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RESEARCH ARTICLE

Identification of Fake Products Using Blockchain

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Abstract-Fake products are something which is like producing the same product as that of the original product but by degrading the quality of the product by using the cheap materials. Even though the quality may be low but the product may look same as that of the original product. This makes it merely impossible for the consumer to validate and know whether the product is real or fake. There are very less ways to keep the track of the original products. The customer thinks twice when he needs to buy any product as he or she will have very less way to track the product's originality. This may cause a huge loss for customer as well as the company. Along with that the customers trust on the company will also get hindered. To avoid this Blockchain can be used in order to have a proper tracking of the product as Blockchain is known for its immutability a proper immutable, transparent tracking can be done. Therefore the main aim is to develop a system which will keep a track of the products main details such as manufacturer name, product ID, product manufactured date, place within the Blockchain, making the system decentralised and immutable with peer to peer transaction so that when the customer receives the product they can verify it by scanning it through the QR code and thereby do the validation of the product

Index Terms – Blockchain, Counterfeit, Decentralized network, Immutable

I. INTRODUCTION

Counterfeit products can be manufactured in various ranges such as Luxury bags, healthcare products, automotive parts, mobile phones etc. The customer buys the fake item thinking that it is original thus making a loss for himself. Counterfeiting has become one of the big problem for consumers and legitimate businesses. A various numbers of the surveys have been conducted so far where some results say that the fake products account up to 3.3 percentage of the world's trade where it is found that China stands first in the count of producing counterfeit products thereby Turkey, Singapore and India. In order to have a transparency to maintain the product manufacture cycle right from the manufacturer to the consumer Blockchain technology can be used .Blockchain technology mainly have the feature of immutability, transparency, decentralization of peer to peer network .In Blockchain all the data's will be stored in the form of block where in the details will be converted into the hash format each block contains the data of the previous hash block value the previous block hash value sums up with the present block details which will be converted into a hash and the both hash values add up to form a hash value of the present block. This hash format continues through the blocks in the Blockchain. Thus it makes the

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blockchain immutable as if any data tampering or any changes occur it will reflect in all the blocks which will cut the block connectivity.

In this paper, an idea is proposed where the product details are kept in a proper track right from the manufacturertill it reaches the customer so that the customer can verify whether the product that he received is from the original manufacturer by using the secure technology that is Blockchain making the whole project transparent and making the product details non alterable once the details are stored into the Blockchain. The customer can view the details either by scanning the generated QR code using the phone or by verifying the same using the website that is run by using IPFSprotocol. Thus identifying the product whether it is a fake or the original product.

Background

IPFS can be used to have the same functionality as that of Blockchain where it maintains all the data in the form of the block or file within a decentralised peer to peer network form.

IPFS Overview

The main feature of Blockchain will be its decentralised nature, peer to peer transaction and to avoid duplicity. IPFS serves this all features that are used in the project in order to provide the decentralised feature and the other features mentioned above. IPFS is Interplanetary File system that is used to store data such as images, files, applications, websites etc. The IPFS uses content locating of file i.e., whenever we try to store anyfile in this IPFS, The file is converted into a hash code IPFS uses SHA-256 hashing algorithm to convert the file to the respective hash code .Thus in this project the product details such as product id, product manufactured date, productimage etc. will be stored in Blockchain using the IPFS. Security is the built in feature of IPFS as it is decentralised and it also involves the feature that makes uniqueness and avoid duplication in the system.

More resilient

Files in the IPFS network are distributed in across the networkof nodes thus it makes more difficult for any one of the nodegroup to bring the network down.

Sharing the files in IPFS is much easier

As IPFS uses content based addressing to locate the files rather than that of location based addressing which are used in HTTP, it makes much easier and less time consuming for the IPFS protocol to locate the file within the network.

SHA -256 Algorithm overview.

SHA is the Standard Hashing Algorithm that was developed by NSA(National Security Agency) The hash value generated by this algorithm can be used for verifying the integrity of the message and to detect any changes that aremade in the message .The data will be converted into a 256 bit has value irrespective whatever the input be, the output will be of a constant size i.e of 256 bit. This project uses thisalgorithm where the manufacturer details are converted into the hash values. Some of the features

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of the SHA- 256 are, Collision Resistance meaning it is highly impossible to get a same value of hash for two different messages, Security, Reliability. The data is divided into 512 bits of data either through compression or expansion and according to the corresponding values the hash value is created

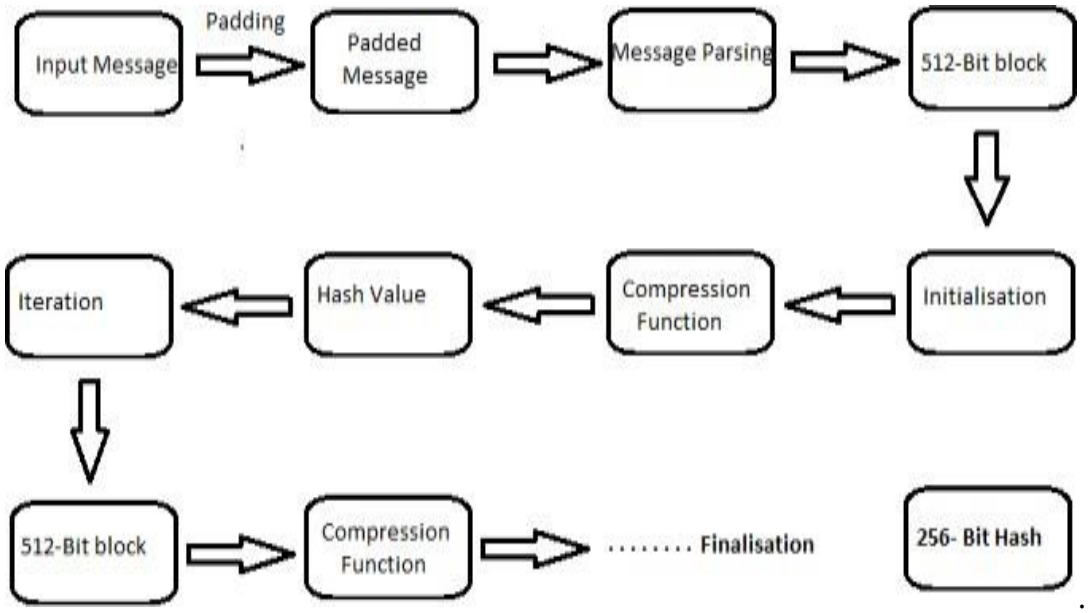

Fig. 1. Block diagram for SHA-256 algorithm.

In the above block diagram the message will be padded to bitsthat are multiple of 512 bits .The padded message is then divided into 512 bit blocks that are then compressed by the compression function these method where the compression function gives the output and that output which will be fed asa new input to the compression function will be carried out for n number of times as some iterations where all the blockswill be evaluated by the hash function then once all the blocksare iterated the final value will be a 256 bit hash value. For example, the hash value for the letter 'a' is "ca978112ca1bbdcafac231b39a23dc4da786eff8147c4e72b9 807785afee48bb"and the hash value of 'A' will be "559aead08264d5795d3909718cdd05abd49572e84fe55590eef31a88a08fdfd".Thus for each of the messages the value of the hash differs in a drastic value which makes the SHA 256to be different for the different values and the values for the particular message will remain same forever.

II. LITERATURE SURVEY

Many works related to identifying the fake products are goingon but making use of the Blockchain in carrying out this research is new thing that are happening, thus on this topic there are several researches are carried out .This paper mainly focuses on using the decentralised concept in a better way by going through a least expensive method in order to pay for every transactions and there by having a proper record of theproduct details that can be verified by the customer over the peer to peer network by using the web application or by scanning the QR code that can be done with the mobile phone.JINHUA MA et al. [1] proposed how Blockchain's immutability can be utilised for storing the product details. Bitcoins are been used to carry out the transactions. Bitcoin is the limited virtual currency that have no specific

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currency institution and not controlled by any central authority. M Lavanya et al. [2] have proposed how the transactions occur by transferring the ownership from manufacturer to distributor and from distributor to consumer within the Blockchain ledger.

A ledger is the financial tracking system that keeps the record of the transactions done. As the productis transferred from manufacturer to the consumer in each steps, the ownership is transferred thereby keeping a proper tracking of the product. Aman Thakkar et al.[3] have proposed a way to create their own hash value as the proof ofwork in carrying out the transaction where the data which is to be hashed is added with counter combination of SHA-256and then converted into big integer there by converting it intosome hash values. They have also used BoltDB in order to store the hash values in the key value pairs. BlotDB is an opensource database that stores only the key value pair and that doesn't need a separate DB server and support the ACID transactions. Chin-Ling-Chen et al.[4] have proposed a system to track counterfeit drug by using the IOT based system where the details are all stored into the Blockchain through the smart contracts.

A smart contract is a self- runnable program that works through a set of rules. YasmeenDabbagh et al. [5] have proposed a system where it uses a Blockchain in every steps of the product life cycle it uses a digital signature by the consumers to authenticate there by providing more security features. Each step in the product lifecycle have their own algorithm written.M.C Jayaprasanna et al. [6] have proposed a way to store the details and verify it through the QR code within the decentralised Blockchain network. The user will be able to compare the entities withinthe Blockchain with his information which is used for authentication.Roshan Jadav et al. [7] have proposed a idea where firebase is used with the Blockchain in order to store the data so that the customer can verify whether the product is a counterfeit or not by comparing with the data in the firebase. [10][11]They have also used android studio to build up an mobile application to scan the code and get the notifications about the product.Yash Madhwal [8] [12][13] have proposed a systemwhere Blockchain is used in the tokenised form to store the details and to combat the counterfeit products. They have taken the aircraft's supply chain to explain about identifying the counterfeit products through tokenised system in Blockchain.

III. METHODOLOGY

This module gives us the information about the methodology.The architecture will give a brief understanding of the entire concept. The main aim would be to use the Blockchain in a convenient way in order to store the details of the product through the manufacturer so that all the details become immutable and tamper resistant. The below Fig 2 will give a brief idea aboutthe architecture of the project where the manufacturer will enter the details and the customer will verify the entered details. We will discuss more about this in the following modules.

Manufacturer

The Manufacturer is the first entity in the project who is responsible to initiate the chain of Blockchain. As the Manufacturer manufactures the product and when the product gets prepared for delivery the manufacturer will do the login through the website and enter the product details such as

Int. Jrl. of **Human Computations & Intelligence**
Vol. 02, Issue 02, 2023
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product image ,product ID, date of manufacture of the product , type of the product , number of units of the productthat is manufactured. There is also a register option for the manufacturer for the first time. The next time, manufacturer can just login into the module with his credentials. As soon as the manufacturer will enter the details and submit the product, the metalmark comes into picture where metalmark is the Google chrome extension and the crypto currency wallet that helps users to carry out Blockchain related transactions through the crypto currencies such as ethereum. The ethereum for the transactions will be provided by the Ganache. Here each entries would be considered as a particular transaction.i.e whenever a manufacturer will enter any details into the Blockchain ,leads to a transaction. Once the ethereum is used from the wallet the data is stored in the form of a particular block into the Blockchain as a hash value.This project uses the IPFS server for storing the data in the form of hash within the decentralised network.

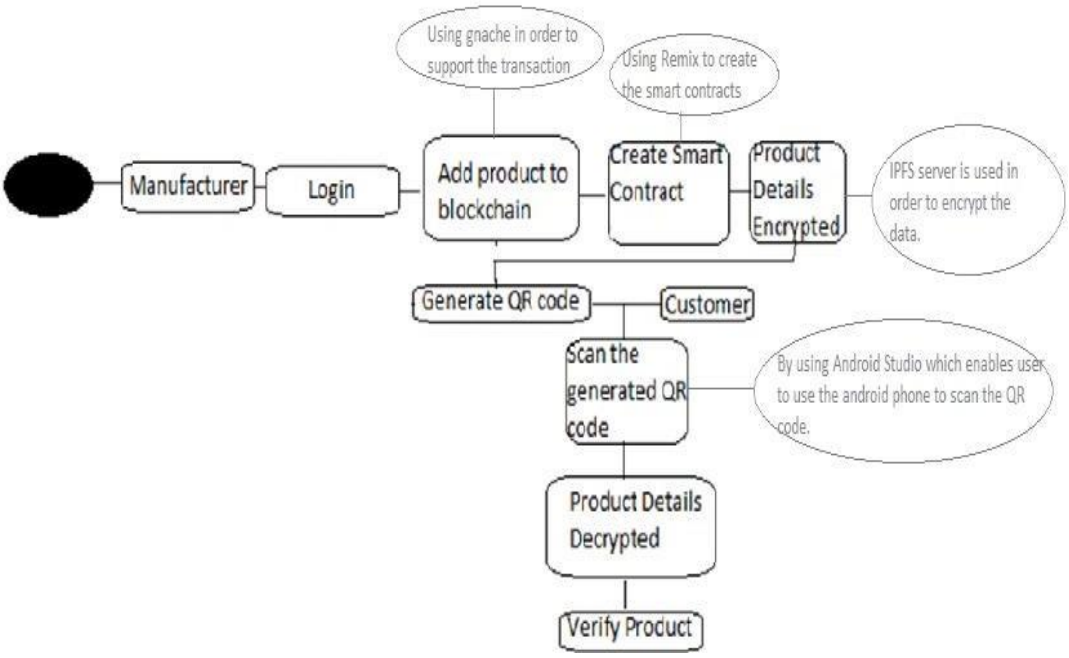

Fig. 2 Architecture for the Identification of fake products using Blockchain

QR code generator.

Once the manufacturer uploads the details about the product into the Blockchain the data becomes secure. The next part will be generating the QR code for the particular product. This job is done by the admin. The admin can have the privilege of checking and verifying the manufacturer's details. Once the admin logs into the website he will get the interface of the product lists that are uploaded by the manufacturer. The admin can generate the QR code for the list of the products. The module that is used for generating theQR code is "qrcode" in python that is run using Spyder IDE. Some of th e methods likeadd_data(),make().make_image(),save() are usedin generating the QR code.QR code are the Quick Responsecode that are in the 2 dimensional representational form where matrix of black-white squares are set within a square grid. Each small box represents the bit in the form of 0 or 1.To generate a QR code the data is first encoded where it is first transformed into a stream of bits .These stream of bits are then segregated or divided into the segments which are then encoded by using certain algorithms. Thus a QR code is formed. Once the Admin uploads the product the QR code isready to be

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Vol. 02, Issue 02, 2023
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generated when the consumer or customer will login and clicks on the particular product the QR code will bedisplayed. The QR code will also be displayed in the admin module.

Customer

Customers in this module are the one who check for the rightproduct that they get once after the delivery and verify it by scanning it with the generated QR code .Customer will havea separate logging module by which he or she can register with the respective phone number and the details such as dateof birth .These details can be used for further verification purpose. After registering the customer can do the log in withtheir credentials .Once the customer does the login they can see the product lists and also the QR code. These QR code can be scanned by the android app which gives the information of the products that was uploaded by the Manufacturer previously. Android studio is used to create a small lightweight application that can be used to connect withthe phone in order to install the application and once the application is installed the phone is ready to scan the QR code.

All the product details which are stored by the manufacturer will be stored through the smart contracts. Smart contracts are the self-executing programs that are run when the transaction takes place in the Blockchain. Smart contracts run based on the predefined rules that use if and thenstatements .Once the conditions of the rules are satisfied the program is automatically run without the need of any external commands. This Smart contract are created by the Solidity programming language that is similar to that of JavaScript .Remix is the IDE that is used in order to run thesesmart contracts. Remix is the web based platform that is usedto handle the smart contracts it can be also connected with metamask. Thus when the customer scans the QR code he will get to the conclusion that the product that is received is fake or original by getting to know about the details about theproduct.

IV. RESULTS AND DISCUSSIONS

This section will give the information of the effectiveness ofthe work that is carried out through some of the screenshots and photos.

Simulation Environment

A computer based simulation of the suggested proposed system was carried out using Intel Core i7-6500U with a clock speed of 2.4Ghz and 8 GB of RAM.Spyder python IDE was used with python 3.1 and Django framework was used. IPFS is used to have Blockchain features like decentralized network, hashing etc. Ganache is used to support the each transaction. Android Studio is used to build a mobile application. Solidity is used to write the smart contracts. Figure 4 is the home page of the Fake product detection where the Login as button gives option of user, admin, manufacturer login as shown in figure 5 .Before login the user or manufacturer, needs to do the registration using the details such as contact information name, place, date of birth. This information can be used as a details for verification too.

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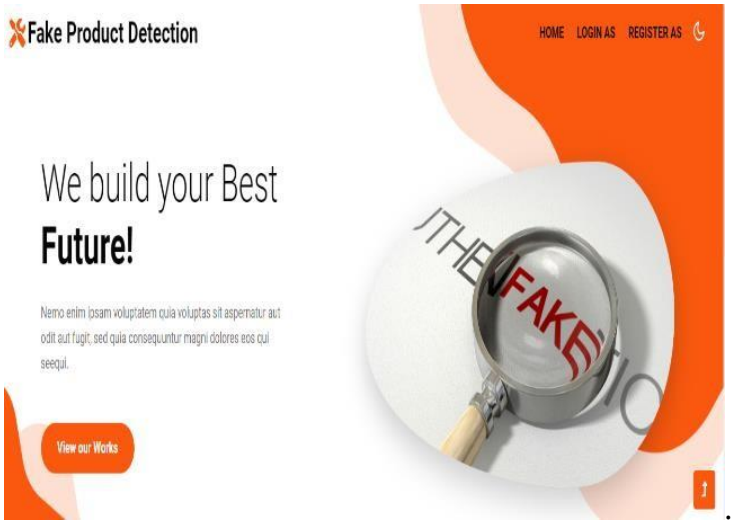

Fig .4. Home page

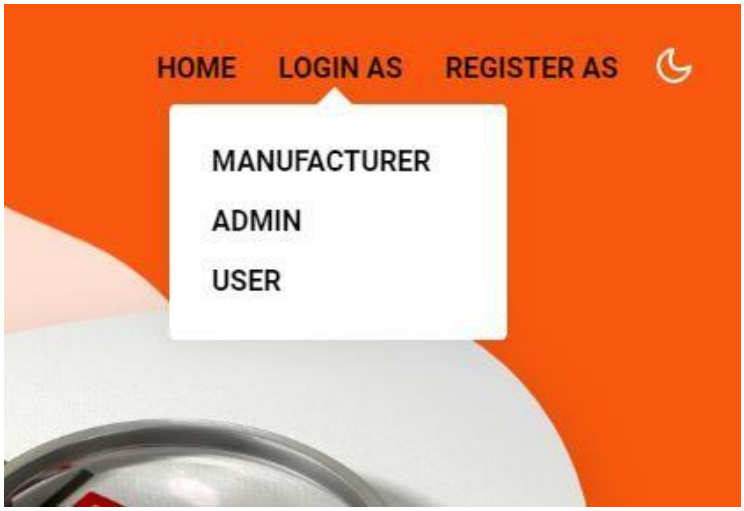

Fig .5. Login module

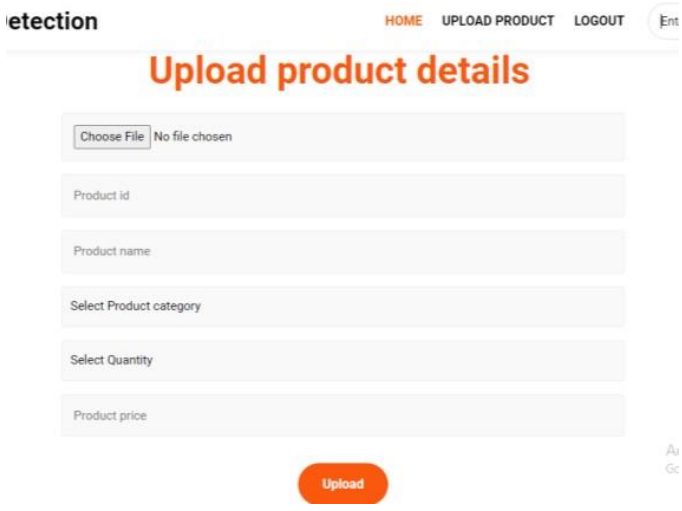

Fig .6 Manufacturer uploading the product details.

Int. Jrl. of **Human Computations & Intelligence**
Vol. 02, Issue 02, 2023
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Once the manufacturer will login to the module he can enter the product details and upload all the necessary information about the product that will be converted into the hash value andwill be stored into the Blockchain through IPFS protocol. Figure 6 will give the picture of the manufacturer uploading the product details. The uploaded details will be next put into the Blockchain by the Admin who will generate the QR code. This QR code can be scanned by the customer.

Fig .7 Generated QR code.

V. CONCLUSION

Blockchain technology is getting more popular day by day because of the main transparency and immutable feature. If this technology is used in the field like keeping the records of product cycle management it would be of great use thus this paper focuses on using blockchain for the fake product identification system.

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