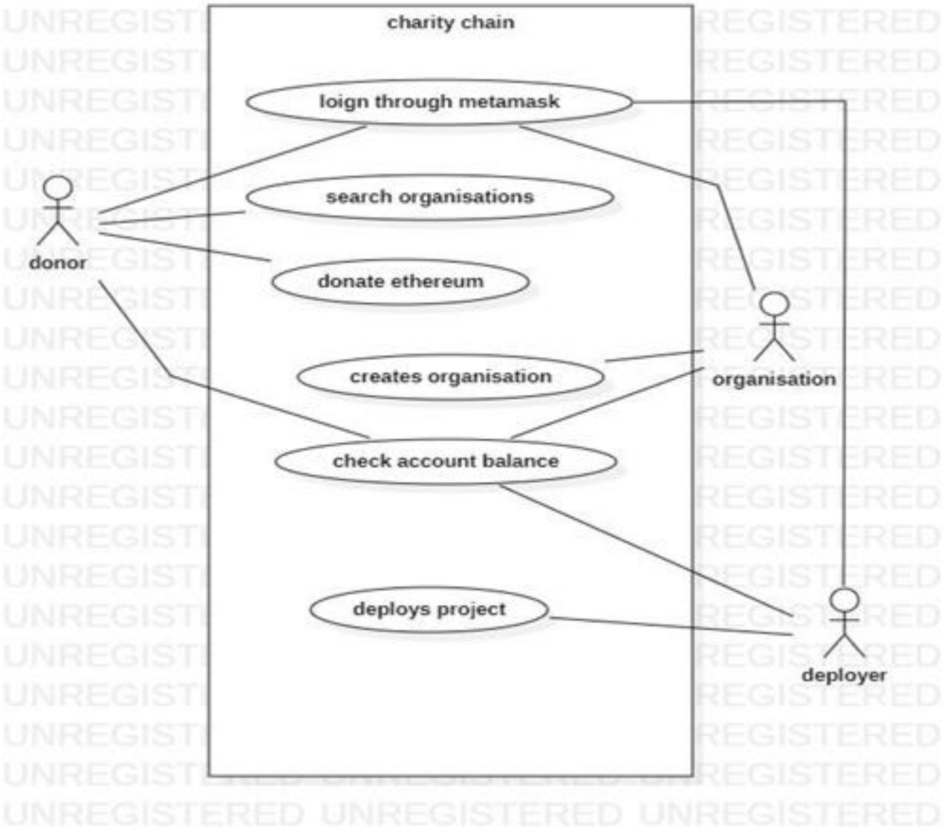


Fig 3.3.1 Use Case Diagram

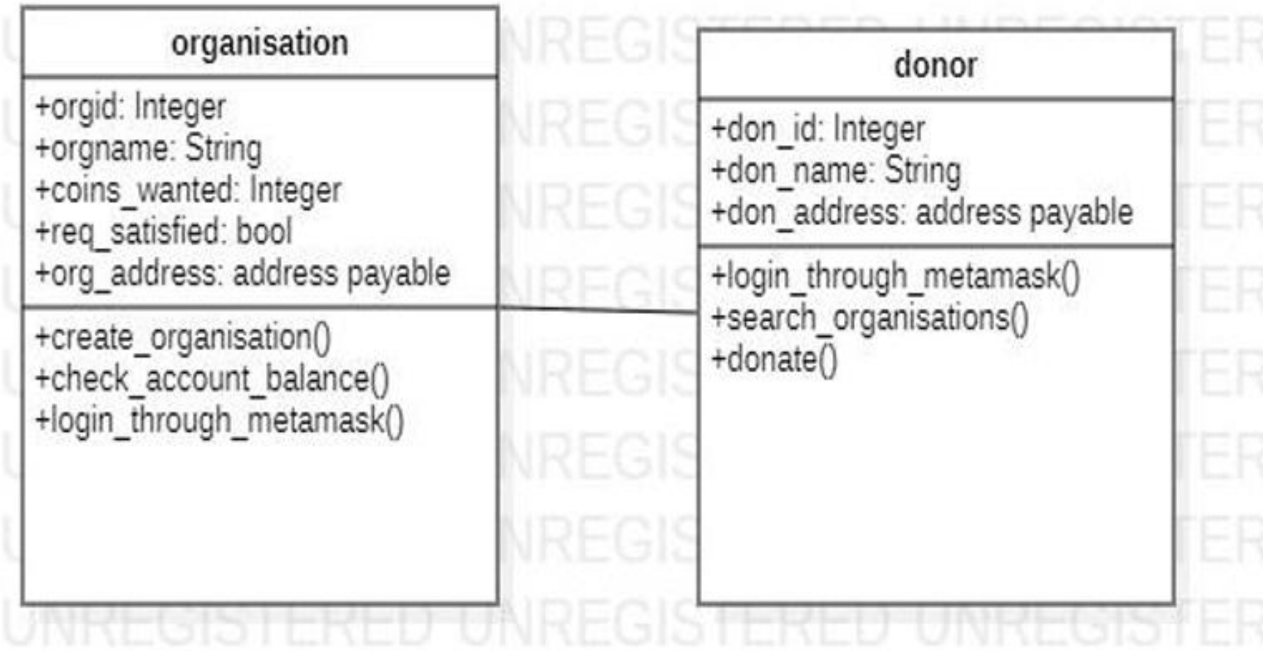


Fig 3.3.2 Class Diagram

CHAPTER 4

Development

The process usually involves multiple phases, including pre-alpha, alpha, beta, and release candidate, before to the public release of the final version.

Pre-alpha:

- Developed the basic system architecture.
- Identified System requirements, functional and non-functional requirements.
- Implemented core functionality, such as donation request by organizations and donation functionality by users to organizations requesting charity.

Alpha:

- Invited a small group of donors and charities to test the application.
- Identified and fixed major bugs or usability issues.
- Gathered feedback from users on the application's features and functionality.

Beta:

- Released the application to a group of users.
- Refined the user experience based on feedback from beta testers.
- Fixed remaining bugs and ensured that the application is stable and reliable.

Release candidate

- Conducted final testing with a small group of charities and donors.
- Addressed critical issues that are identified during testing.
- Prepared the application for release to the general public

CHAPTER 5

Quality Assurance

Quality Assurance Stages

Phase 1: Pre-Development QA

- **Define Quality Goals:**
  - **Success metrics:** Increased donor trust, reduced fraud, improved charities impact, growth in global donations within 1 year.
  - **Transparency:** Donation, public access to charity financials and impact reports.
  - **Security:** Zero vulnerabilities in smart contracts, secure network nodes, data encryption.
  - **Impact**: Standardized impact measurement framework, regular reporting on social good achieved.

- **User Persons & Scenarios:**
  - Developed user archetypes for donors (individual, corporate), charities (small, large).
  - Defined detailed use cases for each persona, covering typical workflows and interactions.

Phase 2: Development & Testing

- **Smart Contract Audits:**
  - Smart Contracts Testing and static code analysis were performed by the developers.
  - Identified and fixed vulnerabilities in donation processing, fund management, and governance contracts.

- **Performance Testing:**
  - Tested by adding a few organizations for analyzing the performance of the donation process.
- **Usability Testing:**
  - User testing conducted with organizations from each persona to assess platform intuitiveness and efficiency.
  - Gathered feedback on user interface, navigation, and feature accessibility.
- **Functional Testing:**
  - Exhaustive testing of core functionalities, including organization creation and fund donation.
  - Verified automated workflows for disbursement, reporting, and governance activities.

Phase 3: Deployment & Ongoing QA

- **Monitoring:**
  - Performing frequent auditing for security, performance anomalies and identifying unusual user behavior in the system.
- **Integrity Checks:**
  - Extensive testing of data immutability across the blockchain network.

CHAPTER 6

Software Deployment

1. Environment Setup:

- Preparation of development environment, implementation framework, including the server, blockchain platform, and deployment network.
- Download Truffle, a top-notch testing framework, asset pipeline, and development environment for blockchains utilizing the Ethereum Virtual Machine (EVM), with the goal of simplifying the development.
- Download Ganache, It is a personal blockchain designed to speed up the development of distributed applications for Filecoin and Ethereum. Ganache is compatible with all stages of the development cycle. allowing you to create, implement, and evaluate your dApps in a predictable and secure setting.

2. Smart Contract Deployment:

- Once all the installations are done. Define the contract properties and develop the smart contract.
- After the smart contract is ready to be tested and deployed. Compile it using command truffle compile.
- Migrate the script and deploy the smart contract code to the Ethereum network.
- Test the smart contract with javascript, mocha, and chai.
- Deploy the smart contract to Ganache.

Smart Contract Code:

```
pragma solidity ^0.5.0;

contract CharityChain {
  string public name;
  uint public orgsCount = 0;

  mapping(uint => Organisation) public organisations;

  struct Organisation {
    uint id;
    string name;
    uint coins_wanted;
    address payable addr_org;
    bool reqSatisfied;
  }

  event OrganisationCreated (
    uint id,
    string name,
    uint coins_wanted,
    address payable addr_org,
    bool reqSatisfied
  );

  event OrganisationDonated (
    uint id,
    string name,
    uint coins_wanted,
    address payable addr_org,
    bool reqSatisfied
  );

  constructor() public {
    name = "Charity Chain";
  }

  function createOrganisation(string memory _name, uint _coins_wanted) public {
    // Required Valid Name
    require(bytes(_name).length > 0);
    // Required Valid coins_wanted
    require(_coins_wanted > 0);
    //Increment organisation count
    orgsCount++;
    //create an organisation
    organisations[orgsCount] = Organisation(orgsCount, _name, _coins_wanted,
msg.sender, false);
    //Trigger the event
    emit OrganisationCreated(orgsCount, _name, _coins_wanted, msg.sender,
false);
  }

  function giveDonation(uint _id) public payable {
      Organisation memory _org = organisations[_id];
      address payable _addr_org = _org.addr_org;
      require(_org.id > 0 && _org.id <= orgsCount);
      require(msg.value >= _org.coins_wanted);
      require(!_org.reqSatisfied);
      require(_addr_org != msg.sender);
      _org.addr_org = msg.sender;
    // Mark as requirement Satisfied
    _org.reqSatisfied = true;
    // Update the organisation
    organisations[_id] = _org;
    // Pay the organisation
    address(_addr_org).transfer(msg.value);
    // Trigger the event
    emit OrganisationDonated(orgsCount, _org.name, _org.coins_wanted,
msg.sender, true);
  }
}
```

3. Platform Deployment:

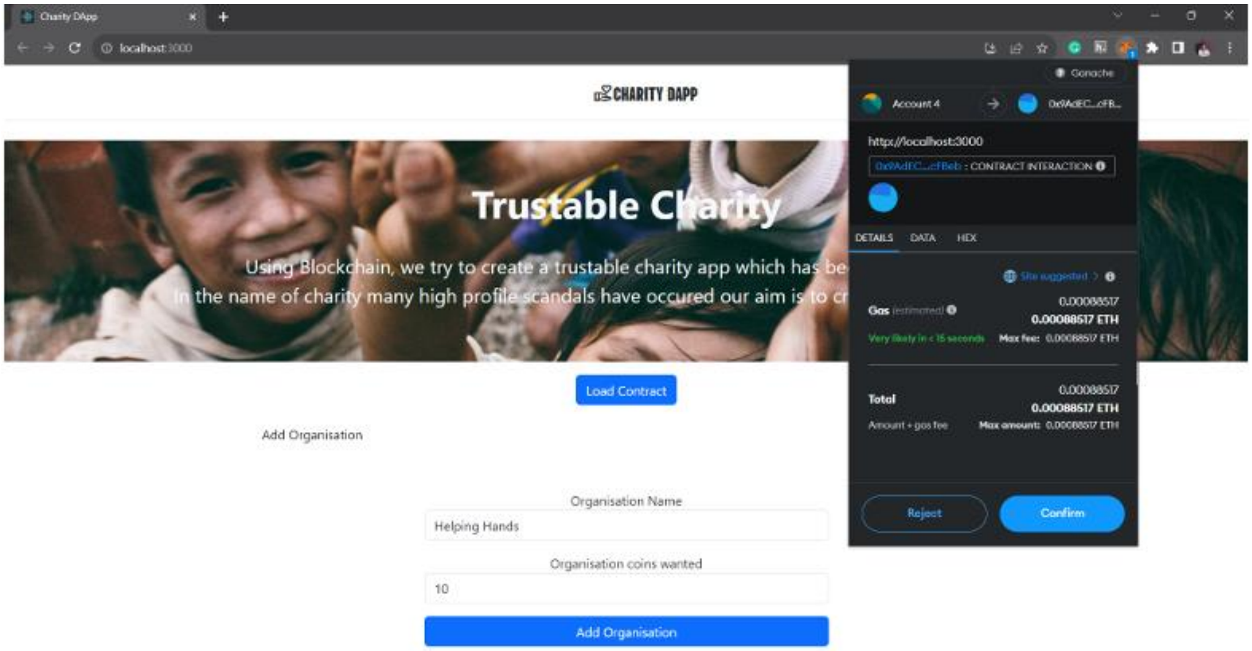
- Developed the web application using react framework.
- Smart contracts are developed using solidity programming language.
- The Web application is deployed on development server (live server).
- The smart contracts are deployed on development blockchain network using truffle and ganache.

4. Testing:

- MetaMask is used for manual testing.
- Verified the platform's functioning such as creation of charity by organizations for cause, donation of funds in particular.
- Adding a few organizations and testing of the donation process.

5. Output / Results:

- **Web Platform:**



Trustable Charity

Using Blockchain, we try to create a trustable charity app which has be

In the name of charity many high profile scandals have occured our aim is to cr

Account 4 → 0x9AdEC...cFB...

http://localhost:3000

0x9AdEC...cFBeb : CONTRACT INTERACTION

Gas (estimated) 0.00088517 0.00088517 ETH

Very likely in < 15 seconds Max fee: 0.00088517 ETH

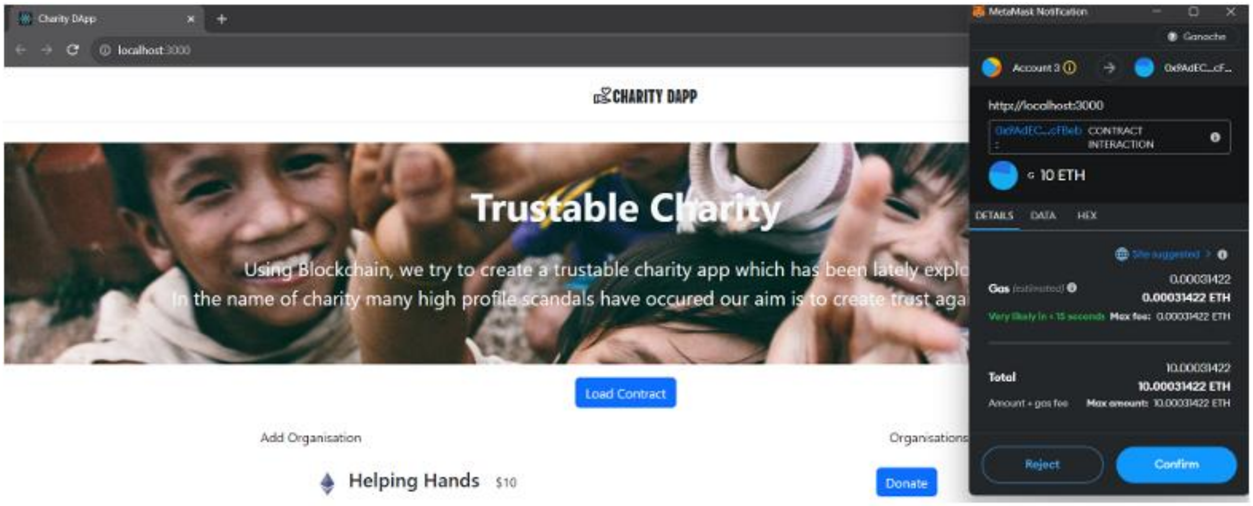
Total 0.00088517 0.00088517 ETH

Amount + gas fee Max amount: 0.00088517 ETH

Add Organisation

Organisation Name: Helping Hands

Organisation coins wanted: 10



Trustable Charity

Using Blockchain, we try to create a trustable charity app which has been lately explo

In the name of charity many high profile scandals have occured our aim is to create trust aga

Account 3 → 0x9AdEC...cF...

http://localhost:3000

0x9AdEC...cFBeb : CONTRACT INTERACTION

10 ETH

Gas (estimated) 0.00031422 0.00031422 ETH

Very likely in < 15 seconds Max fee: 0.00031422 ETH

Total 10.00031422 10.00031422 ETH

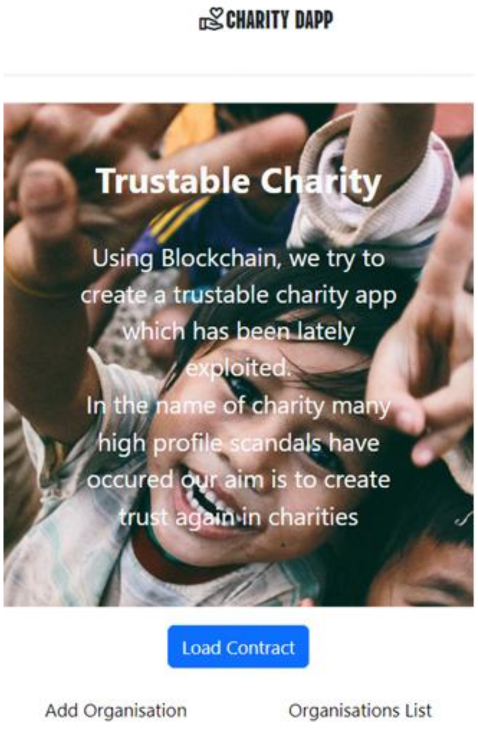
Amount + gas fee Max amount: 10.00031422 ETH

Add Organisation

Organisations

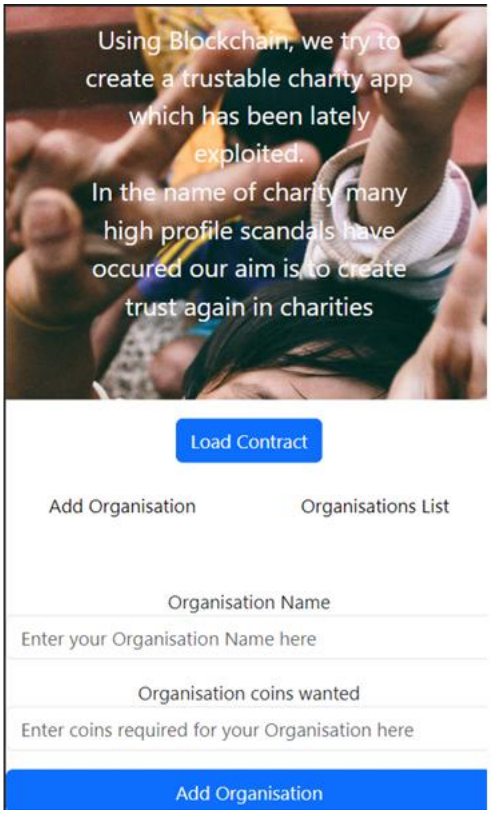
Helping Hands $10

- **Mobile Platform:**



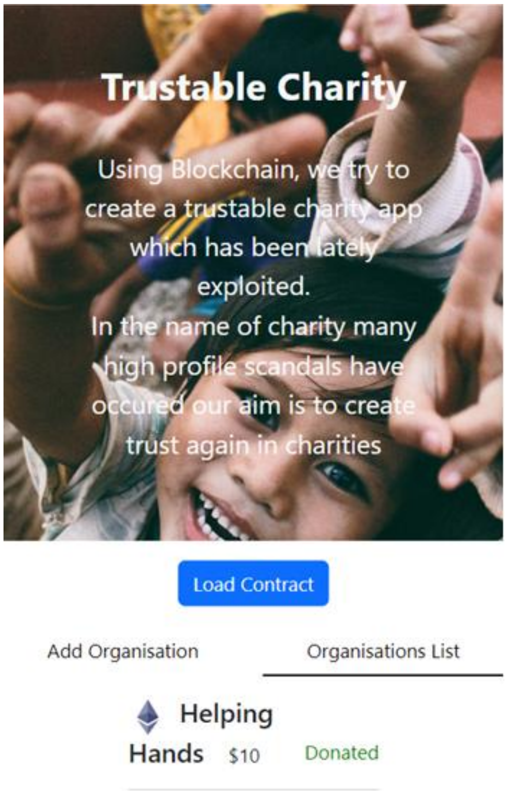
Trustable Charity

Using Blockchain, we try to create a trustable charity app which has been lately exploited.
In the name of charity many high profile scandals have occured our aim is to create trust again in charities



Using Blockchain, we try to create a trustable charity app which has been lately exploited.
In the name of charity many high profile scandals have occured our aim is to create trust again in charities

Load Contract
Add Organisation
Organisations List
Organisation Name
Enter your Organisation Name here
Organisation coins wanted
Enter coins required for your Organisation here
Add Organisation



Trustable Charity

Using Blockchain, we try to create a trustable charity app which has been lately exploited.
In the name of charity many high profile scandals have occured our aim is to create trust again in charities

Helping Hands $10 Donated

CHAPTER 7

Summary

7.1 Future Scope:

Though we have added the important features to the website there many more which can be added to this application.

- **Market-place:** Organizations which have received the funds can directly use the 'Market-place' feature in the dapp or decentralized application where they can buy the essential items according to their need. These items are hosted by other sellers on the blockchain network.
- **Donations with conditions:** Smart contracts to help charities collect donations only when predetermined milestones are achieved by the organization.
- **Transparent transactions:** The transactions we make in the network may be shown to everyone on the website and users can search with the address of the ethereum account.
- **New cryptocurrency for the dapp:** Users will give their ethereum to the dapp which will convert it to the native cryptocurrency to move forward with future transactions in the dapp.

7.2 Limitations:

Some of the limitations of blockchain technology in charity sector:

- **Lack of an established regulatory base:** Blockchain is relatively very new technology, so naturally most governments in countries around the globe are only just starting to roll out laws and regulations stipulating the use of blockchain and cryptocurrencies. These laws are still premature and may be changed drastically in the future which may affect this sector in a negative way due to the taxes for using digital assets.
- **Difficulty in understanding blockchain:** A lack of understanding of the basics of blockchain and smart contracts may discourage potential donors. Some philanthropic organizations could also be hesitant to adopt a new technology they don't completely trust, without fully understanding the advantages of blockchain for charities. Unless there is a very good clarity about this topic, it is difficult for people to actually trust this application in charity sector.
- Cryptocurrency: These are highly unstable and this can lead to drop in the value very frequently. These drops in value may lead to donors' distrust in the currency which will attract no funds from the donors to the organizations.
- Like every software smart contracts are also prone to bugs. With the immutability of the contract and potential bugs, this can be an easy target to hackers.

7.3 Conclusion:

We have proposed a system using blockchain technology with cryptocurrency for charity work and make it more transparent through a decentralized system. This system maintains the authenticity and security. This technology will get rid of the middle men between the donor and the receiver, this increases the speed, reduces cost handling and gets rid of the illegal activities by the middle men.

Here we use cryptocurrency to make transactions. So, this helps in a scenario where the banking economy collapses, this will be the only viable option and we can make payments even then. And this philanthropic model can be expanded at global environment.

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