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Fake Product Identification using Blockchain

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Abstract: *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. 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 (Fake) product, QR code, Blockchain, Supply Chain, Transaction history

I. INTRODUCTION

Every time a product is developed, there are risk elements like copying and counterfeiting that could harm the brand name, income, and consumer happiness. The sale and promotion of fake goods are expanding quickly. A fully working blockchain system is suggested to ensure the identification and monitoring of fake items or products as well as to combat this situation. Businesses may stop worrying about fake goods by investing very little time and money. Because consumers mistakenly believe that the product is a legitimate offering from the company, counterfeit products have a significant negative impact on manufacturers' reputations and brand values. Blockchain is a decentralized, distributed technology that uses chains to connect blocks of data stored in a database. Every time new data is added to databases, it is combined with the already existing data by chaining new blocks together. Every time data is added to an existing block of data using blockchain, no user is permitted to edit the data. As a result, the data in the blockchain cannot be deleted or modified, ensuring data security and protection. Blockchain assists in addressing the issue of counterfeit goods.

II. BLOCKCHAIN BACKGROUND

A decentralised system called a blockchain is spread among the machines in a computer network. Blockchains act as databases, storing data in the form of blocks and chains. Cryptocurrency like bitcoin is one of the blockchain's most widely used and successful real-world applications. The technique used by blockchain to store transaction records is more safe and secure. Our data is guaranteed to be secure by blockchain.

Traditional databases and blockchain databases are very similar. The main distinction between both is how the data is organised in databases, even though both are used to store data. A typical database keeps data as it is entered by the user, whereas a blockchain stores data in units called blocks that are connected to one another by chains. Hashing is the technology used in block and chain systems. Each block has its own capacity and information. When a block is fully filled, a new block is linked to it, and the newly added information is placed there. This process is repeated as long as new data are added.

Blockchain offers us a distributed, decentralised database that is noneditable, which is one of its key benefits. As a result, the blockchain does not give us the functionality to update our existing data.

III. HOW DOES BLOCKCHAIN WORK?

As we see from the discussion above, the main objective of blockchain is to make recorded data irrevocable. The approximately five steps that make up how a blockchain operates are as follows:

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- A user must be authenticated by the transaction blockchain before they can input data..
- A new block is created with transaction data stored after authentication is complete.
- Every node of the computer network receives a copy of the newly created block.
- With the aid of chaining techniques, the authorised nodes carry out their processes for confirming the transaction, after which the transaction's details are added to already-existing blocks.
- Once more, updates are dispersed throughout the network,

The transaction history is thus finally finalised to be maintained in blockchain databases. The subsequent picture displays the same procedures.

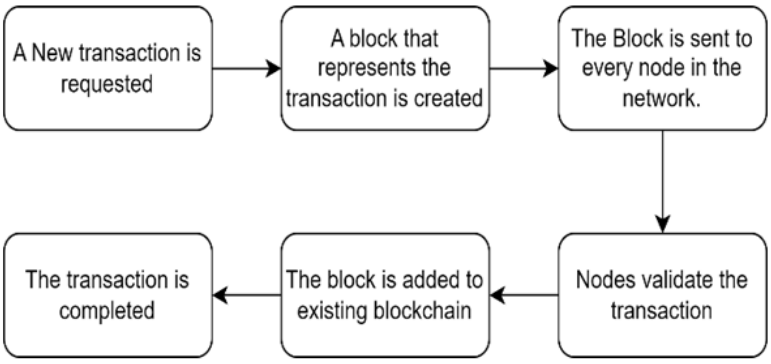

Figure 1. Working of Blockchain.

IV. BENEFITS OF BLOCKCHAIN

- **Accuracy:** Since the blockchain is a distributed system, the blockchain's database is split among several nodes on computer networks. This implies that the user will never learn where the blockchain's database originates. Because fewer people are involved in the development of this technology, there are fewer opportunities for human mistake, which reduces computational error caused by blockchain technology and increases accuracy.
- **Cost Savings:** Because blockchain does not require the involvement of third parties like banks, it can significantly lower transaction costs. For instance, the bank will take a small percentage of the money paid to business owners each time they accept credit card payments. Yet, because blockchain lacks a centralised authority, transaction fees will either be nonexistent or extremely low.
- **Decentralization:** As we can infer from the definition of blockchain provided above, it is a decentralised distributed system. The blockchain database is therefore duplicated and dispersed among other machines in computer networks. So, each computer must update its blockchain to reflect the change whenever a new block needs to be added to the database. Blockchain becomes harder to tamper with as a result. Even if a hacker attempted to change the blockchain, only that copy would be altered; the rest would remain unchanged. Hence, the decentralisation feature of blockchain contributes to data security.
- **Efficient Transaction:** Transactions on the blockchain are efficient because they are decentralised and not controlled by a single entity. Since authorities only conduct transactions during business hours, if we begin a transaction on Friday, it will take three days to complete, or until Monday. However, the blockchain is operational around-the-clock. The transaction is also completed using blockchain in less than 10 minutes. Blockchain similarly speeds up cross-border transactions that would often take longer to complete if handled by traditional authorities due to issues with time zones and other factors. Blockchain thus offers a reliable method for transactions.
- **Transparency:** Transparency is made possible by blockchain because the majority of them are open-source databases. This will enable us to review the code and provide suggestions for how to make blockchain technology better. As a result, blockchain is totally transparent to the user. Only if the majority of network users agree will the suggestions be implemented.

V. PAPER SURVEY

Paper [1] gives us a straightforward flowchart that helps us determine whether or not we need blockchain for our

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initiatives. It offers various scenarios, and by ignoring them, you may determine whether or not blockchain technology is necessary.

Paper [2] [3] gives us a thorough explanation of blockchain technology. It provides comprehensive details regarding the blockchain's history, advantages, disadvantages, architecture, and security.

Paper [4] presented a system for identifying counterfeit goods. The suggested system is to create a QR code for a product that contains all of its information and store that QR in a blockchain database. When a customer or distributor purchases the same product and scans the QR code that is embedded in the product, the system determines whether the product is genuine or fake based on whether it matches the stored QR code.

Paper [5] [6] [9] gives us details about the blockchain-based supply chain management solution. Blockchain technology has the potential to improve product traceability, authenticity, and legality in a more cost-effective manner by creating a permanent, shareable, auditable record of products across their supply chain.

Paper [7] [8] gives us details regarding the texture of QR codes and their authenticity. It is simpler to counterfeit critical printed material, such as important documents, the anti-counterfeit label on merchandise, packaging, etc., due to the widespread use of high-quality printing and scanning QR codes.

Paper [10] offered a straightforward QR code-based method in which the consumer validates the product's authenticity by comparing its QR codes to those stored on their device.

Literature Survey

VI. COMPARISONS OF DIFFERENTANTI-COUNTERFEITING TECHNOLOGIES

Several anti-counterfeiting systems are displayed in the following table [1], along with comparisons between them.

Index	Technology	Product Type	Advantage	Limitation	Blockchain
1.	Magnetic Strips	Hotel key Cards	1.More Secure than barcodes. 2. Fast and Easy to use.	1. Perhaps harmed even by minor scratches. 2. Does not function from far away	No
2.	RFID	Any	Dependable track and trace in any setting.	1.Reader collision. 2.Transmitting through metal things is impossible	No
3.	Security Hologram	Currency	If tried to remove it leaves residue behind.	1. Producing takes a lot of time and money. 2. Easy to clone.	No
4.	Barcodes	Daily use products	1.Simple implementation. 2.Scalable	1. Easy to replicate. 2. Editable	No
5.	Laser Engraving	Metal Products	1. Permanency 2. Fast Development speed	1.Expensive 2.Can be replicated	No
6.	DNA Coding	Medicines	1.Very difficult to replicate. 2.Easy to encrypt data.	Unstable and sensitive to harsh environment	No
7.	Digital Watermark	Digital Documents	1.Easy to implement 2.Hard to remove	Limited to digital world only.	No
8.	Hashing Algorithm	Digital Biodata	Hard to replicate	1. Easy to encrypt and decrypt 2. Security issues	No
9.	Fingerprinting	Digital Content	1.High security. 2.Non-transferable	1.System failure 2.High cost	No

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10.	Blockchain	Any	1. Can be used when making something. 2. Once stored, data cannot be changed.	1.Demands high memory. 2. Expensive to implement.	Yes

VII. METHODOLOGY

7.1 Proposed System

We need to create a complete application system that will enable us to recognize these counterfeit goods because their prevalence is expanding globally. The system that is suggested in this paper will store the product's source chain and preserve the items' ownership histories. In order for the buyers who purchase these goods to examine all of the product's details and make an informed decision about whether the thing is legitimate or not. To validate the products and add product information, we will employ QR codes. Also, we need to employ a mechanism to store product data that prevents unauthorized users from altering the data; blockchain technology can help with this.So, to identify bogus products in this suggested system, we are employing blockchain and QR codes.

7.2 System Model

Blockchain is built for the proposed system utilizing a piece of personal software named Ganache. A blockchain network created by Ganache is employed for recording and overseeing transactions. We must utilize the ganache software, which facilitates the implementation of blockchain, in order to use the Ethereum blockchain. A web browser extension called Metamask serves as a conduit between a website and the blockchain. Both the web page and the blockchain's smart contracts are created using the node.js and solidity programming languages, respectively.

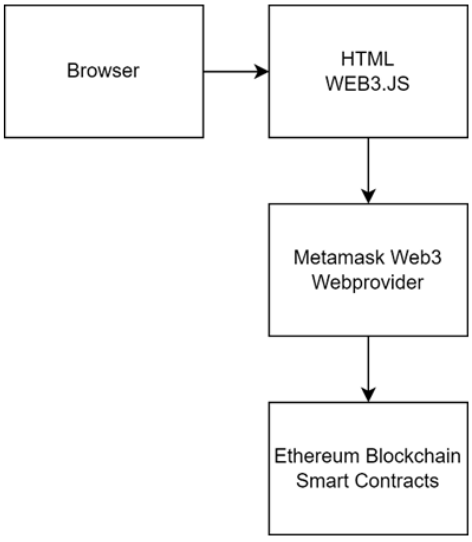

Figure 2: System model of Proposed System

7.3 Tools Requirement

- **Ganache**: A software package called Ganache is used to create your own Ethereum blockchain. Your blockchain is deployed to the network using this method. It facilitates Ethereum blockchain stimulation so that you may communicate with your blockchain-based smart contracts.
- **Metamask**: A web browser extension called Metamask serves as a conduit between the browser and the Ethereum blockchain and facilitates the use of an Ethereum blockchain wallet by the user.
- **Truffle Suite:** A framework called truffle allows us to create a setting for creating blockchain-based smart contracts.
- **NodeJS:** Nodejs is a framework that is used todevelop the web page of the website.
- **Solidity:** Solidity is a programming language. It isused to write smart contracts in blockchain.

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7.4 Flow of Proposed System

The system keeps track of the product's ownership status, including the manufacturer, the current owner, the product's ownership history, and a QR code.

Stage 1: Procedure for registering a product: The maker will be the product's initial owner. In order to upload fresh product data to the blockchain, the manufacturer will put a QR code to the product and add it to the blockchain's database.

Stage 2: Chains of distributors: The manufacturer will send the product to the distributor in the following stage. The distributor will scan the QR code when he receives the product and add a new chain with his network data, product ownership, time stamp, and date.

Stage 3: Final User: At the end of the supply chain, the customer will take the product, visit the website, upload the QR code, and then be able to access all the product's information, from the producer to the final store. He had the option to purchase the product after receiving the information.

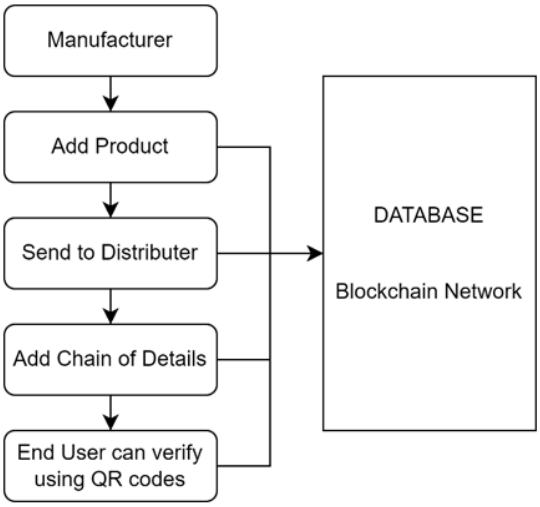

Figure 3: Block Diagram of Proposed System

VIII. LIMITATIONS AND FUTURE WORK

The suggested system indeed protects retailers, manufacturers, and customers from products that are counterfeited, but it fails when a QR code is taken from a legitimate product and given to a false product, making the product that is sold first genuine regardless of whether it is genuine or fake. Also, because every product's supply chain must be stored, this system will cost a lot of money.

The next step is to put this idea into practice and try to overcome the limitations. One way to do this is to incorporate some material inside the product so that when someone tries to scan a QR code, a chip or other device will transmit a signal.

IX. CONCLUSION

As a result of the discussion above, we can conclude that creating a fully functional application that can determine whether a product is genuine or fake actually aids in the expansion of the retail industry, gives the consumer confidence that the product he is purchasing is authentic and branded, and aids manufacturers in upholding the reputation and value of their brands. The only new technology in the world of current technology that offers additional functionality and security for data that is kept is blockchain. Thus, blockchain-based applications are a godsend for all buyers and producers.

We have shown a fully working application in this study that enables users to determine if a product is authentic or phoney. The producer created an integrated QR code to allow third parties to add additional details to the product for the first time and recorded the information in the blockchain. Other parties will add their ownership information to the goods at the time of delivery. At the end, the client may scan the QR code, look up the product's history, and determine whether or not the goods is authentic.

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