Counterfeit Product Detection System Using One-Time QR code

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Abstract

Counterfeit goods have become particularly crucial issue in the product manufacturing industry in recent years. This phenomenon has an impact on company sales and profits. This problem affects a variety of industries, including pharmaceuticals, electronics, jewellery, and cosmetics. We also recognize that in today's fast changing digital environment, smartphones have become both common and necessary. Various smartphone applications have been developed, allowing us to increase our productivity while also saving time. In recent years, several digital technologies have been introduced, such as QR codes, barcodes, OTP verification, call verification, and so on for detecting falsified products. However, due to reasons such as complicated functionality, easy cheating, and poor user experience, they were unable to implement these ideas on a large scale. A one-time QR code-based solution is used to ensure the identification of real products across the supply chain and at the consumer end, avoiding product counterfeiting. By using this system, consumers can easily differentiate between genuine and tampered or counterfeit product without any registration. The proposed system also helps the organization get data of the customers based on the region where their product is being sold. The given approach is quite scalable, fool-proof and cost effective as it uses centralized database, QR code generator and scanner.

Keywords: Counterfeit; QR code; Centralized Database; Scratch label

1. Introduction

The majority of the time, fraudsters sell counterfeit or falsified products which spoils the reputation of an organization in various sectors such as electronics, pharm, etc. QR codes [1], barcodes, OTP verification, call verification systems are also available. However, these systems are complicated, and easy to cheat. The given approach is primarily intended to detect genuine products. The proposed system is separated into two parts: an admin-side QR code and key generator for organization and a QR code scanner for consumers.

1.1 Main objective

The proposed system is a combined system which includes a admin-side software for industry or organization and android application for consumers. In this system, the higher authority of the organization, will have the responsibility to generate the required number of QR codes with their corresponding keys, upload the generated keys to the database, apply the generated QR codes on the packaging of the product along with scratch label. A consumer has to install the android application in order to scan the QR code of the product while buying it. If the product is original the app will display the message accordingly. The major objective of this system is to help the consumer to get the genuine product that they deserve the as well as prevent consumers from buying falsified products. This system will also help the organization to collect the data related to the location and region of the consumers.

Following are the advantages of the proposed system:

- Simple and easy to use

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- Time-saving, scalable and effective
- No registration required
- Difficult to cheat and almost foolproof
- Single-click operations
- Almost zero maintenance and cost effective

1.2. Problem statement

- Development of a Counterfeit Product Detection System
- Differentiate between original and falsified product
- Collecting necessary data from customers for further use.

1.3. Feasibility

- Economic feasibility: Because both the admin-side application and the smartphone application include single-click procedures, the designed solution is time efficient.
- Technical feasibility: The system is relatively low-cost as it does not require any additional hardware.
- Behavioral feasibility: The system is straightforward and easy to use. All of the operations are usually done with a single click.

1.4. Characteristic of proposed system

- User Friendly
- Time saving
- Instant result/output
- Cost effective
- Almost fool proof

2. Related Approaches/Work

The authors of [2] proposed a novel QR code-based solution that stores keys in a decentralized database. The system can be readily fooled if identical copies of QR codes are put to a fake item. Because they can't verify the reality of items in this system, they created the POM [3] system, which seeks to mimic the real products of counterfeiters. Consumers can refuse to buy counterfeit products even if they have a valid product code if the seller does not have their ownership. This method can detect a number of fake products, but it is vulnerable to identical tags. After copying the RFID tags attached to the genuine product, the attacker inserts the counterfeit duplicate label into the supply chain.

The author called for a de-centralized Block chain technology [4] method so that users do not have to rely on sellers to decide whether the products are fake or genuine. As a result, businesses may use this technology to provide authentic products without having to operate their own retail stores. It has the ability to reduce expenses dramatically while maintaining product quality. While supplying firms with limited financial resources, technology can successfully decrease the threshold for legitimate items. It's also a more direct means of guaranteeing clients that they won't be misled into purchasing counterfeit goods. There is no code simplification or redundancy[5].

The maker chain de-centralized application (DApp) was created to demonstrate how individual producers can self-organize around tailored demands [6]. To strengthen security and prevent phoney products, it incorporates a low-cost and simple to install chemical signature twinning with QR code. On a big scale, distributed production prototypes and mass personalization are not yet commonly used.

The authors have presented an anti-counterfeiting strategy based on RFID [7], which is used to detect counterfeit products at the point of sale. They proposed using a lightweight and low-cost tag for deployment in large-scale industry in this system. Product return scenarios, security verification, and application testing are not available. They offered an open architecture product in this research to track the authenticity and quality of products, as well as to manage the internet-based credit of chemical manufacturing among many builders. That signature's method is used to indicate the unique properties of customized products.

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They developed a block supply chain-based new de-centralized supply chain [8] that uses Near Field Communication (NFC) technologies and block chain to discover attacks on bogus products. The block supply chain features technologies for product tracking and traceability, as well as detection of moderation, reproduction, and reapplication of tags. They developed a new scalable and secure protocol for this chain. For big networks, it is particularly efficient and reliable. It will be a good fit for massive block chains that need to be completely de-centralized. The number is constant, which is a piece of information that can be manipulated by an opponent. Even yet, there are some flaws in the supply chain. The authors submitted a study to investigate trust issues and use validation to solve supply chain challenges.

3. Proposed System

This section covers the tools and techniques required to create counterfeit product detection system, as well as the system's overall functionality.

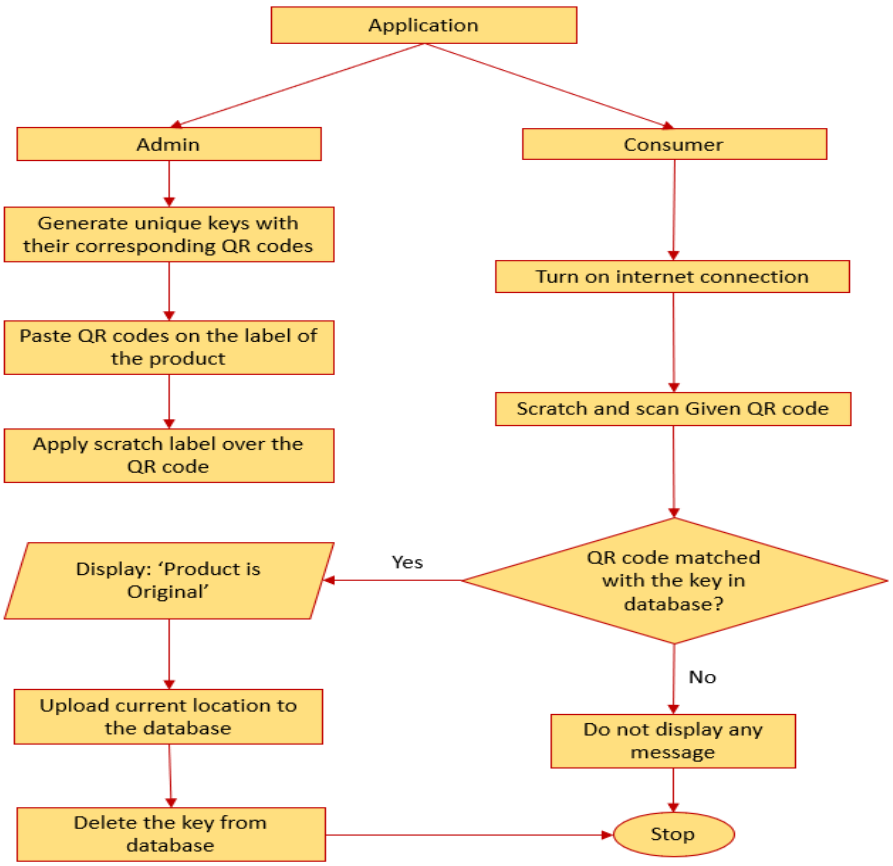

Figure 1: Architecture Diagram

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The proposed model (Figure 1) is separated into two modules: the first is for higher authority of the company/industry, and it includes a QR code and their corresponding keys generator. This module's basic function is to generate unique QR codes with their corresponding keys and upload keys to the database. This is the primary module, which is aadmin-side application. When the manufacturer needs to manufacture the specific number of products, he/she will add that number in the input field of the software.

Then the software will generate the unique QR codes with their corresponding keys and upload it to the database. Then the manufacturer will apply these generated QR codes on the labels of the products manufactured as well as apply scratch label over the QR codes. Scratch labels are applied on the QR codes in order to prevent it from accidental scanning and tampering. A consumer should not accept the product if the QR code is scratched.

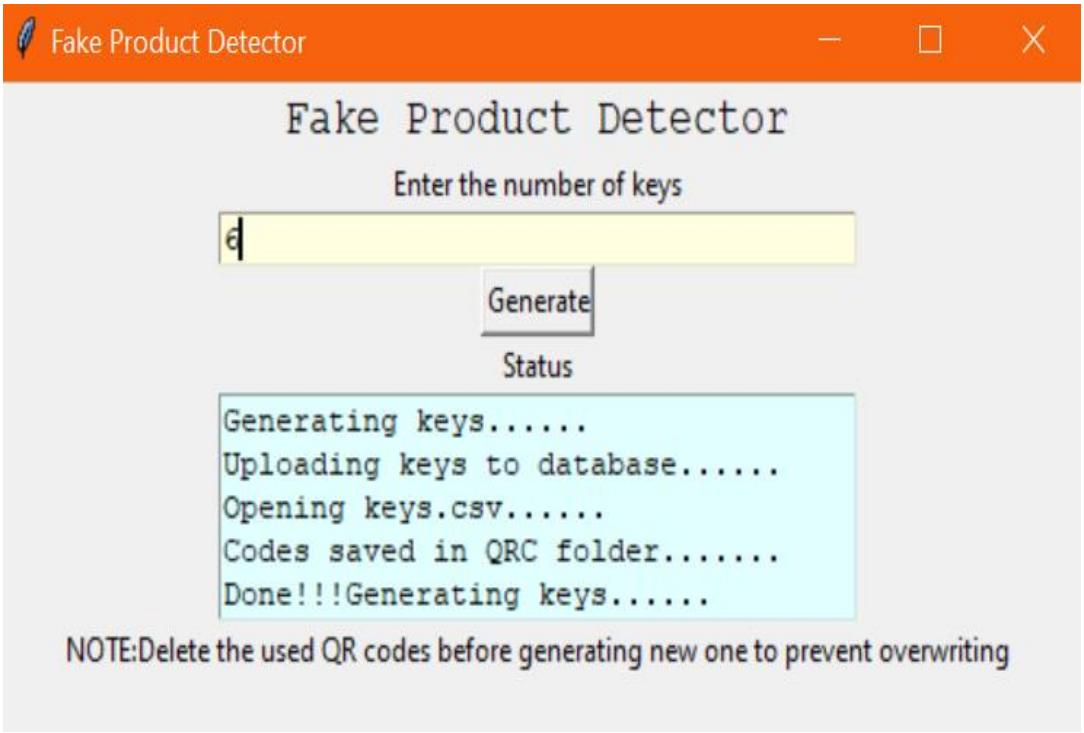

Figure 2: Admin-side module

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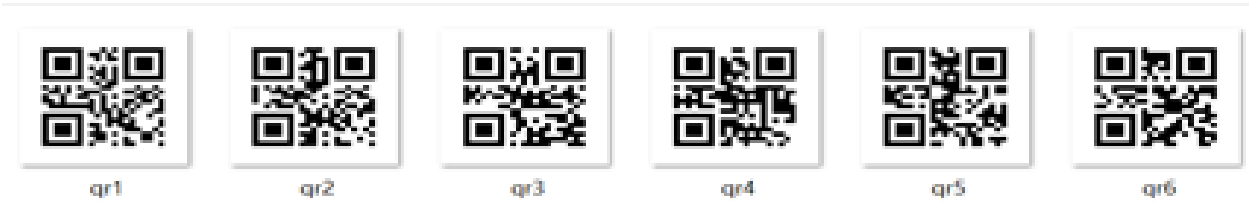

Figure 3: Generated QR Codes

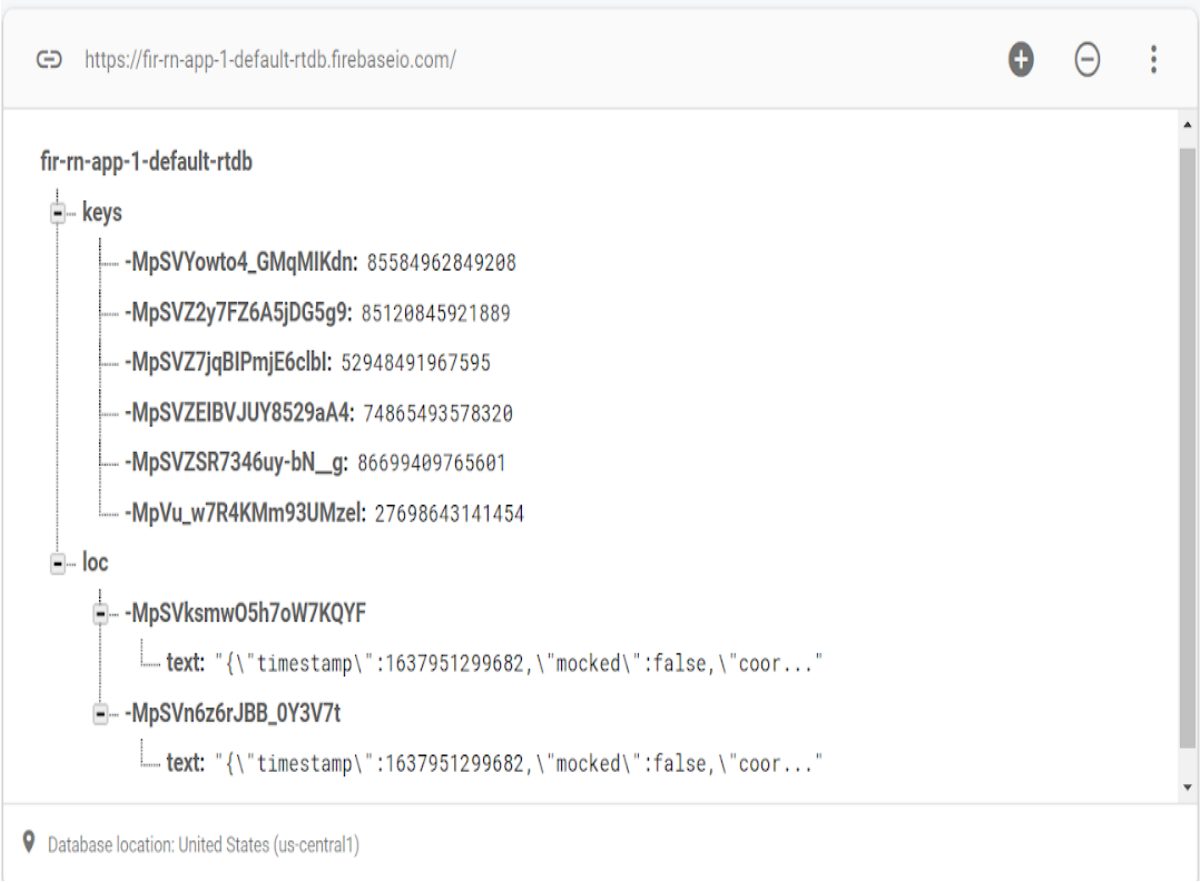

Figure 4: Database

The second module is a smartphone application that consumer must download and install on their smartphones. This module has a QR code scanner. When the consumer confirms to buy the product, firstly the he/she erase the scratch label available over the QR code, then scan the given QR code using this module. If the product is original and genuine, it will display the message that the product is original. Then the key corresponding to the scanned QR code will be deleted from the database. The current location details of the consumer will be added to the database. It will help the industry or organization to understand about the reach of their product.

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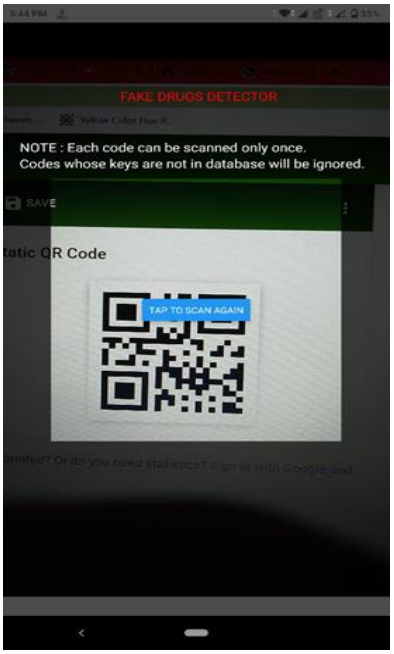

Figure 5: QR code scanner

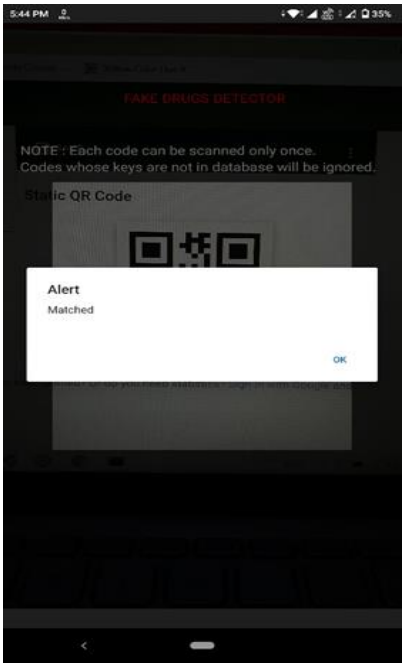

Figure 6: Output when product is original

4. Conclusion

It is necessary to stay up with the latest technologies these days. A consumer should be smart while buying products as in recent times, market of counterfeit and falsified products are increasing rapidly. Various organizations have been exploring for methods to use cutting-edge technology to improve the customer satisfaction. We believe that, as the world evolves toward digitization, this technology is a must-have for the almost all types of product manufacturing companies. In this study, we discuss a proposed system for detecting falsified products that uses QR codes and a centralized database. This study demonstrates how the QR code, widely utilized feature of smart devices, may be used to accurately differentiate between original and fake product. This system was created after evaluating and assessing the previous systems.

This low-cost and scalable counterfeit product detection system allows consumers to identify the original product, especially of a category like electronics, pharmaceutical, fashion and beauty products. The proposed solution is more secure than existing ways, as it eliminates the possibility of fraudsters creating the identical copies of the QR codes and using it on a falsified products. Despite the fact that similar platforms have already been there in a market, we believe the proposed system will be more efficient for a number of reasons as follows: The counterfeit product detection system is the most accurate, failsafe, scalable, and efficient means to identify a genuine product.

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References

[1] M. Bala Krishna and Arpit Dugar, "Product Authentication Using QR Codes: A Mobile Application to Combat Counterfeiting", Aug 2016.

[2] M. C. Jayaprasanna, V. A. Soundharya, M. Suhana and S. Sujatha, "A Block Chain based Management System for Detecting Counterfeit Product in Supply Chain," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), 2021, pp. 253-257, doi: 10.1109/ICICV50876.2021.9388568.

[3] Kentaroh Toyoda, P. Takis Mathiopoulos, I. Sasase and TomoakiOhtsuki, "A Novel Blockchain-Based Product Ownership ManagementSystem (POMS) for Anti-Counterfeits in the Post Supply Chain," June2017.

[4] Jinhua ma, Shih-Ya Lin, Xin Chen, Hung-min-sun, Yeh-Cheng Chen, Huaxiong Wang" A Block Chain Based Application For Product AntiCounterfeiting" Feb,2020.

[5] Muhammad Asif Habib, Muhammad Bilal Sardar, Sohail Jabbar, C M Nadeem Faisal, Nasir Mahmood and ," Block chain-based Supply Chain for the Automation of Transaction Process: Case Study based Validation",March,2020

[6] JiewuLeng, Pingyu Jiang, Kailin Xu, Qiang Liu, J.Leon Zhao, YiyangBian,Rui Shi" Makerchain: A Block Chain With Chemical Signature For Self Organizing Process In Social Manufacturing", June 2019.

[7] Ghaith Khalil, Robin Doss, Morshed Chowdhury" A New Novel RFID Based Anti-Counterfeiting Scheme for Retail Environment", March 2020

[8] N. Alzahrani, and N.Bulusu" Block-Supply Chain: A New AntiCounterfeiting Supply Chain Using NFC And Blockchain", July 2018.

[9] P. Kavitha , R. Subha Shini , R. Priya, "An Implementation Of Statistical Feature Algorithms For The Detection Of Brain Tumor", Journal of Cognitive Human-Computer Interaction, 2021, DOI: https://doi.org/10.54216/JCHCI.010202.

[10] Sonia Jenifer Rayen, "Survey On Smart Cane For Visually Impaired Using IOT", Journal of Cognitive Human-Computer Interaction, 2021, DOI: https://doi.org/10.54216/JCHCI.010205.

Doi : https://doi.org/10.54216/JCHCI.020205

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