

AI-Based Secure Cardless Banking System Using QR Code and Facial Recognition

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Abstract: *This project presents a secure and contactless banking system using QR code technology and facial recognition. Traditional banking methods rely on physical cards and PINs, which are vulnerable to theft, duplication, and unauthorized access. To overcome these limitations, the proposed system introduces biometric authentication to verify user identity and enhance security. In this system, QR codes are used to initiate transactions in a fast and contactless manner. Once the QR code is scanned, the system captures the user's facial image through a camera and performs facial recognition by comparing it with stored data. This ensures that only authorized users can complete transactions. The system utilizes image processing techniques and AI-based models for accurate verification. A secure backend manages authentication, data processing, and transaction execution efficiently. This approach reduces the risk of fraud and improves overall security. Additionally, it enhances user convenience by eliminating the need for physical cards. Overall, the system provides a reliable, efficient, and user-friendly solution for modern digital banking.*

Keywords: AI – based models, QR code, Facial recognition, Digital banking, OTP verification, Transaction Processing.

I. INTRODUCTION

In the modern digital era, banking systems are rapidly evolving to provide secure and convenient services to users. Traditional banking methods rely heavily on physical cards and PIN-based authentication, which are vulnerable to theft, loss, and unauthorized access. With the increasing number of digital transactions, there is a growing need for a more secure and contactless authentication system. This project proposes an AI-based secure banking solution that integrates QR code technology with facial recognition to enhance both security and user experience. The system eliminates the dependency on physical cards by allowing users to initiate transactions through QR codes, while facial recognition ensures that only the authorized account holder can complete the transaction. By leveraging advancements in artificial intelligence and computer vision, the system provides accurate and real-time user verification. Additionally, the proposed solution reduces the risk of fraud and identity theft while improving the efficiency of transaction processing. This approach not only enhances security but also offers a user-friendly and contactless banking experience suitable for modern digital environments.

II. LITERATURE REVIEW

Recent advancements in artificial intelligence and computer vision have significantly improved the development of secure authentication systems. Facial recognition technology, which uses deep learning and image processing techniques, has become widely popular for identity verification due to its accuracy and reliability. Many modern applications, including smartphones and security systems, utilize biometric authentication to enhance security. Similarly, QR code technology has gained widespread adoption in digital payment systems for enabling fast and contactless transactions. Existing solutions such as mobile banking applications and UPI-based systems provide QR-based payments but often rely on PIN or password authentication, which can still be compromised. Research studies highlight that combining biometric authentication with digital transaction methods can greatly reduce fraud and



unauthorized access. Additionally, tools like OpenCV and machine learning models have made it easier to implement real-time face detection and recognition systems. However, most existing systems do not fully integrate both QR-based transaction initiation and facial recognition for authentication in a single platform. This project aims to bridge that gap by combining these technologies to provide a more secure, efficient, and user-friendly banking solution.

III. METHODOLOGY

The proposed system integrates QR code technology and facial recognition to enable secure banking transactions. The process begins when the user scans a QR code to initiate a transaction. After scanning, the system captures the user's facial image using a camera. Face detection and feature extraction are performed using image processing techniques. The captured image is then compared with stored data in the database for verification. If a match is found, the system authenticates the user and processes the transaction securely. The backend handles data validation and transaction management. This approach ensures a secure, efficient, and user-friendly cardless banking system.

IV. TARGET

The proposed system is designed for bank customers who prefer secure and contactless transactions. It is suitable for individuals who frequently use digital banking services. The system is also useful for businesses and organizations that require safe payment methods. It targets users who want to avoid physical cards and PIN-based authentication. Overall, the system aims to enhance security, convenience, and efficiency in modern banking.

V. RELATED WORK

Methodology

The aim of this project is to develop a secure and contactless banking system using QR code technology and facial recognition. The system uses QR codes to initiate transactions and integrates facial recognition for user authentication. The combination of these technologies ensures that only authorized users can access and perform transactions. This approach enhances both security and user convenience in digital banking.

Data Collection

Data for the system is collected during user registration and real-time transactions. Facial data is captured using a camera and stored securely in the database. QR codes are generated for each user account to enable transaction initiation. During transactions, user input and facial images are collected dynamically for verification.

Data Preprocessing

Before processing, the captured facial images undergo preprocessing steps such as resizing, noise reduction, and normalization. Face detection techniques are applied to extract relevant facial features. These steps improve the accuracy and efficiency of the facial recognition process.

Model Selection

The system uses facial recognition models based on image processing and machine learning techniques. Tools such as OpenCV are used for face detection and recognition. The model compares captured facial features with stored data to verify user identity accurately.

Evaluation

The system is evaluated based on accuracy, security, and performance. Facial recognition accuracy and transaction success rate are key metrics. The results show that the system effectively prevents unauthorized access and ensures secure transactions.



VI. WORKFLOW DIAGRAM

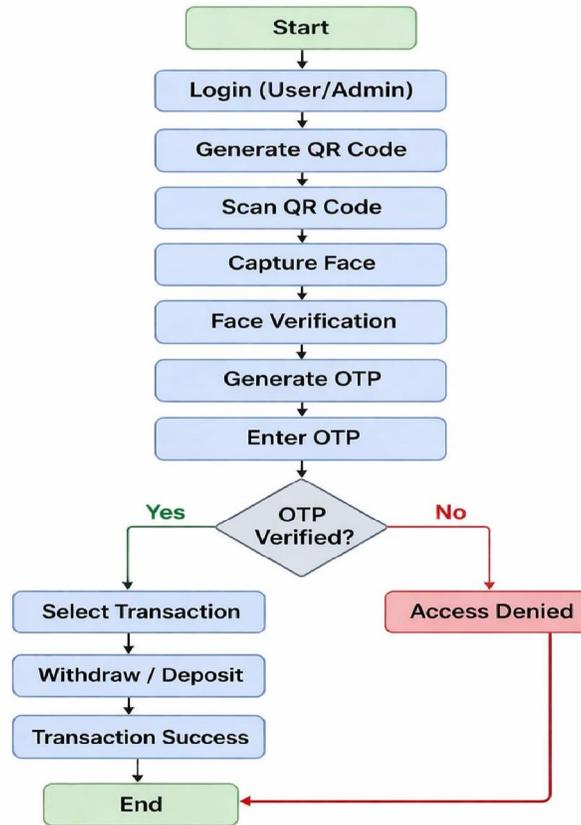


Fig. 1

VII. PROPOSED ALGORITHM

Login Authentication Algorithm

- User/Admin enters login credentials.
- System verifies username and password with database.
- If valid, access is granted, otherwise, access is denied.

QR Code Generation Algorithm

- After login, the system generates a unique QR code.
- QR code contains transaction or account details.
- The generated QR code is displayed to the user for scanning.

QR Code Scanning Algorithm

- User scans the QR code using a device camera.
- System extracts encoded data from the QR code.
- Validates the extracted information before proceeding.



Face Detection and Recognition Algorithm

- System captures the user’s facial image in real time.
- Face detection is performed using image processing techniques.
- Extracted facial features are compared with stored data.

OTP Verification Algorithm

- OTP Verification Algorithm
- OTP Verification Algorithm

If OTP matches, authentication is completed.

Transaction Processing Algorithm

- User selects transaction type (Withdraw/Deposit).
- System verifies account balance and details.
- Transaction is processed securely through backend.
- Confirmation message is displayed to the user.

VIII. RESULT

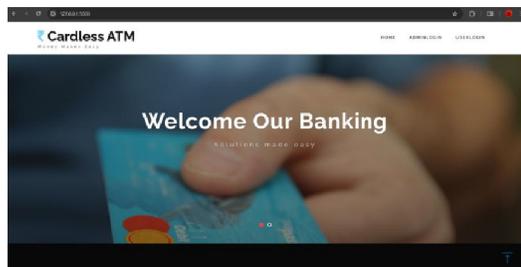


Fig. 2



Fig. 3



Fig. 4

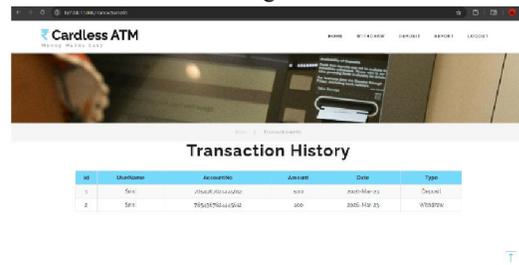


Fig. 5

The proposed system successfully implemented a secure cardless banking solution using QR code and facial recognition. The system was able to accurately verify users through face recognition and OTP authentication. Transactions such as withdrawal and deposit were completed efficiently without using physical cards. The integration of QR code scanning provided a fast and contactless user experience. The system effectively prevented unauthorized access and reduced the risk of fraud. Overall, the results demonstrate improved security, reliability, and user convenience in digital banking.

IX. CONCLUSION

The proposed system successfully developed a secure and contactless banking solution using QR code and facial recognition technology. It eliminates the need for physical cards and PIN-based authentication, thereby reducing the



risk of theft and unauthorized access. By integrating biometric verification, the system ensures that only the authorized user can perform transactions. This improves both security and user trust in digital banking systems.

The system provides an efficient workflow by combining QR code scanning, facial recognition, and OTP verification. Each step adds an additional layer of security, making the system highly reliable. Transactions such as withdrawal and deposit are processed quickly and accurately. The user-friendly design makes it easy to use for both individuals and businesses. Overall, the system enhances convenience while maintaining high security standards.

In the future, the system can be improved by integrating advanced deep learning models for better facial recognition accuracy. Additional features such as mobile application support and multi-factor authentication can be added. The system can also be extended to support multiple banking services and platforms. These enhancements will further improve performance, scalability, and usability. Thus, the proposed system provides a strong foundation for modern secure banking solutions.

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