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ONLINE DIGITAL CHEQUE VERIFICATION AND CLEARANCE VIA BLOCKCHAIN

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Abstract **–** One of the non-cash payment options accepted everywhere is the use of checks. Cheques began to be used in transactions in the late 1980s and early 1990s. It takes a lot of effort and time to clear a cheque. Cheque clearing is a semi-manual process that takes at least two days to complete. Cheque fraud has recently increased in frequency as technology advancements make it easier for fraudsters to commit their crimes. In the proposed project we are developing a system which will be used block chain which provides high security to the payers and the payees information. Both the Payers and payees' information are taken in code as hash code which provide data security. Ethereum is the type of blockchain we are using with python as programming language in our project. The issued cheque can be cleared in a time less than an hour. The proposed system can be used for both the digital cheques and the paper cheques. We can issue, verify and clear a digital cheque. We can scan and upload paper cheques which can be verified and cleared.

Keywords: **Blockchain, Ethereum, Hashcode**

1. INTRODUCTION

Technology advancement has brought about significant changes in various sectors, including Finance, Industry, Education and Administration. The Banking Industry has grown to rapid pace as a result of these technological advancements. In the late 1980s or early 1990s, there was a dramatic transformation in the banking industry. Electronic clearing systems (ECS) for electronically transferring money from one bank account to another and card-based payment systems were introduced during this decade.

Later, the banking system included Real Time Gross Clearance (RTGS) and NEFT (National Electronic Funds Transfer). Banking institutions have put in place a cheque truncation system (CTS) to speed up cheque clearance due to the large volume of transactions. The main objective of the blockchain-based online cheque clearing and verification system is to provide a substitute for the current, established cheque clearing method by leveraging the blockchain to expedite digital cheque clearing in a short amount of time.

Blockchains store data in blocks that are then encryptedly connected to one another, unlike traditional databases. A shared database of sorts is what blockchains are. Stuart Haber and W. Scott Stornetta, two mathematicians, proposed using blockchain technology to build a system that would guard against the forging of document timestamps in 1991. Nick Szabo, a cypherpunk, suggested utilising a blockchain to secure the bit gold digital payment system (which was never implemented) in the late 1990s. The methods used to organise data in a blockchain and a traditional database are very different.

A blockchain's blocks are collected as data units and each one contains a specific collection of data. When a block's storage capacity is reached, it is closed and linked to the preceding filled block, forming a data chain known as the 2 blockchain. All new data is integrated into a new block after the most recent block is

input, which is then finalized and added to the chain. A blockchain, as the name implies, separates its data into linked pieces (blocks), as opposed to databases, which normally organise their data into tables. When employed decentralizedly, this data structure creates an irreversible data timeline. Each completed block is added as a permanent state to this timeline. Each block that is inserted into the chain is given a precise timestamp. With the help of blockchain, it should be possible to share and store digital data while keeping its integrity. In this sense, immutable ledgers, which are records of transactions that cannot be altered, canceled, or deleted, are built on a blockchain.

A paper cheque and an electronic cheque (e-cheque) are the same thing, however the term "electronic" refers to improvements that the basic paper cheque has undergone. Let's define their differences so that you may understand why utilising e-cheques is preferable to using traditional paper checks after reading this article. A cheque is a legal instrument that orders and authorises the withdrawal of a certain sum of money from a bank account. The term "drawer" refers to the person who grants authority.

2. LITERATURE SURVEY

To finish each module of this project, we researched several earlier works, including:

1] Bogahawatte W.W.M.K.A, Isuri Samanmali A.H.L, Perera K.D.M, Kavindi M.A.T, Senaratne A.N, Rupasinghe L.P, "Online Digital Cheque Clearance and Verification System using Blockchain" April 2021, IEEE.

The cheque is one of the most common and repeated bank reports. Checks are the most popular non-cash payment option, accounting for more than 96.8 billion USD globally in 2018. The process of clearing a cheque is time- and labor-intensive. Currently, Sri Lanka uses a semi-manual approach for clearing checks. By reducing physical delivery and improving system efficiency, the Cheque Imaging and Truncation (CIT) System, which went into service on May 11, 2006, decreased the amount of time needed to clear and settle cheques. The time it takes for a check to clear has decreased since the CIT System was established to T+1, where T is the day the clearing house receives the check for clearing and 1 signifies one business day from T, but the entire process typically still requires three working days. Users of cheques and commercial banks are looking for a safe and efficient cheque clearing system that clears cheques faster than the traditional cheque clearing process.

2] Nikita Singh, Tarun Kumar, Manu Vardhan, "Blockchain based e-cheque Clearing Framework" September2019. DOI: 10.12694/scpe.v20i3.1506

This work offers a novel and thorough architecture for digital cheque transactions. The suggested e-cheque method is resistant to a variety of security attacks, including e-cheque manipulation, double spending, and fake e-cheques. The suggested system's electronic check (e-cheque) can be physically deposited at teller machines or electronically. As a result of this service, banking system customers enjoy greater flexibility. The proposed approach also enables professional miners to mine and benefit from the e-cheque transaction mechanism. Because every transaction in the proposed system includes both a digital signature and a cryptographic hash, it is completely safe from the user's perspective. The proposed system takes only 1.65 seconds to clear any e-cheque, in contrast to the usual CTS-based cheque clearance request, which can take up to two or three days. Technology development has significantly altered every industry, including finance, business, education, and administration. These technical advancements have led to a rapid expansion of the banking industry.

3] Ravinder Deol, "Using Blockchain Tech to Streamline the Cheque Clearance System" May 2020.

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My blockchain experience has primarily been research-based. However, comprehending code and some technical knowledge are essential to understand the concepts that I come across in my studies. I did collaborate with few student groups to develop a few prototypes for a cheque-clearing system using distributed ledger technology. The final prototype was rather simple, with no sophisticated protocols or currencies. Although we included a cryptocurrency with proof-of-work consensus in the early iterations, we eventually realized that it was not necessary for our specific use-cases. I collaborated with a colleague to investigate the formation of software design patterns in blockchain implementations ranging from Ethereum and Bitcoin to simple Decentralized Applications (DApps). We are now investigating the impact of these designs patterns on the performance of the blockchain systems. We want to use the prototypes we created to validate any conclusions. There is currently not meaningful agreement on approved performance metrics for blockchain-based applications. Among others, Whiteblock.io and Hyperledger have been two standout organizations working on this topic. My current focus is on developing methods to evaluate blockchain-based systems, mostly through performance testing but also through functional testing. This is a fascinating topic for me because blockchain testing is still a problem in the domain. I feel like I'm working on the cutting edge of our understanding of the issue, which is always thrilling.

3. PROBLEM STATEMENT

In the existing system clearing a cheque is a very long and time taking process. As it is a semi manual process, we need bank employee to help which requires a minimum of 2 business days. We know that the bank employees are not available during holidays, it will be a troublesome if the payee requires the amount urgently. The verification system is not accurate to identify the fraudulent cheques. The software's used for verification of cheque in the existing system is a licensed one, not everyone can access it.

4. PROPOSED SYSTEM

The primary goal of the blockchain-based online cheque clearing and verification system is to create a replacement for the conventional and regular cheque clearing system that will enable speedier digital cheque clearing in a short amount of time. Various participating banks and their replicated web servers, miner nodes for each of these replicated web servers, a cloud data centre, and certain expert miners with cutting-edge hardware resources are all included in the network architecture of the proposed system.
A common peer-to-peer swarm network connects all of the miners, and all of the participating banks use the same blockchain. Each bank offers an interface for creating and depositing e-cheques via an internet portal. The bank's miners and the potential data centre provide the teller machine with the data it needs. Any customer who deposits an e-cheque must use a teller machine to read the barcode and scan the check. For verification and clearance, paper checks can be scanned and uploaded.

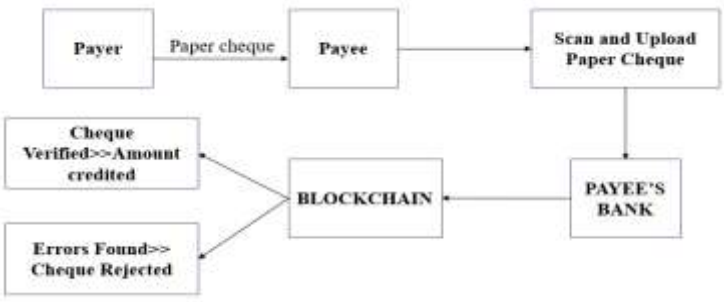

Fig 1: Block diagram for paper cheque verification and clearance

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A cheque is a piece of paper that tells a bank to move money from one person's account to the one in whose name it is issued. The money is maintained in the drawer's transaction banking account, which is often referred to as a checking, share draught, or cheque account. The drawer completes the cheque with the payee's information, the date, and a number of other details before signing it and asking their bank—the drawee—to pay the specified sum to the payee.

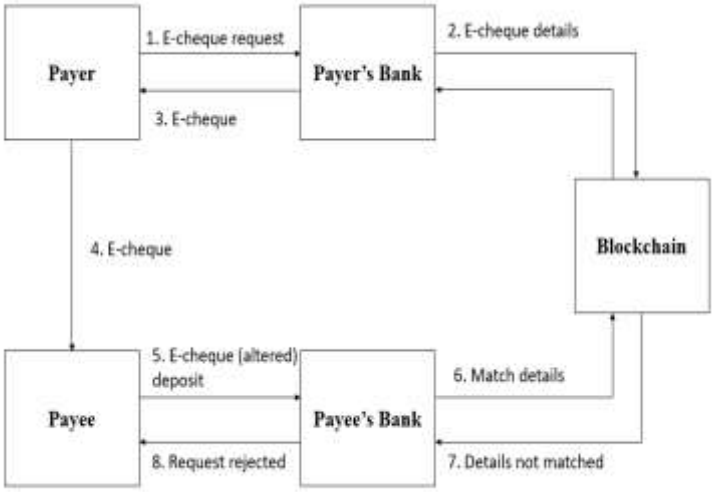

Fig 2: Block diagram for e-Cheque issuance, verification and clearance

The electronic version of paper checks are known as e-Cheques. The information on an electronic cheque is the same as that on a paper cheque. The same laws apply to traditional and electronic checks. An electronic cheque operates in the same way as a conventional paper cheque. The person would first write an e-cheque using one of the electronic gadgets. The e-cheque is thereafter sent electronically to the payee. Later, the electronic cheque is deposited by the payee, who then receives credit, and the payee's bank clears the electronic cheque to the paying bank.

The identification and processing of checks is done by magnetic ink character recognition (MICR). A cheque's bottom left corner contains a series of characters known as the MICR. It consists of three numbers: the customer's account number, the routing number for the bank, and the cheque number. The MICR includes a routing number with nine characters, an account number with twelve characters, and a cheque number with four characters. A magnetic ink character recognition line is the printing method used to allow a machine to read, process, and record information.

- The string of characters at the bottom left of a personal cheque that comprises the account, routing and cheque numbers is known as magnetic ink character recognition.
- MICR numbers are intended to be legible by both humans and sorting machines.
- Because of the use of magnetic ink and unique fonts, they can not be faked or replicated.
- The technology's advantages include increased protection against fraud and the mechanization of cheque processing.
- MICR was invented in the late 1950s and is currently used worldwide.

The technique of converting printed texts into digital picture files is known as Optical Character Recognition (OCR). It is a digital copier that employs automation to convert scanned documents into machine readable, editable PDFs. When you use your computer to scan a receipt, you can see OCR in action. The scan is then saved on your computer as an image. The words in the image can not be searched, modified or tallied, but you can convert the image to a text document with the content stored as text using

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OCR. Data can be extracted from scanned documents, camara photographs and image-only PDFs using OCR software. It makes static content editable and eliminates the need for human data entry.

5. METHODOLOGY

To launch the Ethereum tool, first open the 'hello-eth/node_modules/.bin' folder and double-click the 'runBlockchain.bat' file. To deploy solidity code on Ethereum, enter the command "truffle migrate" and press the enter key. For access to the check solidity functions, copy the contract address and include it in the python code. The following modules were developed by us for this project:

- New User Registration: Using this module, a user can register with the application and submit their signature template, which is located in the "template" folder. The signature image on the cheque and the signature on the cleared cheque will be recognised and compared.
- User Login: The user can log into the programme using this module.
- Digitise Your Cheque: With the use of this module, a user can upload a cheque, choose the recipient name they want, enter the amount, and then the cheque and template are processed to determine whether the cheque is real or fraudulent.
- View Credited Cheques: With the help of this module, users can access all of the credited checks stored on the blockchain.
- View Debited Cheques: With the help of this module, users can access all debited checks on the blockchain.

When you receive a cheque, you can see your cheques in 'view credited cheques'.

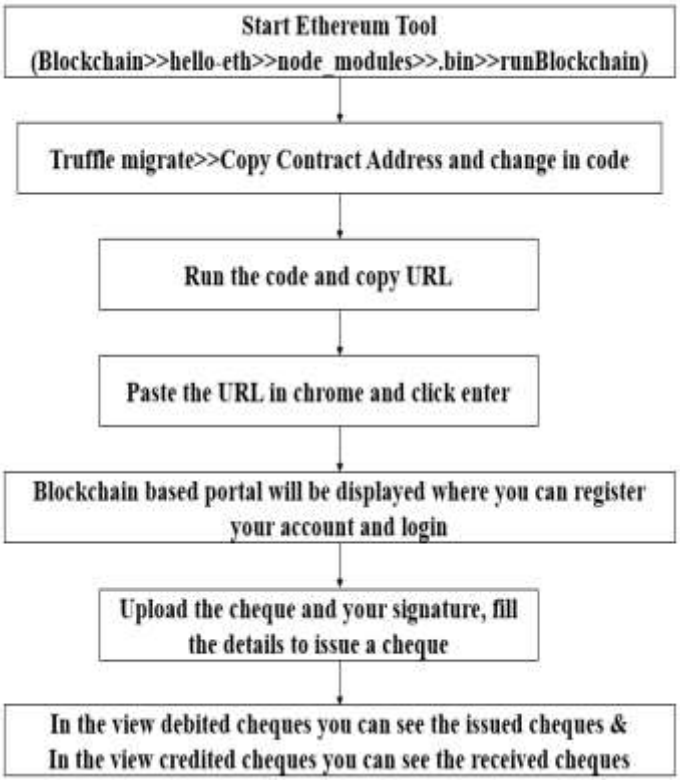

Fig 3: Flowchart

After changing the contract address in the python code run the program and you will get an URL in the results. Copy the URL and paste it in the chrome and click enter. Blockchain based cheque clearance and verification system portal is displayed with the above-mentioned modules. Register using the user sign in

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module. Enter your name, password, location, phone number and upload your signature; and register your account. If you want to issue a cheque login to your account; click digitize your cheque; enter the receiver's name; select cheque; select signature image from the template's folder and issue the cheque. If the signature matches the cheque will be issued or else an error pops on the screen saying 'Fraud Cheque Detected'.

6. SYSTEM REQUIREMENTS

Python along with Ethereum are the major technologies used in our project. Hashcode is used for data security.

Fig 4: Ethereum x Python

The general-purpose, high-level programming language Python is popular all across the world. Code readability is given top emphasis in its design philosophy, which fully utilizes the off-side rule-compliant indentation. The text is written in an easy-to-read style. Python is a dynamically typed, garbage-collected language. Programming paradigms including functional, object-oriented, and structured programming are among those it supports. Due to its extensive standard library, it is frequently referred to as a "batteries included" language.
Python was created by Guido van Rossum to replace the ABC programming language in the late 1980s, and it was first made available in 1991 as Python 0.9.0. 2000 saw the release of Python 2.0. The 2008 release of Python 3.0 was a big improvement that was only partially backward-compatible with earlier iterations. The final Python 2 release was Python 2.7.18, which was made available in 2020. One of the most popular programming languages in use today.
Because of the following features, we decided to write the project's code in the Python programming language:

- Simple syntax>> Easy to learn
- Interpreted Language
- Free and open source
- Portable
- Object oriented

Decentralized blockchain Ethereum and smart contracts work together. The platform's native cryptocurrency is Ethereum. Ether is only slightly behind bitcoin in terms of market capitalisation. Open-source software is available for free. Ethereum was founded by programmer Vitalik Buterin in 2013. Ethereum was founded by a number of people, including Gavin Wood, Charles Hoskinson, Anthony Di Lorio, and Joseph Lubin. Following the start of 2014 and crowdfunded development work, the Network went live on July 30, 2015.

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On Ethereum, users can engage with decentralised applications that are permanent and irreversible. Applications for decentralised finance (DeFi) provide direct access to financial intermediaries including banks, exchanges, and brokerages. This makes it simpler to borrow money using bitcoin assets as collateral or to lend them out for a profit.

Comparisons between ether and bitcoin are unavoidable given that ether is the second-largest cryptocurrency by market capitalization (market cap). Bitcoin and ether are comparable in a number of ways: Each one is a form of digital money that can be stored in different types of cryptocurrency wallets and traded on online exchanges. There are many notable changes, though. Bitcoin is intended to be used as money and a store of value, in contrast to the Ethereum network, which aims to enable complex smart contracts and decentralised apps.

A hashcode is a code with a set length that can be used to verify data, confirm the authenticity of messages, or locate resources. Hashcodes play a significant role in encryption. For instance, hashcodes are frequently used to store passwords. In order to identify an object when it is being tested for equality, a hashcode is a numeric value. Additionally, it can be utilised to index an item in a collection. In hashing techniques and data structures like hash tables, the GetHashCode function is employed. The default implementation of the GetHashCode function does not ensure unique return results for different objects.

Furthermore, the GetHashCode method's default implementation may not always yield the same result when used with different.NET Framework versions. Because of this, it is not recommended to use the method's default implementation as a hashable unique object identification.

The true advantage of hashcode is when you want to place something in hash table, and with hash tables, you can find objects quickly, which is where the hashcode comes in. They make it possible to easily find items in hash tables. It's a hack that vastly enhances performance at the expense of accuracy. When using computers, if two objects have the same hashcode value, you must investigate further to determine whether they are truly equal. Example, you'd have to examine whether the objects have the same attributes, such as height, weight and so on, whether the integers are the same, or if the customer_id matches, and then decide whether they're the same. This is usually accomplished by implementing the IComparer or IEquality interfaces.

7. RESULTS AND CONCLUSION

We have designed a project using which we can issue and clear a cheque in less than an hour. Our project is suitable for both paper cheque and digital cheque. It is highly time efficient. The fraudulent cheques are detected using MICR technology. We used blockchain as the main technology which speeds up the process and secures the data. The cryptography provides the secure communication between the payer and the payee without the involvement of the third party. As the data is stored as hashcodes the data security is increased which makes it difficult to hack.

In the paper cheque clearing process we can scan and upload the image and then convert it into binary format and then extract words from cheque using OCR technology and then match cheque MICR words and signature. We are processing image for signature verification as no OCR technique will identify words correctly because some people will write small words and some people will write big words.

In paper-cheque digitization, if the signature and MICR code matched then cheque will be converted to digital signatures and then store that cheque in Blockchain and credit amount to receiver account.

Random forest algorithm will run by OpenCV to signature verification and if signature matched then cheque will be converted to digital or else fraud detection alarm will be raised.

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