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# Fake Product Detection Using Blockchain Technology

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***Abstract*: In recent years, Counterfeit products play an important role in product manufacturing industries. This affects the companies name, sales, and profit of the companies. Blockchain technology is used to identification of real products and detects fake products. Blockchain technology is the distributed, decentralized, and digital ledger that stores transactional information in the form of blocks in many databases which is connected with the chains. Blockchain technology is secure technology therefore any block cannot be changed or hacked. By using Blockchain technology, customers or users do not need to rely on third-party users for confirmation of product safety. In this project, with emerging trends in mobile and wireless technology, Quick Response (QR) codes provide a robust technique to fight the practice of counterfeiting the products. counterfeit products are detected using a QR code scanner, where a QR code of the product is linked to a Blockchain. So, this system may be used to store product details and generated unique code of that product as blocks in the database. It collects the unique code from the user and compares the code against entries in the Blockchain database. If the code matches, it will give a notification to the customer, otherwise it will give the notification to the customer that the product is fake.**

***Keywords*: Counterfeit product, QR code, Blockchain, Solidity, Smart contracts.**

## 1. Introduction

The global development of products and technologies entails risks such as counterfeiting and duplication, leading to potential harm to a company's reputation, revenue, and customer well-being. To address this issue, blockchain technology can be employed, offering a secure and tamper-resistant way of recording information. A blockchain is a decentralized digital ledger that duplicates and distributes transactions across a network of computers. Each block in the chain contains multiple transactions, and new transactions are added to all participants' records. By generating a hash code for each product and creating a chain of transactions, blockchain ensures the genuineness of products. A proposed system involves assigning a QR code to a product, allowing end customers to scan it and access comprehensive information, thereby verifying the product's authenticity.

### *A. Objective of Project*

The idea of this project came into existence because of the increase in the counterfeit products. The objectives of this project are:

1. To Design Anti Counterfeit System using Blockchain.
2. To secure product details using a QR code and image.
3. Provide security to the clients by offering data to client.

### *B. Scope and Limitation of Project*

In recent years, the spread of counterfeit goods has become global. There are many fake products in the current supply chain. According to the report, fake product incidents have risen in the last few years. It is necessary to have a system for customers or users to check all the details of the product so that users can decide that the product is real or fake. In India currently, there is no such system to detect counterfeit products. So, the solution involves a simple QR code-based identification that can help the end-user or customers to scan and identify the genuineness of the product by using a smartphone.

The limitations of using blockchain for fake product detection are as follows:

1. *Data accuracy:* The integrity of the blockchain relies on accurate data entry; incorrect information can compromise its effectiveness and lead to false verification results.
2. *High implementation costs:* Implementing blockchain can be expensive, especially for small businesses, potentially limiting its widespread use and effectiveness.

## 2. System Design

### *A. System Architecture*

System architecture refers to the design and organization of software and hardware components of a system to meet certain functional and non-functional requirements.

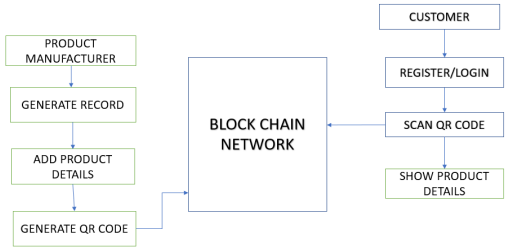


Fig. 1. System architecture

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The above diagram represents the architecture of fake product detection using blockchain technology in which it contains the fields like product manufacturer, generate record, add product details, generate QR code, blockchain network, customer, register/login, scan QR code, show product details.

Firstly, product manufacturer will manufacture the product with unique identifier and product name then generation of QR code is done based on the unique ID. The QR code is appended to blockchain network through metamask. Further, customer will scan the QR code and get the authentication of product.

### *B. Use Case Diagram*

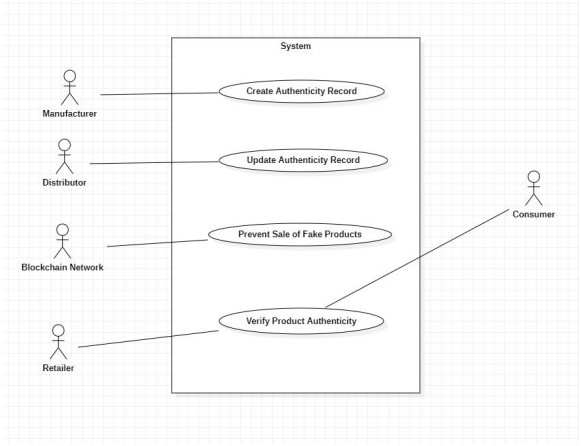



Fig. 2. Use Case diagram

The above figure 2, describes the functions that a system performs to achieve the user's goal. It describes how the actor(user) interacts with the system.

### *C. Class Diagram*

Class diagram shows a collection of classes, interfaces, associations, collaborations, and constraints. It is also known as a structural diagram

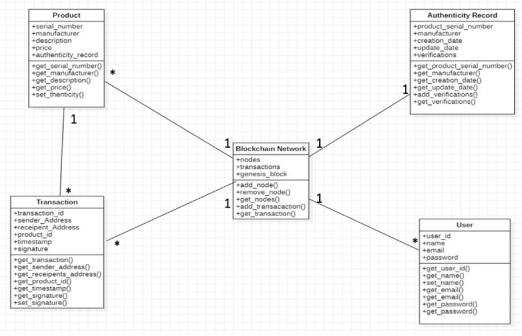



Fig. 3. Class diagram

The above diagrams fig. 3, describes the class diagram of the system. It shows the attributes and operations of various classes and it shows the dependency and multiplicity among different classes.

### *D. Sequence Diagram*

The sequence diagram represents the flow of messages in the system and is also termed as an event diagram. It helps in envisioning several dynamic scenarios. It portrays the communication between any two lifelines as a time-ordered sequence of events, such that these lifelines took part at the run time. In UML, the lifeline is represented by a vertical bar, whereas the message flow is represented by a vertical dotted line that extends across the bottom of the page. It incorporates the iterations as well as branching.

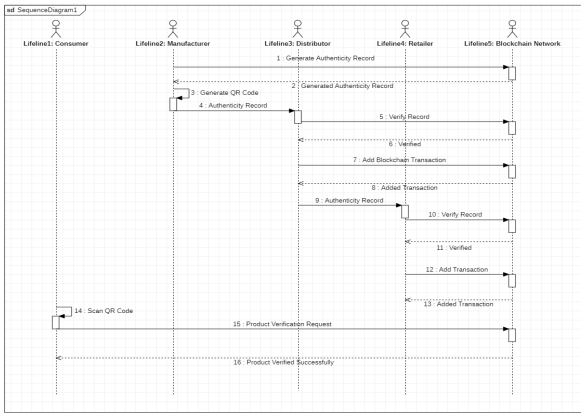



Fig. 4. Sequence diagram

The above fig. 4 depicts the sequence flow included with the time and it describes how the system interacts with the user.

### *E. Activity Diagram*

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system.

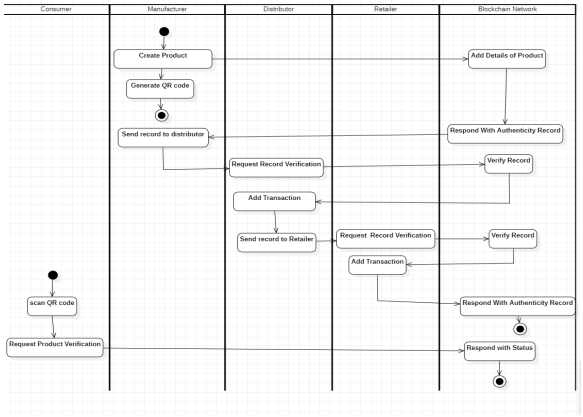



Fig. 5. Activity diagram

## 3. Implementation

The method of implementation deals with how the system being implemented, the technologies involved in developing the software and executing the software. The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are to be written and tested. The user can then change over to his new fully tested system and the old system is discontinued.

### *A. Technologies Used*

The technologies that are used in the project are:

- Blockchain

- Solidity
- HTML
- CSS
- JavaScript

### *B. Security Algorithm*

*SHA 256:* The SHA-256 algorithm is one flavor of SHA-2 (Secure Hash Algorithm 2), which was created by the National Security Agency in 2001 as a successor to SHA-1. SHA 256 is a patented cryptographic hash function that outputs a value that is 256 bits long

1. Sha-256 algorithm is used in blockchain to get a constant hash of 256 bits every time. This algorithm, is also part of encryption technology. So, now let's see how this algorithm works.
2. In this there is some data called IV which is of 256 bits. Now the input we get will be in the very large. So, be break it in size of 512 bits.
3. As the input will always be not a perfect multiple of 512 bits, So, some part of input will be left.
4. To this left input we do a padding concatenate the input with 10 bits before it. Now our input is perfect multiple, so we can proceed further.
5. Now 512-bit input is added with 256 bits IV to get total of 768 bit. These 768 bits is passed through compression function 'c' to get an output of 256 bit only.
6. This output 256 bit is again merged with 512 bits input from block B2.
7. Again, the total is passed through the compression function to yield a 256- bit output. This loop goes on fill the last block (block n).

## 4. Result

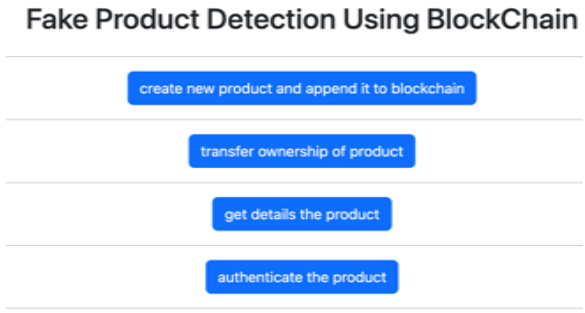



Fig. 6. Home page

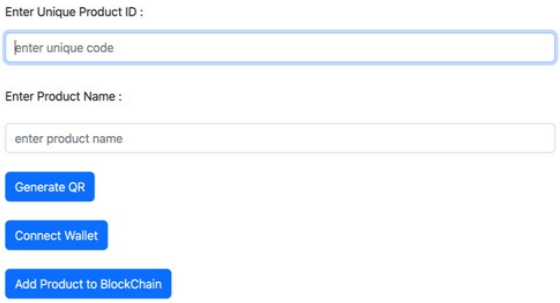



Fig. 7. Manufacturer page

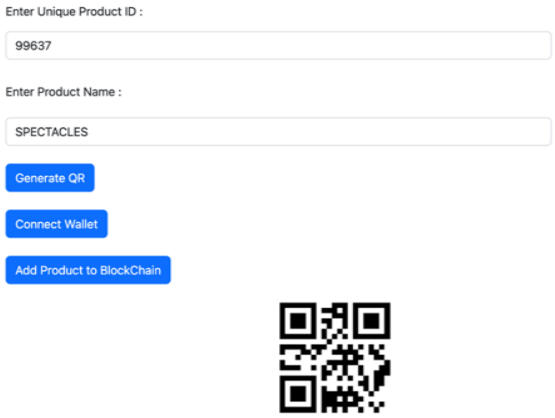



Fig. 8. QR code generation

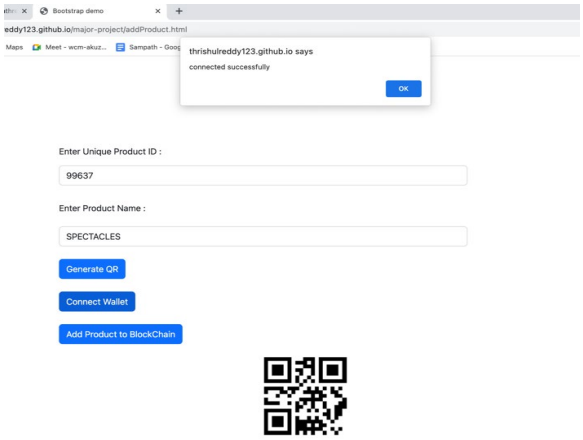



Fig. 9. Wallet connection

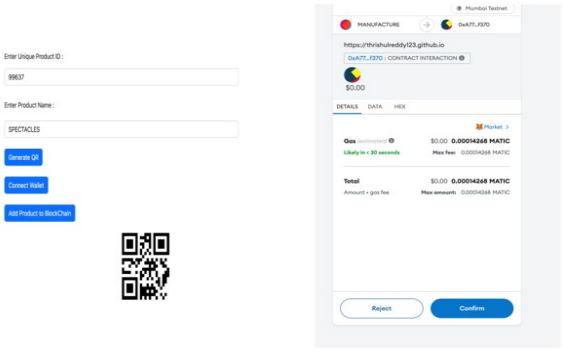



Fig. 10. Adding product to blockchain

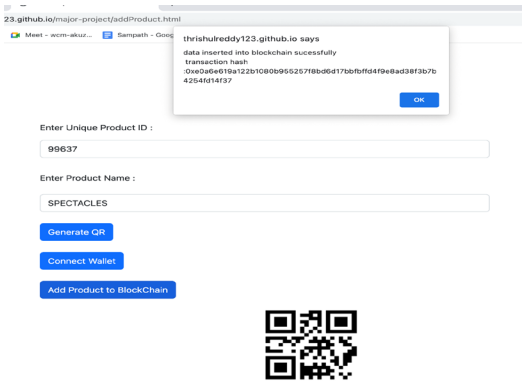



Fig. 11. Product added to blockchain technology successfully

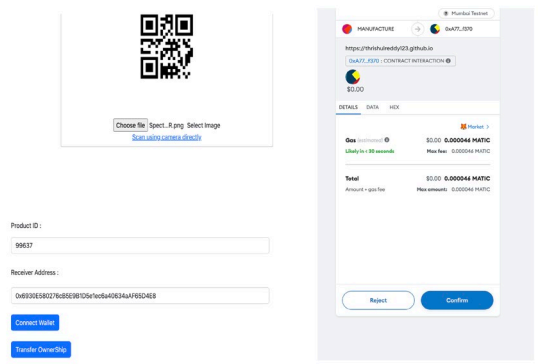
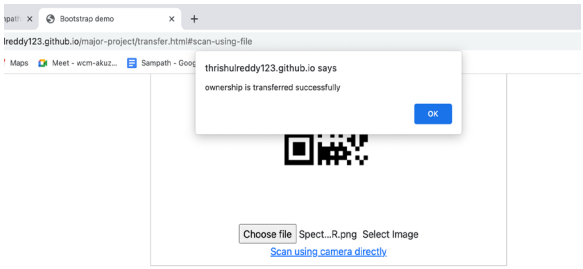



Fig. 12. Transfer ownership



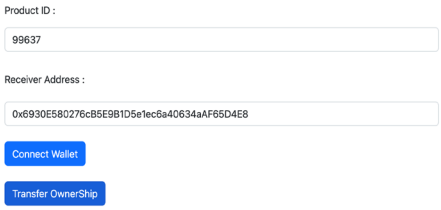
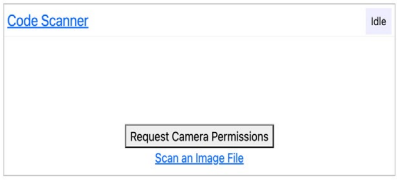




Fig. 13. Successful transfer of ownership



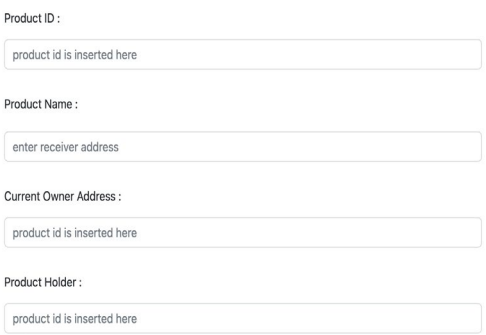
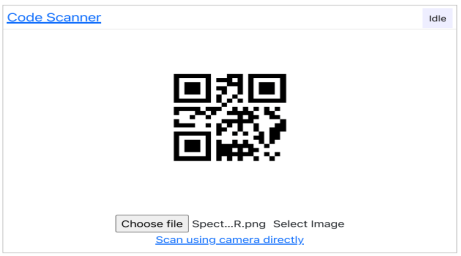




Fig. 14. Details of product



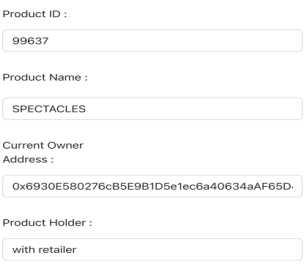
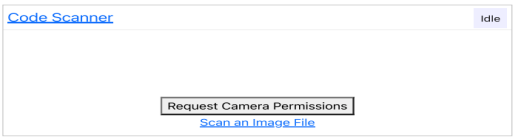




Fig. 15. Successful fetching of product details



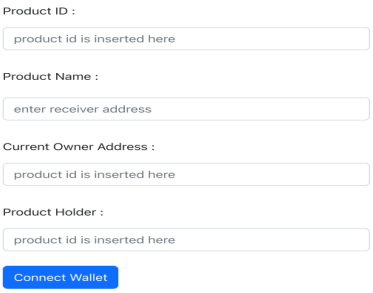




Fig. 16. Authentication of product

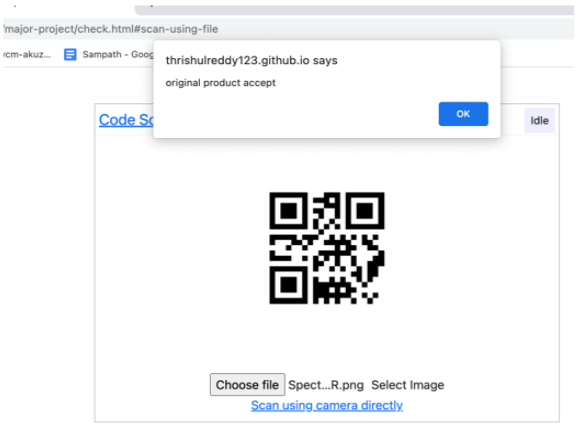



Fig. 17. Successful authentication

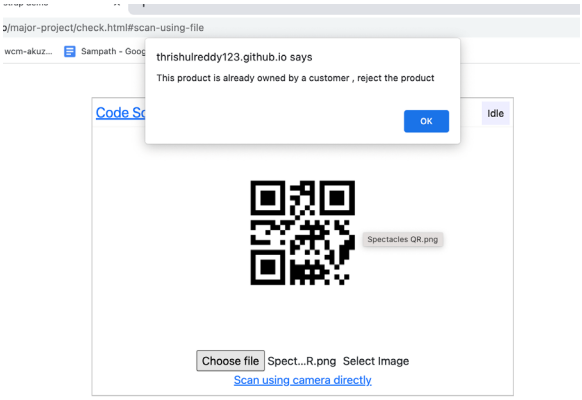



Fig. 18. Fake product detection

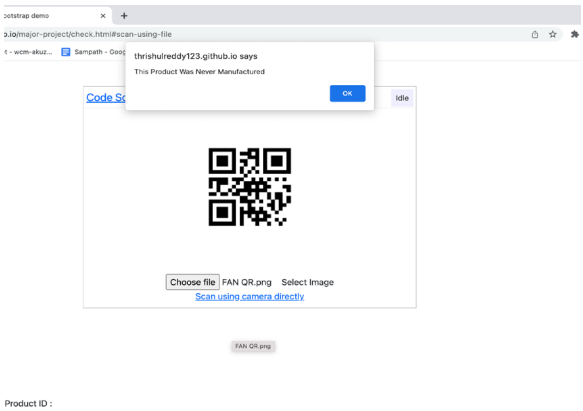



Fig. 19. Product not added to manufacturer

## 5. Conclusion

In conclusion, the use of blockchain technology to detect fake products has the potential to significantly improve product authenticity verification. By leveraging the immutable and decentralized nature of blockchain, the system can ensure that product data is recorded accurately and cannot be altered or tampered with. This increases transparency and trust in the supply chain and helps to combat the proliferation of fake products.

Overall, the adoption of blockchain-based product verification systems can help to protect consumers, businesses, and the broader economy from the negative impacts of fake products. It has the potential to create a more secure and trustworthy supply chain ecosystem and enhance the integrity of global trade.

## 6. Future Enhancement

The use of blockchain technology to detect fake products is a promising approach that can significantly improve product authenticity verification. Here are some potential future enhancements to this approach**:**

*Integration with AI and machine learning:* Integrating AI and machine learning algorithms can improve the accuracy of product verification by detecting patterns in data that may be difficult to detect manually. Machine learning algorithms can also help identify and flag suspicious activity in the supply chain, such as abnormal product movements or suspicious transactions.

*User-friendly interfaces:* User-friendly interfaces can make the blockchain-based product verification system more accessible to consumers, businesses, and other stakeholders. For instance, mobile applications can be developed to scan product codes and provide real-time verification results. This can improve the adoption of the technology and enhance its effectiveness in combating fake products.

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