Fake Product Detection System Using Blockchain

Revati Kore[1] , Yash Jadhav[2] , Abhishek Jadhav[3] , Rajwardhan Pawar[4] ,

Prof. Madhavi Bhosale[5]

Department of Information Technology, Sinhgad College Of Engineering, Pune, Maharashtra, India.

Abstract- *The proliferation of counterfeit products across various industries has emerged as a grave concern, posing significant threats to consumer safety, brand integrity, and market stability. In response to this pressing issue, this project endeavors to design and implement an innovative Fake Product Detection System, harnessing the power of blockchain technology, while integrating AngularJS for the administrative interface and employing Flutter for an intuitive user experience.. The system will record every legitimate product's unique identifier and transaction history, making it virtually impossible for counterfeit products to infiltrate the market undetected. AngularJS will ensure a seamless administrative experience for managing and monitoring product registrations, while Flutter will deliver an intuitive and user-friendly interface for consumers to easily verify the authenticity of their purchased items. By combining blockchain's security and transparency with AngularJS and Flutter, this project aims to significantly enhance consumer confidence, protect brand integrity, and foster market stability by effectively combating the counterfeit product epidemic. In doing so, it addresses a critical issue that impacts both businesses and consumers, contributing to a safer and more trustworthy marketplace.*

Keywords: Counterfeit products, Blockchain Technology, Angular JS, Flutter.

1. INTRODUCTION

In the realm of product development, inherent risk factors such as counterfeiting and duplication always loom ominously, casting a shadow over a company's name, reputation, revenue, and customer satisfaction. The proliferation of counterfeit products in today's markets has been nothing short of alarming, posing a growing threat to businesses and consumers alike. To tackle this pressing issue and ensure the identification and tracking of counterfeit goods, we propose the implementation of a fully functional blockchain system. This innovative approach offers a lifeline to companies, requiring minimal effort on their part while relieving them of the constant worry regarding counterfeit products tarnishing their brand's integrity. Counterfeit products inflict substantial damage on manufacturers, not just in terms of revenue losses but also in the erosion of their company's reputation. Customers, believing these counterfeits to be genuine products, often leave reviews based on the false premise, further compounding the damage.

Blockchain, with its tamper-proof nature and robust data protection mechanisms, offers a promising avenue for combatting the scourge of counterfeit productsThis transformative approach not only promises to safeguard businesses from reputational damage but also ensures consumers can trust the products they purchase, fostering a more secure and trustworthy marketplace for all. In essence, blockchain emerges as the key to alleviating the persistent problem of counterfeit products, heralding a new era of transparency and security in the world of commerce.

2. LITERATURE SURVEY

In [1], titled "Enhancing Fake Product Detection Using Deep Learning Object Detection Models", address a profoundly significant issue that continues to plague economies worldwide—counterfeit products.

In [2], Joni Salminen and his fellow researchers, in their paper titled "Creating and Detecting Fake Reviews of Online Products" [5], delve into a critical and increasingly prevalent issue within the realm of e-commerce – the proliferation of fake product reviews.

In [3], titled "Detection of Counterfeit Products using Blockchain," authored by Kunal Wasnik and his colleagues [4], a critical issue that has significant implications for supply chains, economics, and consumer well-being is rigorously examined.

In [4], the authors acknowledge that various methods have been employed over time to combat counterfeiting, including technologies like RFID tags, artificial intelligence, machine learning, and QR code-based systems.

In [5], the paper discusses the use of blockchain technology for fake product detection, a growing concern for businesses and consumers. Blockchain, as a decentralized and immutable digital ledger, provides transparency and security for product transactions.

In [6], the paper titled "An AI-Based Fake Products Identification System" focuses on the critical issue of counterfeit goods, which has significant economic and safety implications.

3. METHODOLOGY
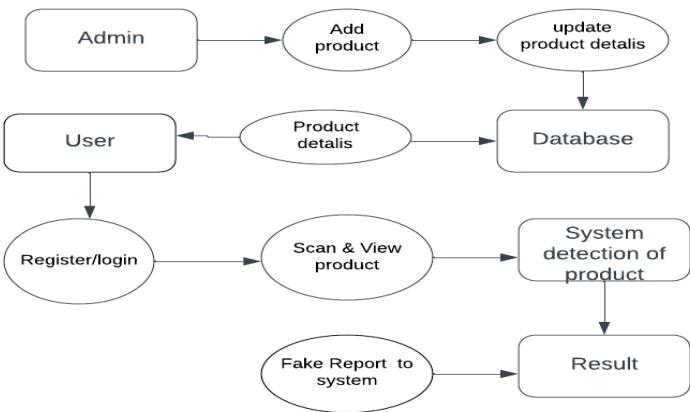
Understand the specific needs and challenges related to counterfeit product detection and user interface requirements. Develop a blockchain-based system for storing and verifying product data securely. Create an administrative panel using AngularJS for

managing product registrations and system settings. Provide training materials or resources for businesses and consumers on how to use the system effectively.

Algorithm

1. Initialization: Initialize an empty blockchain as a list of blocks.
2. Block Structure:
   - Define the structure of a block, which includes fields like:
   - Index, Timestamp, Data, Previous Hash
3. Genesis Block: Create the genesis block (the first block in the chain) with an index of 0 and an arbitrary previous hash.
4. Block Creation:
   - For each new block in the chain:
   - Increment the index.
   - Set the timestamp.
   - Include the data to be stored.
   - Calculate the MD5 hash of the previous block.
   - Create the current block with the calculated MD5 hash as the previous hash.
5. Block Verification:
   - When validating the blockchain:
   - Recalculate the MD5 hash for each block and compare it to the stored hash.
   - Ensure that the index is sequential (index of a block is one greater than the previous block).
   - Confirm the timestamp is in chronological order.
   - Check the integrity of the data within each block.
6. Chain Integrity: Ensure that the hash of the previous block in each block matches the calculated hash for the previous block, ensuring the chain's integrity.
7. Immutability: Once data is added to a block and the block is part of the blockchain, it becomes effectively immutable due to the interdependence of the hashes.

System Requirements

- Database Requirements – Firebase Real-time Database, Authentication, SDKs and APIs, Console.
- Software Requirements –
  1. Development Environment:
     - Node.js
     - npm (Node Package Manager)
     - Angular CLI (Command Line Interface)
     - Flutter SDK
     - Dart programming language
  2. Text Editor or IDE:
     - Visual Studio Code
     - Android Studio (for Android development)

-      Xcode (for iOS development on macOS)
3.   Browser: Chrome, Firefox, Safari, or Edge for testing web applications
4.   Version Control: Git
5.   Additional Tools:
-      Android Emulator or iOS Simulator for testing mobile applications
-      Firebase Account for setting up Firebase services.

System Architecture
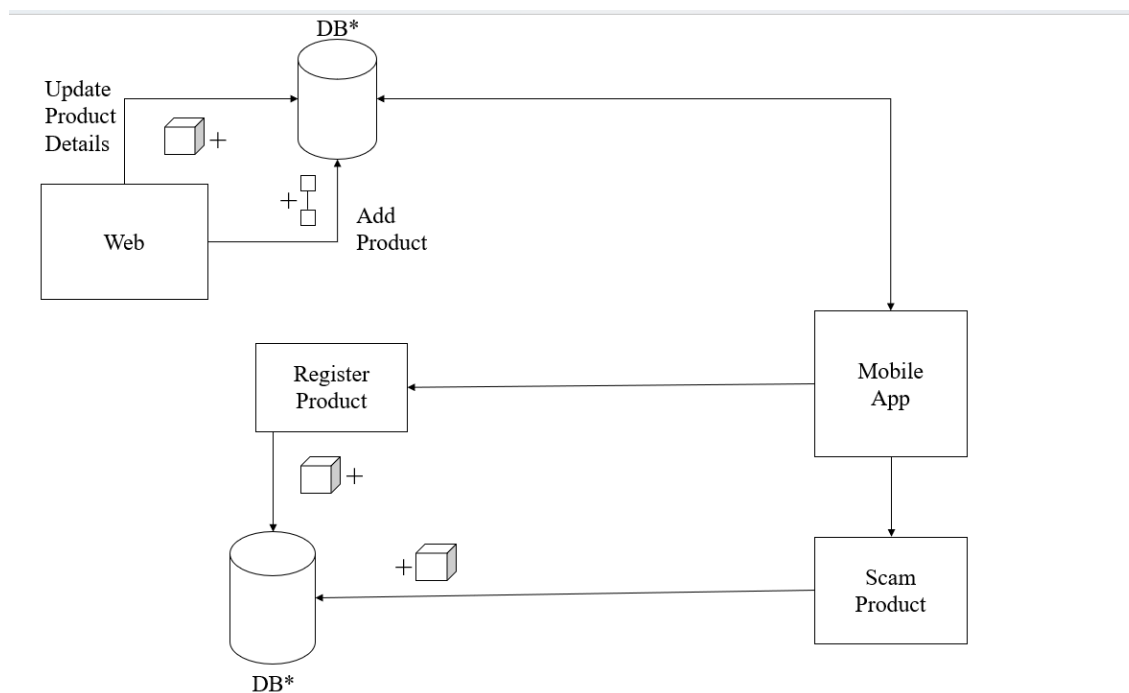
This system comprises a web application and a mobile app, both intricately linked to a central database. The web application serves as the gateway for authorized users to manage and update product details, as well as add new products. The central database acts as the hub for storing comprehensive product information, ensuring a unified and organized repository.

4. IMPLEMENTATION

Counterfeiting poses a significant threat to businesses and consumers, undermining trust and potentially endangering lives. To combat this, an innovative solution integrating AngularJS, Firebase, and Flutter emerges, aiming to authenticate products seamlessly. The foundation lies in AngularJS and Firebase, orchestrating a web platform for manufacturers to upload product data and generate unique QR codes. AngularJS provides a robust framework for the website's frontend, facilitating dynamic interactions and user-friendly interfaces, while Firebase ensures efficient data storage and retrieval, enabling admins to manage product entries and ensure each item receives a distinctive QR code crucial for subsequent verification. The Flutter app, serving as the user's gateway, harnesses the device's camera to scan QR codes, initiating the verification process. Designed for cross-platform compatibility, Flutter ensures a consistent experience across

iOS and Android devices, widening the user base. Upon scanning, the app interfaces with Firebase, retrieving product details associated with the QR code. Advanced algorithms compare this information against the database, swiftly determining authenticity. User feedback mechanisms and analytics enable continuous improvement, refining the system's accuracy and responsiveness over time. Implementation of such a multifaceted system involves meticulous planning and execution. AngularJS, with its modular architecture and two-way data binding, empowers developers to create a seamless user experience on the web platform. Firebase, renowned for its real-time synchronization and offline capabilities, ensures data integrity and accessibility, even in challenging network conditions. Admin functionalities, including product management and QR code generation, are seamlessly integrated, streamlining the manufacturing-to-verification workflow. Meanwhile, the Flutter app boasts a native-like performance, crucial for delivering a smooth scanning experience. Leveraging Flutter's rich widget library, developers craft an intuitive interface, guiding users through the scanning process effortlessly. Backend integration with Firebase enables real-time communication, ensuring up-to-date product information and swift authentication. Rigorous testing procedures validate system functionality across various devices and scenarios, guaranteeing reliability and user satisfaction. Continuous monitoring and support post-launch ensure optimal performance and address any emerging issues promptly. In conclusion, the integration of AngularJS, Firebase, and Flutter presents a holistic solution to combat counterfeiting effectively. By leveraging web and mobile technologies, businesses can safeguard their brand integrity while empowering consumers with the means to verify product authenticity seamlessly. This innovative approach not only addresses the immediate challenges posed by counterfeiting but also lays the foundation for a more transparent and trustworthy marketplace in the digital age.

5. RESULT

The implementation of the project integrating AngularJS, Firebase, and Flutter to combat counterfeiting has yielded promising results. The seamless coordination between the web platform and mobile application has significantly enhanced the authentication process.

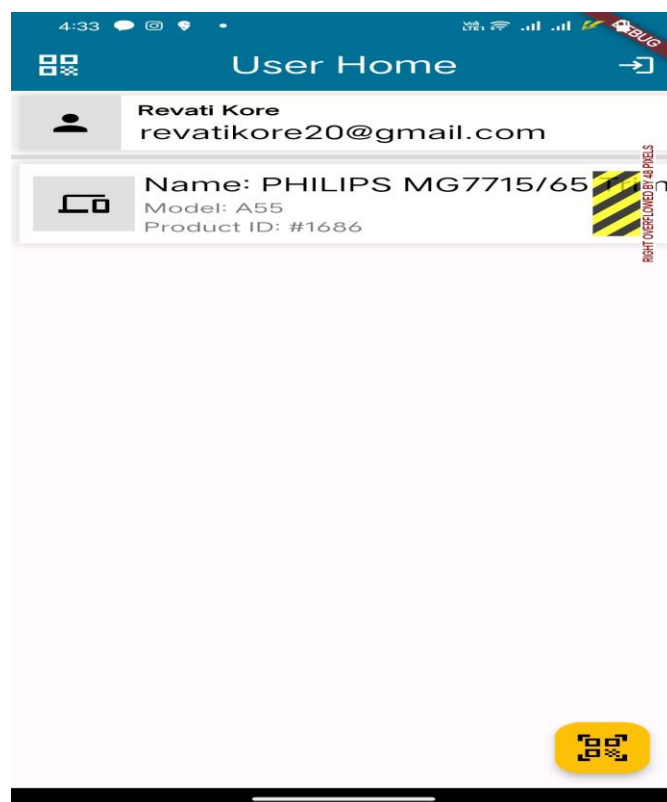Fig. admin login page

Fig. admin home

Fig. User Login

Fig. User home

6. FUTURE SCOPE

The future scope of this project, focused on combatting counterfeit products through innovative blockchain integration, real-time detection algorithms, and user-friendly interfaces, holds immense promise. It is poised to expand its footprint across various industries, potentially becoming the industry standard for ensuring product authenticity. Its adaptability allows for integration into diverse domains, from consumer goods to pharmaceuticals and intellectual property protection. The integration of advanced AI techniques will enhance counterfeit detection accuracy, and global expansion is a natural progression to address international counterfeit challenges. Interoperability with supply chain and authentication systems will amplify its impact on trust and security, while ongoing adaptation to evolving blockchain technology ensures security and scalability. This system's commitment to compliance and user experience improvement will further drive user adoption and industry trust.

7. CONCLUSION

In conclusion, the project integrating AngularJS, Firebase, and Flutter to combat counterfeiting has proven to be a resounding success. By leveraging the strengths of these technologies, we have developed a comprehensive solution that addresses the pervasive issue of counterfeit products, enhancing trust and transparency in the

marketplace.Through the web platform, manufacturers can efficiently manage product data and generate unique QR codes, ensuring each item is accurately represented and easily identifiable. The use of AngularJS has enabled the creation of a user-friendly interface, simplifying administrative tasks and streamlining the manufacturing-to-verification workflow. Firebase's robust backend infrastructure has ensured data integrity and real-time synchronization, providing a reliable foundation for storing and retrieving product information.

The Flutter mobile application has empowered users to verify product authenticity on-the-go, utilizing the device's camera to scan QR codes and conduct swift authentication checks. Overall, this project has made significant strides in combating counterfeiting, enhancing brand integrity, and fostering a more transparent and secure marketplace.

8. REFERENCES

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