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Platform for Organ Donation and Transplantation Using Blockchain

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Abstract
The critical shortage of organs for transplantation necessitates exploring innovative solutions to improve the matching and allocation process. Blockchain technology, with its significant principles of the decentralization, security, and transparency, presents a promising avenue for building a more efficient and trustworthy platform for organ donation and transplantation. This paper surveys the current state of organ donation systems, explores the potential benefits of blockchain integration, and analyzes existing research on blockchain-based platforms for this domain

Keywords: Organ Donation, Transplantation, Blockchain Technology, Smart Contracts, Decentralization, Transparency.

I. INTRODUCTION

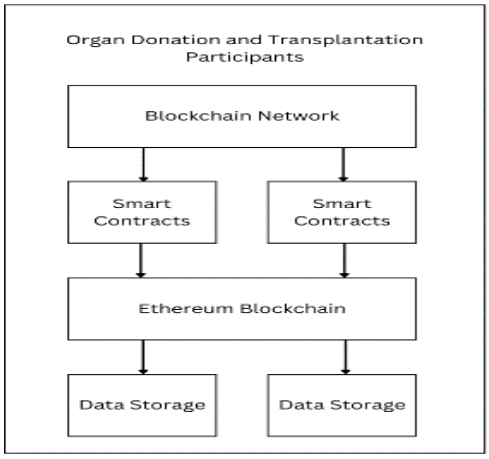
The organ donation and transplantation landscape is a critical domain within healthcare, offering a lifeline to countless individuals in need. However, the current systems grapple with inefficiencies such as irregular record storage, opaque allocation practices, and ethical concerns. **The drawbacks in previous existing technology used include irregular record storage, inefficient organ allocation, and concerns about transparency.** This research delves into the application of blockchain technology as a disruptive force poised to address these challenges. Blockchain, with its decentralized, transparent, and immutable characteristics, stands as a promising solution to enhance the security, efficiency, and ethical dimensions of organ donation and transplantation processes. **This application introduces new features such as decentralized control over medical records, transparent access management, and an intelligent resource allocation algorithm.**

By proposing a blockchain-based system leveraging smart contracts and the Ethereum blockchain, this research aims to empower patients, optimize organ distribution, and fortify the security and privacy of critical medical records. The subsequent sections delve into the methodologies, applications, and implications of this innovative approach, with the overarching goal of contributing to a more robust, patient-centric, and ethically grounded organ transplantation ecosystem. **This application overcomes the drawbacks of other projects by implementing decentralized control over medical records, transparent access management, and an intelligent resource allocation algorithm.**

The following block diagram outlines the key components involved in a blockchain-based organ donation and transplantation system.

The workflow for application works in the following manner –

1. **Organ Donation and Transplantation Participants:** This represents the various entities involved in the organ donation and transplantation process, including donors, recipients, hospitals, and regulatory bodies.
2. **Blockchain Network:** The overarching blockchain network that facilitates decentralized and secure transactions.
3. **Smart Contracts:** These are self-executing contracts with predefined rules and conditions.



II. LITERATURE SURVEY

The literature survey delves into existing research andscholarly works that contribute to the understanding of organ donation, transplantation, and the application of blockchain technology in healthcare.
Literature provides a foundation for our research, guiding the development of a blockchain-based solution aimed at overcoming existing limitations in the organ donation and transplantation domain.

3.1 Literature Survey

3.1.1 Literature survey on Blockchain-Based Management for Organ Donation and Transplantation

From the paper [1], The provided excerpt outlines the challenges faced bycontemporary organ donation and transplantation systems, emphasizing the need for an end-to-end solution that addresseslegal, clinical, ethical, and technical constraints to ensure a fair and efficient process, ultimately enhancing patient experience and trust. The paper proposes a novel approach utilizing a private Ethereum blockchain, introducing decentralization, security, traceability, auditability, privacy, and trustworthinessto the organ donation and transplantation management. The implementation includes the development of smart contracts and the presentation of six algorithms, accompanied by their detailed implementation, testing, and validation. The paperevaluates the performance of the proposed solution through analyses of privacy, security, and confidentiality, comparing it with existing solutions. Notably, the transparency of the project is emphasized by making the smart contract code publicly available on GitHub. This research contributes to evolving discourse on blockchain applications in healthcare, particularly in the organ donation domain, by providing a comprehensive solution that combines technological innovation with rigorous testing and evaluation.

3.1.2 Literature survey on Interoperability in Electronic Health Records Management and Proposed Blockchain Based Framework: MyBlockEHR"

From the paper [2], author has proposed the critical importance of interoperability in Electronic Health Records (EHR) to facilitate seamless information sharing among diverse healthcare stakeholders while ensuring security, privacy, and trust. The study conducts a systematic literature review addressing four research questions, focusing on standards for EHR interpretation and modeling, privacy-preservation techniques, the maturity of blockchain technology for EHR solutions, and the state-of-the-art in cross-chain interoperability for EHR sharing. The findings suggest the potential of a blockchain-based EHR management framework in enhancing privacy, access control, and storage efficiency. However, challenges in blockchain adoption for EHR management are identified, leading to the proposal of a novel framework called MyBlockEHR. The research contributes valuable insights to the ongoing discourse on blockchain applications in healthcare, offering the nuanced understanding of the challenges and potentials associated with interoperable, privacy-preserving EHR solutions.

3.1.3 Literature survey on A Blockchain-Assisted Verifiable Outsourced Attribute-Based Signcryption Scheme for EHRs Sharing in the Cloud

From the paper [3], literature survey explores the challenges associated with the sharing of Electronic Health Records (EHRs) and proposes a novel solution, the Blockchain-assisted Verifiable Outsourced Attribute- Based Signcryption Scheme (BVOABSC), designed to enhance the security of EHRs in a multi-authority cloud storage environment. The conventional practice of outsourcing EHRs to cloud servers raises concerns about patient control, data integrity, and the potential for malicious tampering. The BVOABSC scheme employs attribute-based signcryption to ensure the confidentiality and unforgeability of EHRs, preserving the privacy of the signer. Additionally, it leverages a verifiable outsourcing computation mechanism to reduce user computational burden while maintaining correctness verification. Blockchain technology is integrated to protect against tampering, with each EHR operation recorded as a transaction, ensuring immutability. Smart contracts, created by patients, address issues such as tampering and incorrect results in cloud storage.

3.1.4 Literature survey on An Efficient Authentication Scheme for Blockchain-Based Electronic Health Records

From the paper [4], literature survey addresses challenges in traditional electronic health records (EHRs) where medical information is controlled separately by different hospitals, leading to difficulties in information sharing. Although cloud-based EHRs alleviate this issue, they introduce a new concern of centralization, with a focus on the cloud service center and key-generation center. The paper proposes a paradigm shift by integrating blockchain technology into EHRs, creating a decentralized solution termed blockchain- based EHRs. The paper proposes a paradigm shift by integrating blockchain technology into EHRs, creating a decentralized solution termed blockchain-based EHRs. This research contributes to the evolving landscape of secure and decentralized EHRs through the integration of blockchain technology and the introduction of an improved authentication scheme.

3.2 Summary of Literature Review

The above survey of various researchers of different papers, about organ donation and transplantation using blockchain. From Literature survey, it is concluded that the challenges inherent in the current

systems, including irregular record storage, inefficient allocation, and ethical concerns. To addressthese issues, the review proposes a blockchain-based solution leveraging Ethereum. The motivation is rooted in saving lives through more efficient and trustworthy organ transplantation management. Includes improving transparency, security, and efficiency through use of smart contracts and blockchain technology. The motivation to build trust among donors, recipients, and medical professionals, along with the goal of combating fraud in organ transactions, is emphasized. The scope of the project extends to benefit healthcare institutions and government agencies involved in organ donation and transplantation processes. Overall, the literature review underscores the transformative potential of blockchain in optimizing organ donation procedures and fostering a more ethical and transparent ecosystem.

III. CONCLUSION

This survey paper concludes by providing a comprehensive overview of the current state of organ donation and transplantation record systems and underscores the significance and efficacy of implementing advanced blockchain technologies, particularly Ethereum, for decentralized and cooperative management. This research paper emphasizes the pivotal role of Ethereum blockchain in securely recording and managing organ donation data, enhancing transparency, and facilitating trust among stakeholders involved in the transplantation process. By thoroughly investigating existing methodologies and proposing a decentralized approach based on Ethereum's blockchain, the project aims to streamline organ donation processes and improve overall infrastructure for organ transplantation.

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