FAKE PRODUCT DETECTION USING BLOCK CHAIN

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ABSTRACT

The rapid growth of counterfeit products in the global supply chain has posed significant challenges to manufacturers, distributors, and consumers. Traditional authentication systems, which rely on centralized databases and manual verification, are highly susceptible to data tampering, duplication, and unauthorized access. To address these limitations, this paper proposes a secure and decentralized system for product authentication and counterfeit elimination using blockchain technology.

The proposed system leverages modern technologies, including Python for application development, MySQL for database management, and blockchain for immutable data storage. Each product is assigned a unique digital identity along with a cryptographic signature, which is securely recorded on the blockchain to ensure transparency and traceability throughout its lifecycle.

Manufacturers can register products and generate unique QR codes representing product identities. Distributors and consumers can verify product authenticity by scanning or uploading the QR code. The verification mechanism compares the product's digital signature with blockchain records to determine its legitimacy.

The system ensures secure authentication, reliable data storage, and real-time verification across the supply chain. By utilizing blockchain technology, it enhances transparency, builds trust among stakeholders, and significantly reduces the risk of counterfeit products entering the market.

In conclusion, the proposed solution provides a robust, transparent, and decentralized approach to product authentication, thereby strengthening supply chain security and enabling consumers to verify product authenticity efficiently and reliably.

Keywords: Blockchain, Product Authentication, Counterfeit Detection, Digital Signature, Supply Chain Security, QR Code Verification, Decentralized System

INTRODUCTION

In today's global market, counterfeit products have become a major issue due to the rapid growth of e-commerce and complex supply chains. Traditional authentication methods, such as centralized databases and barcode systems, are vulnerable to data manipulation, duplication, and lack real-time transparency.

To address these challenges, the proposed system uses blockchain technology to provide a secure, decentralized, and tamper-proof solution for product authentication. Each product is assigned a unique digital identity and stored on the blockchain, ensuring transparency and traceability throughout its lifecycle.

The system is developed using Python, MySQL, and blockchain-based cryptographic techniques. It utilizes digital signatures and QR codes for secure product identification and

verification. Manufacturers can register products, while distributors and consumers can verify authenticity by scanning QR codes.

This approach enables real-time verification, enhances supply chain transparency, and prevents unauthorized data manipulation. By eliminating dependency on centralized systems, the solution improves trust, security, and reliability among all stakeholders, significantly reducing counterfeit product circulation

OBJECTIVE

The primary objective of the *Fake Product Detection Using Blockchain* project is to design and develop a secure, decentralized, and reliable system for product authentication. The system aims to eliminate counterfeit products by leveraging blockchain technology to provide a transparent and tamper-proof mechanism for verifying product authenticity.

Another key objective is to overcome the limitations of traditional authentication methods, such as centralized databases and manual verification processes, which are prone to data manipulation and security breaches. The proposed system enables manufacturers to register products with unique digital identities and allows distributors and consumers to verify product authenticity using QR codes and blockchain records.

Furthermore, the project aims to enhance supply chain transparency, enable real-time product verification, and ensure secure data storage through cryptographic techniques. It also focuses on improving trust among stakeholders, protecting brand reputation, and ensuring product safety in modern digital marketplaces.

NEED FOR STUDY

The increasing presence of counterfeit products in global markets highlights the need for a secure and reliable product authentication system. Traditional methods are vulnerable to data tampering, lack transparency, and do not support real-time verification.

This study is needed to explore the use of blockchain technology to provide a decentralized, tamper-proof, and transparent solution for product verification. It aims to enhance supply chain security, ensure product authenticity, and build trust among manufacturers, distributors, and consumers while reducing the circulation of fake products.

EXISTING SYSTEM

Currently, product authentication relies on traditional methods like barcodes, serial numbers, and centralized databases, which depend on manual verification and are vulnerable to data manipulation and duplication. Although technologies such as QR codes and RFID have improved tracking, most systems still rely on centralized control, making them insecure and inefficient for real-time verification.

Existing solutions lack transparency, security, and a tamper-proof mechanism, and they fail to provide effective communication and traceability across the supply chain. This creates a need for a decentralized and secure system.

The proposed *Fake Product Detection Using Blockchain* addresses these limitations by offering a transparent, tamper-proof, and reliable platform for product authentication,

ensuring secure data storage and easy verification of product authenticity

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DISADVANTAGES

- **Lack of Transparency:** Centralized databases reduce visibility across the supply chain.
- **Easy Duplication:** Barcodes, serial numbers, and QR codes can be easily copied by counterfeiters.
- **Manual Verification:** Time-consuming process with higher chances of human error.
- **Poor Traceability:** Difficult to track the complete product lifecycle from manufacturer to consumer.
- **Low Security:** Centralized storage is vulnerable to hacking and data manipulation.

PROPOSED SYSTEM

The proposed *Fake Product Detection System using Blockchain* is a secure and decentralized platform designed to prevent counterfeit products and enhance product authenticity. Unlike traditional systems, it uses blockchain technology to store tamper-proof product information, ensuring transparency and security.

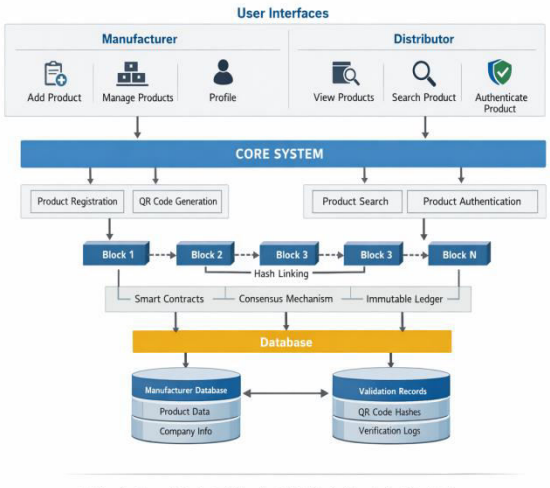
Each product is assigned a unique QR code linked to blockchain records, allowing users to verify authenticity instantly by scanning it. Manufacturers can register products with unique digital identities, while consumers and retailers can easily access product details and confirm whether the product is genuine.

The system ensures real-time verification, secure data storage, and complete traceability across the supply chain. By leveraging blockchain, QR codes, and smart contracts, it improves efficiency, reduces fraud, and builds trust among stakeholders

ADVANTAGES

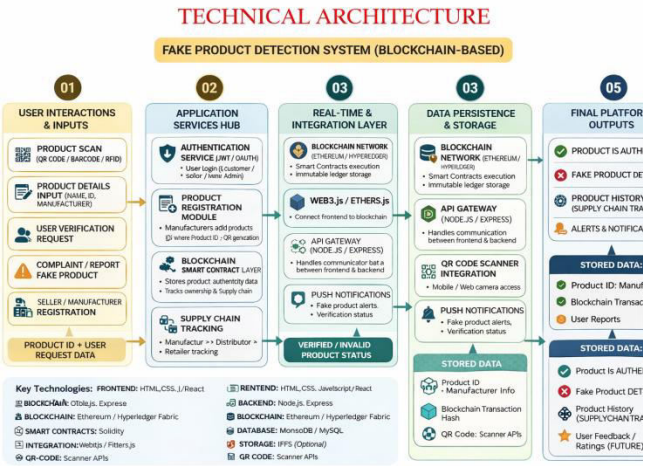
- **Improved Product Authentication:** Enables users to verify product authenticity easily using QR codes linked to blockchain records.
- **Increased Transparency:** Provides clear tracking of product details throughout the entire supply chain.
- **Enhanced Consumer Trust:** Builds confidence by offering secure and verified product information.
- **Faster Verification:** Allows instant product validation through quick QR code scanning.
- **High Security:** Ensures tamper-proof and decentralized storage of data using blockchain technology

SYSTEM ARCHITECTURE



Authentication of Product & Counterfeits Elimination Using Blockchain

Technical Architecture



SYSTEM REQUIREMENTS

Software Requirements :

Operating System : Windows 10/11, macOS 10.13 or later linux.

Frontend : React.js, React Routers,Context API, React Bootstrap.

Backend :Node.js,Express.js,Socket.ioDatabase : MongoDB Atlas.

Authentication : Google Auth 2.0,JWTDeployment :Docker,Docker Compose Environment : Visual Studio code

Hardware Requirements :

Processor : Intel Core i5 or higher.

RAM : 8 GB or more

Storage : 500 GB HDD/SDD

MODULE DESCRIPTION

Manufacturer Module: Enables manufacturers to register products, generate unique IDs, and create QR codes. It ensures accurate data entry and securely stores product details on the blockchain.

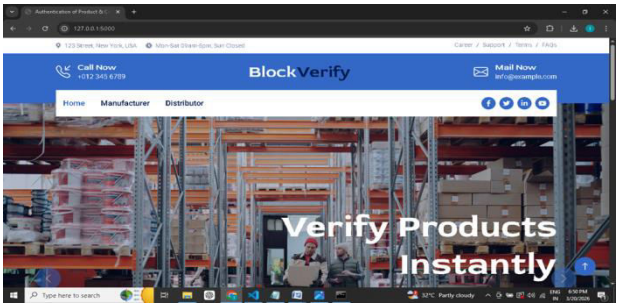
Distributor Module: Allows distributors to search and verify product authenticity by comparing digital signatures with blockchain records.

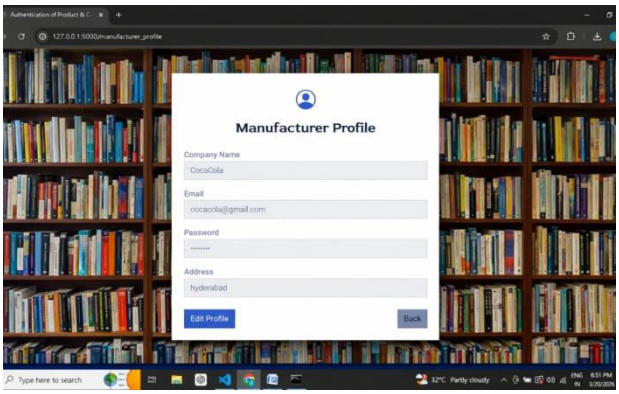
QR Code Generation Service: Generates unique QR codes for each product, which contain essential product information and are used for authentication.

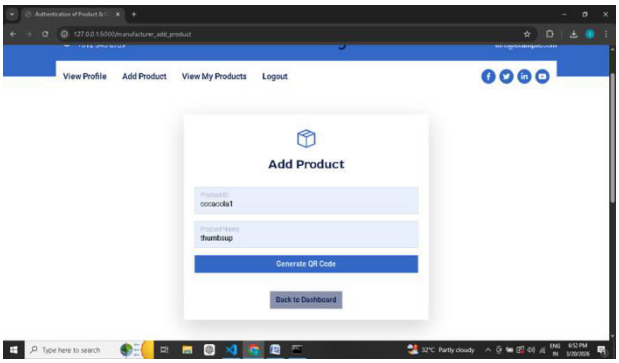
CHALLENGES&RISKS

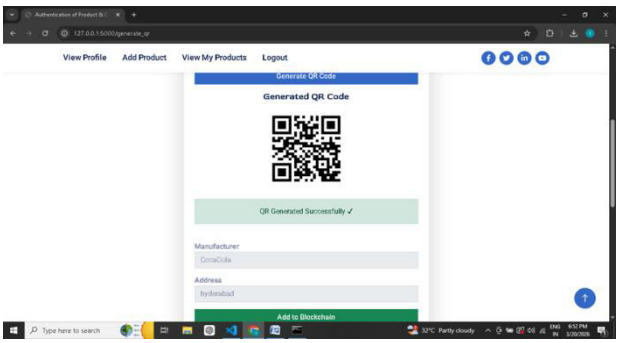
- **Scalability Issues:** Managing large volumes of product data on the blockchain may lead to increased storage requirements and slower transaction processing.
- **Implementation Complexity:** Integrating blockchain with existing systems (Python, MySQL, QR mechanisms) can be technically complex and require skilled resources.
- **Cost Factors:** Initial setup and maintenance of blockchain infrastructure can be expensive for small and medium-scale industries.
- **User Adoption:** Manufacturers, distributors, and consumers may resist adopting new technology due to lack of awareness or technical knowledge.
- **Data Privacy Concerns:** Although blockchain is secure, sensitive product or business data stored on a public ledger may raise privacy issues.
- **QR Code Misuse:** QR codes can be copied or tampered with if not properly secured with cryptographic validation.
- **Network Dependency:** Real-time verification requires internet connectivity, which may not always be available in all regions.
- **Security Risks:** While blockchain is tamper-proof, vulnerabilities may still exist in application layers such as APIs or user interfaces..

Screen Shots





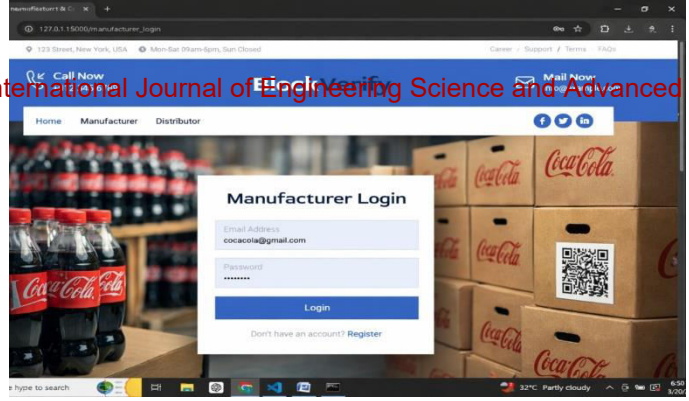




Result Analysis

The proposed *Fake Product Detection Using Blockchain* system was successfully developed and tested to verify product authenticity in a secure and efficient manner. The system demonstrated the ability to generate unique digital identities and QR codes for products, which were accurately stored and retrieved from the blockchain. During testing, the verification process provided real-time results, enabling users to quickly determine whether a product is genuine or counterfeit.

The use of blockchain ensured data immutability and prevented unauthorized modifications, thereby improving system reliability and security. The integration of QR code scanning simplified the verification process and enhanced user experience. Compared to traditional methods, the proposed system showed significant improvements in transparency, traceability, and trust among stakeholders. Overall, the system effectively reduced the risk of counterfeit products entering the supply chain.



Conclusion

In conclusion, the proposed *Fake Product Detection Using Blockchain* system provides a secure, transparent, and decentralized solution for product authentication. By leveraging blockchain technology, QR codes, and digital signatures, the system ensures tamper-proof data storage and real-time verification of products.

The solution effectively addresses the limitations of traditional authentication systems by enhancing security, traceability, and reliability within the supply chain. It helps reduce counterfeit product circulation, protects brand reputation, and builds trust among manufacturers, distributors, and consumers. Thus, the system serves as a robust and efficient approach for ensuring product authenticity in modern digital marketplaces

FUTURE ENHANCEMENT

The system can be further enhanced by integrating advanced technologies such as Artificial Intelligence and Machine Learning to predict and detect counterfeit patterns more efficiently. Mobile application support can be developed to improve accessibility and user convenience.

Additionally, implementing smart contracts can automate product registration and verification processes, reducing manual intervention. The system can also be scaled to support large industries by improving blockchain performance and adopting hybrid or private blockchain models. Integration with IoT devices and RFID technology can further enhance real-time tracking and monitoring of products across the supply chain

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