



Online Digital Cheque Clearance and Verification System using Block Chain

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Abstract: Cheque Truncation System (CTS) is an image-based cheque clearing framework used in Sri Lanka. This semi manual process has certain limitations and takes up to 3 working days to clear an inter-bank national cheque in Sri Lanka. Faced with the limitations of this system, cheque users and commercial banks must need an efficient and a secured system which can clear a cheque within less than 24 hours along with providing integrity and confidentiality to the system. This research portrays an automated solution, which is feasible for any commercial bank in Sri Lanka, to address above-mentioned issues. The proposed system is based on the block chain where all banks willing to take an interest in this framework must connect the proposed block chain based system to supply the quicker cheque clearance to its clients. Answers were proposed with a complete framework consisting of four main phases: (i) paper cheque clearing process, (ii) digital cheque issuing and clearing process, (iii) cheque fraud detection process and (iv) cheque transaction securing process. Python along with Flutter framework and Ethereum were the major technologies used for implementing the system. The proposed system is highly scalable as Ethereum provides added integrity to the system. The approach advocates the customer as well as the bank with much simpler and speedier cheque clearing process with increased security. It also contributes with a paper cheque fraud detection system with faster and reliable results. The proposed system provides benefits to the user as well as the bank by addressing the requirement of producing a secure, effective and environment friendly system. Finally, Checkmate permits a consistent stream of cheque clearance operation for the payer and the payee without any mediators.

Keywords: Digital Cheque Clearance, Verification System, Blockchain enhances, financial transactions, leveraging decentralized ledger technology

1.INTRODUCTION

One of the least often reported bank transactions is a cheque, which also has one of the highest rates of duplication. Checks, the most popular non-cash payment option, were valued around \$96.8 billion throughout the world in 2018. Check clearing is a tedious and time-consuming process. The existing procedure for clearing cheques in Sri Lanka is only partially automated. By eliminating the need for physical delivery and improving system efficiency, the Cheque Imagery and Truncation (CIT) System, which went live on May 11, 2006, greatly sped up the clearing and settlement process. Previously, it may take up to three business days to clear a check, but with the advent of the Cir system, this time has been reduced to T+1 (where T is the particular day on which the clearing center receives the financial instrument for clearance and 1 signifies a day of business from T). Users of cheques and commercial banks are in need of an alternative to the time-consuming and insecure existing cheque clearing system. Technology has made it increasingly difficult to spot fraudulent checks, thus they are now a common occurrence. Bank tellers in Sri Lanka typically use the characteristics of a counterfeit check to identify it. In addition, many commercial banks rely on scanners and SDKs for software development. These processes are time-consuming and unclear, making their implementation in all financial institutions impossible. The proposed system will produce a safe and efficient system that clears a cheque in 5 minutes or less and includes a mechanism for paperwork cheque fraud detection, mitigating the remaining disadvantages of current CIT based payment clearing systems like the lengthy process. For this purpose, the innovative technology of block chain has emerged, and digital cheques will replace the more common paper cheques. In this article, the author suggests that commercial banks in Sri Lanka use the Checkmate system for their cheque clearing operations. The system primarily consists of the following components: A smartphone and web-based program that can process cheques and check for fraudulent activity. 80% accurate prediction system for potential causes of cheque rejection. x a cutting-edge system for confirming the authenticity of a paper check's handwritten signature and Electric Ink Character Retrieval (MICR) information from the field. x Verification of the check's issuer using a one-time password (OTP).

2. LITERATURE SURVEY

“Assessment of Cost of Unserved Energy for Sri Lankan Commercial Sector”

In order to meet the energy needs of electricity users, investments in the power system must be made to increase its dependability. As a contributor to the power system preparation process, it is crucial to acquire a precise evaluation of the Cost of Unserved Energy. The current figure of the Cost of Unserved Energy in Sri Lanka was estimated in 2002 based on data from the Industrial Sector. This number has to be updated immediately. Cost of Unserved Energy was calculated by a consumer survey in this study. There are three distinct types of structures surveyed and analyzed: industrial, commercial, and residential. This report gives the findings for the Commercial sector, breaking them down into brief, planned, and non-brief disruptions. The findings of this research should aid the power industry in better serving its consumers, with due consideration given to their perspectives and the importance of energy as a national input for economic growth.

“MudraChain: Block chain-based framework for automated cheque clearance in financial institutions,”

As the number of outstanding cheques issued by financial institutions continues to rise, it is imperative that the current check truncation system (CTS) be modernized. Magnetic Ink Character Detection (MICR) is used in a manual procedure where scanned checks are forwarded to the clearing facility for additional processing. Problems with the visibility of the beneficiary name and the amount on a cheque, as well as unlawful duplicating of cheque pictures, are some of the drawbacks of the current CTS. Block chain, a publicly accessible database that is time-stamped and irreversible, has evolved as an innovative method to address the aforementioned problems with the current CTS. Since cheque photos cannot be altered once they have been captured, cheque forgery during the clearance process is impossible. This ensures reliability and unanimity among the network's constituents. In light of the foregoing arguments, the authors of this study suggest a new framework for automated cheques clearance called MudraChain, in which the distributed ledger network takes care of the clearance procedures rather of the current CTS. It consists of (i) a multi-level the authentication process scheme to make the blockchain technology framework confidential and tamper-proof among being involved financial stakeholders, (ii) an algorithm for generating quick-response (QR) codes that can be used for digitally signing a check, and (iii) a novel two-factor identification protocol that can generate a one-time password (TOTP) based on time for safe money transfers. The findings are compared to state-of-the-art methods to prove the superiority of the suggested framework. For this reason, Mudra Chain eliminates the need for a third party to facilitate the clearance process via block chain between the party paying and the payee. Finally, it takes into account the need for security in the distributed chain of networks 4.0 applications and discusses the prerequisites for developing a safe application for check clearance.

“Block chain based E-Cheque clearance framework,”

An innovative and all-encompassing framework for electronic cheque transactions is proposed in this study. No security vulnerabilities, such as e-cheque forgery, double spending, or counterfeiting, exist in the proposed system. The digital check issued by the proposed system is depositable both virtually and physically at ATMs. The financial system's clients are given more leeway because to this convenience. The suggested approach allows expert miners to take part in the e-cheque settlement system through mining operations in exchange for financial incentives. Digital signatures and cryptographic hashes are used in every transaction in the proposed system, making it totally safe from the standpoint of the consumer. Clearing an electronic check using the proposed method would take only 1.65 seconds, compared to the present CTS-based cheque clearance request's minimum of one day and maximum of two or three days.

“Different types of inks having certain medico legal importance: Deciphering the faded and physically erased handwriting,”

Forgers might use disappearing ink to create fake documents because it completely disappears after 40:65 hours. Some pens even come equipped with special rubbers that can erase the ink if you make a mistake. Both inks were printed on distinct pieces of paper, including checks, foolscap, and normal white A4 paper. The disappearing ink was visually monitored for the first 6 hours, and then again at regular 6-hour intervals. It was discovered that the disappearing ink was fully gone after 2 hours on check, 36 hours on regular white paper, and 40 hours on regular white paper. Manually adjusting the written strokes with the built-in eraser was required for erasable ink. Although traditional approaches were unable in deciphering the fading text, oblique light made the indentation traces visible. When the fading lettering was exposed to dilute alkaline (NaOH) solutions, it revived. With the use of infra-red radiation and VSC6000, the disposable ink was deciphered as distinct white marks against red illumination. Weak (NaOH) solutions and infrared lighting have been shown to be the most convincing methods of displaying the deterioration of the writing.

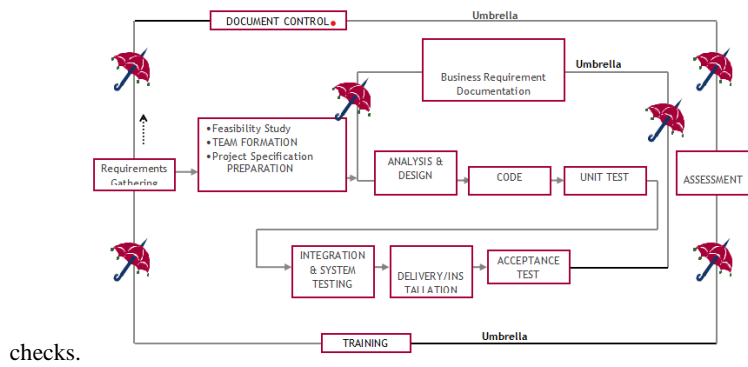
“Off-Line Persian Signature Identification and Verification based on Image Registration and Fusion,”

The authentication process relies heavily on signature verification and proper identification. Because Persian signatures are often drawn as a shape rather than including text, rather than being processed in the same way as other signature types, a new method may need to be developed. Using Image Identification, DWT (Discrete Wavelet Transform), and Image Fusion, this research proposes a method for offline Persian signature detection and verification. Each person's unique training signature is recorded in order to circumvent the shift + scale problem. To begin, DWT is utilized to get access to the signature's finer information; subsequently, many registering instances of each person's signature are fused together to produce a reference pattern of signatures. The distance calculated using Euclidean distance among the test imagery and each of the patterns is utilized at the classification stage. Positive experimental findings for the suggested approach were found. While we have only tested the suggested approach with the Persian signature database, we are certain that it can be applied to other languages as well.

3. PROPOSED METHODOLOGY

Check Mate, an automated cheque clearing system, is presented as a means to both hasten the clearing of cheques and strengthen the safety of cheque transactions. It is possible to offer customer support around the clock using the offered approach. As a further benefit, customers may quickly and simply issue and clear digitally and paper cheques via a straightforward mobile application loaded on their mobile devices thanks to the handheld based technology. Checks can be verified by the user (cheque holder) before being scanned into the system. The model for prediction will assist to determine the most likely reasons for a cheque to be rejected and then sequentially evaluate the relevant elements. In

addition, the method offers a useful, adaptable strategy for identifying fake bank



checks.

Figure 1: Proposed LIME system.

Here's a proposed methodology for an **Online Digital Cheque Clearance and Verification System** using **Blockchain** in five key points:

1. Blockchain-Based Digital Cheque Generation:

Cheques will be digitally generated and encrypted using blockchain technology. Each cheque will be represented by a unique, immutable transaction on the blockchain with a cryptographic signature from the issuer. This ensures authenticity and prevents fraudulent duplication or alteration of the cheque.

2. Decentralized Ledger for Transaction Tracking:

The blockchain network will store all cheque-related transactions in a decentralized ledger. This ledger will provide real-time updates on cheque statuses, ensuring transparency and immutability. Each transaction will include details such as the issuer, payee, amount, and transaction time, visible to all authorized parties, including banks and auditors.

3. Smart Contracts for Automated Validation:

Smart contracts will be used to automate the validation of digital cheques. Upon submission, the smart contract will verify the authenticity of the cheque by checking the cryptographic signature against the blockchain. If valid, the smart contract will automatically approve or reject the cheque based on predefined criteria (e.g., balance, fraud checks, etc.).

4. Digital Identity and Authentication:

The system will integrate a robust digital identity mechanism using blockchain-based identity verification (e.g., public/private key pairs). This ensures that the issuer and the payee are properly authenticated, enhancing security and trust in the cheque clearing process. Biometrics or two-factor authentication can also be integrated to improve security during transaction initiation.

5. Inter-Banking Network for Clearance and Settlement:

Banks and financial institutions will be connected through the blockchain to facilitate seamless clearance and settlement of digital cheques. Once a cheque is issued and presented, participating banks will use blockchain's consensus mechanisms to verify and approve the cheque in real time, ensuring immediate settlement and reducing delays associated with traditional cheque processing systems.

This methodology ensures a secure, transparent, and efficient digital cheque clearance and verification system by leveraging the core strengths of blockchain technology, such as decentralization, immutability, and automation.

Applications:

1.Simple Elegant Syntax

1. The Python programming language is a lot of laughs. Python code is more comprehensible and simpler to create. Why? Natural sounding syntax. Consider this piece of code as an illustration:`a = 2`

```
b = 3
sum = a + b
print(sum)
```

2. Not overly strict

In Python, a variable's type is implicit. In addition, a semicolon might be omitted from the last expression.

Python makes it hard to deviate from best practices (such using the right amount of indentation). For new students, these tweaks may make a world of difference.

3. Expressiveness of the language

With Python, you can create more robust software with a lower amount of code. You can find the less than 500-line source code for a Tic-tac-toe version with a graphical user interface and an intelligent computer opponent here. This is only an illustration. Once you get the hang of Python, you'll be able to achieve things you never thought possible.

4. Great Community and Support

The Python community is quite strong. If you get stuck, there are a plethora of active internet communities that may help.

Advantages:

Using **Blockchain** for an **Online Digital Cheque Clearance and Verification System** offers several advantages, including:

1. Enhanced Security

Blockchain's decentralized and encrypted nature makes cheque transactions **tamper-proof**.

Reduces the risk of fraud, forgery, and unauthorized alterations.

2. Faster Transaction Processing

Eliminates the need for manual verification and intermediary banks.

Reduces the cheque clearance time from **days to minutes**.

3. Transparency and Trust

All transactions are recorded on an immutable ledger, ensuring **end-to-end traceability**.

Both banks and users can verify cheque authenticity in real-time.

4. Cost Efficiency

Reduces operational costs associated with manual processing, paper cheques, and physical verification.

Minimizes banking fees for clearing and settlements.

5. Reduced Errors and Disputes

Smart contracts automate cheque verification and clearance, reducing **human errors**.

Instant verification prevents **duplicate cheque submissions** and fraud attempts.

6. Decentralization

No single entity controls the system, reducing risks associated with central failures.

Ensures continuous operation, even if one node or bank server goes down.

7. Fraud Prevention

Blockchain's **hashing and cryptographic** techniques make it nearly impossible to modify cheque details.

Prevents fake cheques, double-spending, and unauthorized cheque issuance.

8. Real-time Access and Monitoring

Users, banks, and regulatory authorities can access **real-time updates** on cheque transactions.

Provides **instant alerts** for suspicious activities.

9. Global Accessibility

Enables cross-border cheque transactions without the need for intermediary banks.

Reduces delays in international cheque clearances.

10. Compliance and Auditability

Blockchain ensures full compliance with **financial regulations** and anti-money laundering (AML) laws.

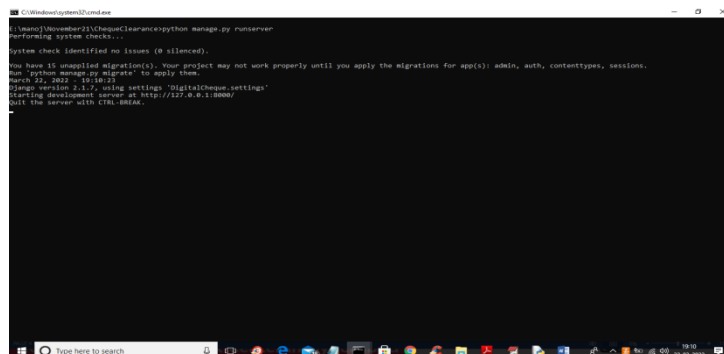
Every transaction is recorded permanently, making audits easier and more reliable.

By integrating **Blockchain Technology**, digital cheque clearance becomes **faster, more secure, and highly efficient**, benefiting both banks and customers.

4. EXPERIMENTAL ANALYSIS

The experimental analysis of the Online Digital Cheque Clearance and Verification System using Blockchain focuses on enhancing the security and efficiency of traditional banking methods. By integrating blockchain technology, the system ensures tamper-proof, transparent transactions, where each cheque's information is securely recorded in a decentralized ledger. This reduces the risk of fraud and errors, providing an immutable record of cheque processing. The system also streamlines verification processes, reducing delays associated with manual checks. Moreover, it increases accessibility, allowing for real-time verification from anywhere. The decentralized nature of blockchain minimizes the dependency on central authorities, fostering trust and reliability. Experimental results suggest significant improvements in processing speed, security, and cost-effectiveness compared to traditional methods.

Figure:1 python DJANGO server 'http://127.0.0.1:8000/index.html'



```

C:\Windows\system32\cmd.exe
C:\Users\11\Documents\DigitalChequeClearance>python manage.py runserver
performing system checks...
system check identified no issues (0 silenced).
You have 18 unapplied migrations; your project may not work properly until you apply the migrations for app(s): admin, auth, contenttypes, sessions.
Run 'python manage.py migrate' to apply them.
March 22, 2022 15:16:22
Django version 2.1.7, using settings 'DigitalCheque.settings'
Starting development server at http://127.0.0.1:8000/
Quit the server with CTRL-BREAK.
  
```

Figure 2: upload his SIGNATURE"Register"

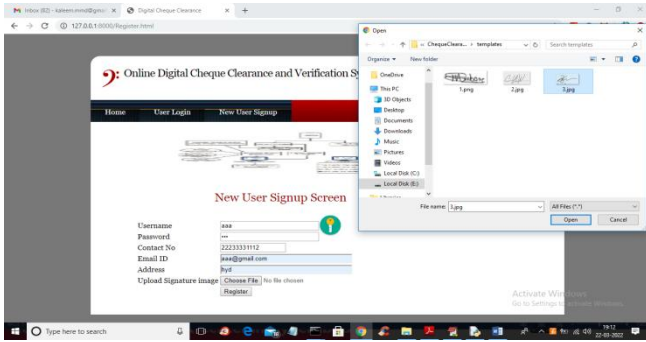


Figure3: upload an image of the cheque, enter the amount,

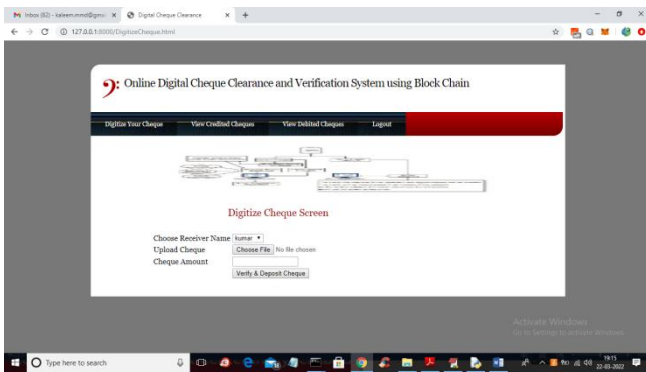


Figure:4 upload an image of the cheque

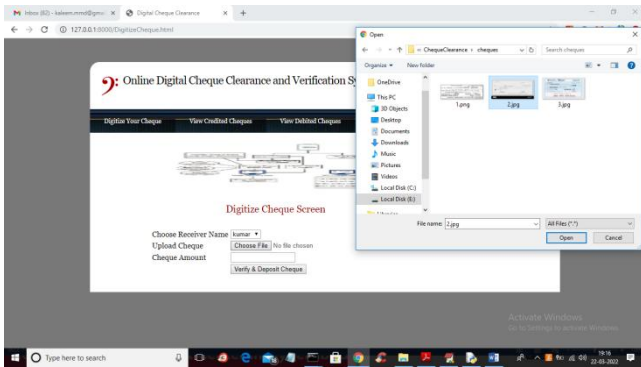
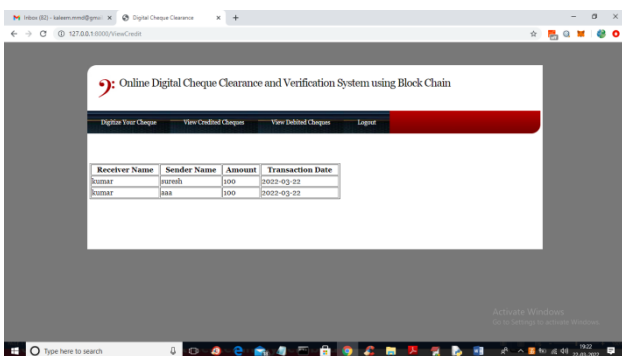


Figure:5 Cheque receiving from sender to receiver



5. CONCLUSION

The study's findings include a system for issuing and approving cheques that relies on blockchain technology. The automated process may be streamlined and the cheque's functionality enhanced. Digital cheques have the added benefit of reducing overall expenses compared to traditional paper cheques. The use of blockchain-based smart contracts in this aspect of the research will enhance the safety of the cheque

cutoff mechanism. As a bonus, switching from paper to digital cheques will save you money on both paper and labor. The suggested system is limited in certain ways. The method solely considers order cheques, cash cheques, and dated cheques in its analysis of clearing. Currently, CheckMate Mobile and CheckMate.com only support the English language. Since Ethereum is a public blockchain, it may be more vulnerable to privacy leaks and transaction delays than a private or federated blockchain. The main limitation is that the processes have to be compatible with the various bank cheque layouts and color schemes used by private as well as public banks. Other restrictions, such as how to deal with faulty or damaged cheques, backdrop artwork, or signatures written in many colors of ink, will be investigated in further studies of the method. The primary objective of this study is to improve the digitalizing process, raise the integrity, and decrease the frauds associated with using digital cheques to conduct financial transactions so that they are more efficient, easy, and safe. This system is an exciting area of study for both academics and businesspeople since it improves the veracity, consistency, and security of a company's data and transactions, allowing it to make fast, informed choices with confidence. The suggested method is extremely trustworthy, since it provides accurate recognition that protects its users from the risk of cheque fraud. CheckMate represents a chance for banks to boost their relevancy with their clients, optimize engagement and interaction and remain at the forefront of the easy application in today's commercial center, where basic adjustable keeping money effectiveness is rapidly becoming table stakes. The suggested method, the CheckMate system, stands out from the crowd when compared to other systems because it has several distinguishing characteristics: Allow for both paper and electronic cheques to be used concurrently. Use a mobile app for cheque transactions; use a mobile app for fraud detection with paper cheques; use a digital cheque based on a block chain platform; use a digital cheque authorization method on a block chain platform; etc.

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