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Cyber-Physical Customer Management for AI Internet of Things-Enabled Banking

[1] Panjala Srinu

PG Scholar, Department of Computer Science & Engineering, Siddhartha Institute of Technology and Sciences, Hyderabad, India.

[2] Mr. Farooq Hussain Mohammad

Assistant Professor, Department of Computer Science & Engineering, Siddhartha Institute of Technology and Sciences,

ABSTRACT

In this project, an automated deep learning-based framework for interbank KYC in AI-based cyber-physical banking is proposed. A deep biometric architecture was used to model the customer's KYC and anonymize the collected visual data to ensure the customer's privacy. The symmetric-asymmetric encryption-decryption module in addition to the blockchain network was used for secure and decentralized transmission and validation of the biometric information. A high-capacity fragile watermarking algorithm based on the integer-to-integer LSB algorithm for the secure transmission and storage of in-person banking documents is also proposed. The proposed framework was developed and validated using a web application for the collection of biometric finger prints of customers. The biometric information of bank customers such as fingerprint and name is embedded as a watermark in the related bank documents using the proposed framework. The results show that the proposed security protection framework can embed more biometric data in bank documents in comparison with similar algorithms.

1. INTRODUCTION

During the COVID-19 pandemic, the banking sector delivered the majority of its financial services through online banking solutions. However, in-person banking services are still essential for the deposition and collection of handwritten bank checks and other traditional paper-based financial transactions. In addition, in-person banking services are useful for elderly customers who are unable to use digital banking. The major problems of in-person services in bank branches are their high cost, lack of seamless integration with digital banking, and lack of safety of interactions in pandemic conditions. Humanoid service robots acting as bank tellers and the Internet of Robotic Things (IoRT) can provide a solution to these problems by creating hybrid cyber-physical bank branches that are efficient, cost-effective, and safe.

2. LITERATURE SURVEY

A. A. Mamun, A. Al Mamun, S. R. Hasan, S presented a system for secure and transparent Know Your Customer (KYC) processes in banking systems utilizing InterPlanetary File System (IPFS) and blockchain technology. This system enables customers to open accounts at one bank, complete the KYC process, generate a hash value using IPFS, and share it using blockchain. Subsequently, any other bank or financial institution can securely retrieve and store customer data (KYC) using the IPFS network if the customer desires to open an account with them.

Y. P. K. Singh proposed a robust and imperceptible image watermarking technique based on Singular Value Decomposition (SVD), Discrete Cosine Transform (DCT), Bi-dimensional Empirical Mode Decomposition (BEMD), Particle Swarm Optimization (PSO), and Discrete Wavelet Transform (DWT). The method employs DWT for image decomposition, DCT for watermarking, and utilizes PSO for optimization.

Z. N. Agarwal and P. K. Singh introduced a watermarking method for color images, combining Discrete Cosine Transform (DCT) with Genetic Algorithm (GA) for robustness and imperceptibility. The method partitions the cover image into 8x8 blocks for DCT transformation, with GA employed for optimization.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM:

For biometric feature extraction have been verified in the past few years. Szczuko et al. proposed a data fusion-based approach to multi-modal biometrics for the verification of bank clients. The Dempster–Shafer method was used for data fusion, and the outcome was acceptably accurate for banking applications. Almabdy and Elrefaei reviewed recent advances in deep learning systems for applications of biometrics. Several performance indicators have shown that deep neural networks can provide the high accuracy required for verifying human identity. Estrela et al. presented a behavioral measure of biometrics for user verification in banking applications to prevent fraud and impersonation attacks.

3.2 PROPOSED SYSTEM:

To have an automated intelligent bank branch capable of providing traditional paper-based services to the customer using robots, a complex system capable of addressing multiple problems is required. The problems that the proposed ADD-KYC framework is addressing are as follows:

1. A practical web based solution is required for banking. This solution reduces the cost of human resources and increases the speed and accuracy of the banking services as well as adhering to the safety requirements in pandemic conditions.

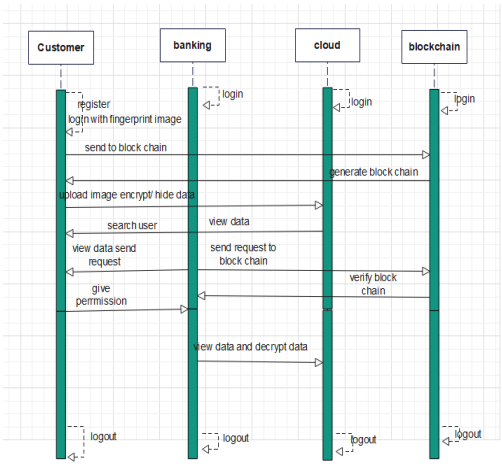
2. An automated multi-biometric KYC solution is required for secure banking. This system should allow the interbank ecosystem to provide customer identity verification with high accuracy.

3. A fast and high-capacity watermarking algorithm is required for securing digitally transmitted documents in the banking cloud. This algorithm should be capable of storing multiple biometric information in banking documents.

4. SYSTEM DESIGN

4.1 USE CASE DIAGRAM

4.2 SEQUENCE DIAGRAM



5. IMPLEMENTATION

5.1 Input and Output Designs

5.1.1 Logical design

The logical design of a system pertains to an abstract representation of the data flows, inputs and outputs of the system. This is often conducted via modeling, using an over-abstract (and sometimes graphical) model of the actual system. In the context of systems design are included. Logical design includes ER Diagrams i.e. Entity Relationship Diagrams

5.1.2 Physical design

The physical design relates to the actual input and output processes of the system. This is laid down in terms of how data is input into a system, how it is verified / authenticated, how it is processed, and how it is displayed as output. In Physical design, following requirements about the system are decided.

User Interface Design is concerned with how users add information to the system and with how the system presents information back to them. Data Design is concerned with how the data is represented and stored within the system. Finally, Process Design is concerned with how data moves through the system, and with how and where it is validated, secured and/or transformed as it flows into, through and out of the system. At the end of the systems design phase, documentation describing the three sub-tasks is produced and made available for use in the next phase.

5.2 Input & Output Representation

5.2.1 Input Design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy.

5.2.2 Objectives

Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

6. CONCLUSION

The proposed automated deep learning-based framework for interbank KYC in AI-based cyber-physical banking presents a comprehensive solution to the challenges faced by traditional KYC processes. By utilizing a deep biometric architecture, customer KYC information can be accurately modeled while ensuring privacy through anonymization of visual data. The integration of symmetric-asymmetric encryption-decryption with blockchain technology enables secure and decentralized transmission and validation of biometric information, enhancing trust and reliability in interbank transactions.

Additionally, the high-capacity fragile watermarking algorithm based on integer-to-integer LSB technique ensures secure transmission and storage of in-person banking documents, further strengthening the security measures in the banking sector. The development and validation of the proposed framework through a web application for biometric fingerprint collection demonstrate its practical applicability and effectiveness in real-world scenarios.

7. REFERENCES

I. D. B. Anitha and M. Rao, "A survey on defect detection in bare pcband assembled pcb using image processing techniques," in 2017 Interna-tional Conference on Wireless Communications, Signal Processing andNetworking (WiSPNET), 2017, pp. 39–43.

II. M. Moganti, F. Erçal, C. H. Dagli, and S. Tsunekawa, "Automatic pcbinspection algorithms: A survey," Comput. Vis. Image Underst., vol. 63,pp. 287–313, 1996.

III. T. Evgeniou and M. Pontil, "Support vector machines: Theory andapplications," in Machine Learning and Its Applications, vol. 2049, 092001, pp. 249–257.

IV. E. Grossi and M. Buscema, "Introduction to artificial neural networks,"European journal of gastroenterology and hepatology, vol. 19, pp. 1046–54, 01 2008.[11] C. R. Reeves, "Genetic algorithms," in Encyclopedia of Database Sys-tems, 1993.

V. L. Rokach and O. Maimon, "Decision trees," in The Data Mining andKnowledge Discovery Handbook, 2005.

VI. M. Seul, L. O'Gorman, and M. J. Sammon, "Template matching," inPractical Algorithms for Image Analysis: Description, Examples andCode, 2000