Iris-Based Authentication For ATM Transactions with Matlab s GSM Module

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Abstract: The main aim of this paper is to provide ATM Center security using IRIS Recognition. For the traditional ATM terminal, customer recognition systems rely only on bank cards, passwords, and such identity verification methods, whose measures are not perfect, and their functions are too limited. The use of Biometric ATM's based on IRIS recognition technology provides a safe and paperless banking environment. This project will detect the iris of user and allow the person to make transactions. By using MATLAB, it detects the human IRIS and allows the person to make a transaction and sends a message automatically. We do not use fingerprints, passwords to take an amount. We use Iris recognition to make money. Senior citizens use this method to take money easily; they do not ask anyone to take money. By using this method to prevent misuse of ATM card PINs. It is madly for senior citizens.

Keywords: — Iris Recognition, Biometric ATM, ATM Security, MATLAB, Senior Citizen Friendly Technology, Cash Withdrawal without PIN, Iris-based Authentication, Secure Banking, Paperless Transactions, ATM Fraud Prevention

I. INTRODUCTION:

With the rapid growth of electronic banking and ATM usage, ensuring secure and reliable user authentication has become a critical concern. Traditional ATM authentication methods, such as ATM cards and Personal Identification Numbers (PINs), are increasingly vulnerable to threats like card theft, skimming, shoulder surfing, and unauthorized access. These security challenges highlight the need for advanced authentication mechanisms that are both robust and user-friendly. Biometric authentication systems offer a promising solution by utilizing unique physiological characteristics of individuals. Among various biometric traits, **iris recognition** is considered one of the most accurate and secure methods due to the uniqueness, stability, and complexity of iris patterns. The iris remains stable throughout a person's lifetime and is extremely difficult to duplicate, making it ideal for high-security applications such as ATM transactions.This project, **"Iris-Based Authentication for ATM Transactions using MATLAB and GSM Module,"** proposes a secure ATM access system that replaces or enhances conventional PIN-based authentication with iris recognition. MATLAB is used for image acquisition, preprocessing, feature extraction, and matching of iris patterns. To further strengthen security, a **GSM module** is integrated to provide real-time transaction alerts and one-time password (OTP) verification, notifying the account holder immediately in case of authentication

attempts or suspicious activities. By combining biometric iris recognition with GSM-based communication, the proposed system significantly enhances ATM security, reduces fraud, and improves customer trust. This approach ensures that only authorized users can access banking services, making ATM transactions safer, faster, and more reliable in modern banking environments.

II. OBJECTIVES:

- **To enhance ATM security** by implementing iris-based biometric authentication instead of relying solely on traditional ATM cards and PINs.
- **To design and develop an iris recognition system using MATLAB** for accurate image acquisition, preprocessing, feature extraction, and matching.
- **To reduce ATM fraud and unauthorized access** by ensuring that only genuine users with registered iris patterns can perform transactions.
- **To integrate a GSM module** for sending real-time alerts and notifications to the account holder during authentication and transaction attempts.
- **To implement an additional layer of security using OTP verification** through GSM communication for critical or suspicious transactions.
- **To improve user convenience and reliability** by providing a fast, contactless, and secure authentication method.
- **To demonstrate the effectiveness of biometric and communication technologies** in modern banking systems for secure financial transactions.
- **To provide a scalable and efficient authentication model** that can be adapted for future enhancements in ATM and electronic banking security systems.

III. SCOPE OF THE STUDY

This study is confined to a prototype-level ATM security system and focuses on users registered for iris-based authentication. It primarily covers the implementation and evaluation of iris recognition techniques using MATLAB and the integration of a GSM module for transaction alerts and OTP verification. The study considers simulated ATM transactions and evaluates system performance in terms of authentication accuracy and security. It includes only iris-based biometric verification and does not incorporate other biometric methods such as fingerprint or facial recognition. The study also excludes real-time banking server integration, large-scale deployment, and other security technologies such as blockchain or advanced encryption mechanisms.

IV. LITERATURE REVIEW

Biometric authentication has gained significant attention in recent years as a reliable solution to overcome the limitations of traditional security systems. Among various biometric techniques, iris recognition is widely regarded as one of the most accurate and secure due to the uniqueness and stability of iris patterns.

Daugman (2004) introduced one of the earliest and most effective iris recognition algorithms, emphasizing iris segmentation, normalization, and feature encoding using Gabor filters. His work established iris recognition as a highly reliable biometric technology suitable for high-security applications.

Wildes et al. (1997) proposed an iris recognition system based on image processing techniques such as edge detection and Hough transforms. Their research demonstrated that accurate iris localization significantly improves recognition performance.

Several researchers have explored the application of biometric authentication in banking systems. Jain, Ross, and Prabhakar (2004) discussed the advantages of biometric-based security over traditional authentication methods, highlighting reduced fraud and enhanced user verification in financial transactions.

MATLAB has been widely used for implementing biometric systems due to its powerful image processing and pattern recognition capabilities. Gonzalez and Woods (2018) emphasized MATLAB's effectiveness in developing and testing image processing algorithms for biometric applications, including iris recognition.

The integration of GSM technology for security enhancement has also been explored in ATM systems. Kumar and Ramesh (2016) proposed a GSM- based alert system for ATM transactions, where SMS notifications are sentto users for every transaction attempt, improving transparency and fraud detection.
Recent studies combine biometric authentication with GSM-based communication to provide multi-layer security. Researchers have shown that combining iris recognition with OTP-based GSM alerts significantly enhances ATM security by preventing unauthorized access and immediately informing users of suspicious activities.

Overall, the reviewed literature indicates that iris-based biometric authentication, when integrated with GSM communication and implemented using MATLAB, offers a robust, secure, and efficient solution for ATM transaction security.

V. METHODOLOGY

5.1 Research Design

The present study adopts a descriptive and experimental research design. The descriptive approach is used to understand the security requirements and user perceptions related to ATM authentication systems, while the experimental design is applied to develop and test the iris-based authentication system. MATLAB is used to simulate iris recognition processes, and a GSM module is integrated to evaluate real-time alert and OTP functionality. This combined design helps assess the effectiveness, accuracy, and reliability of the proposed system.

5.2 Sampling Method

The study uses a **purposive sampling method**, selecting participants who are familiar with ATM usage and willing to participate in biometric authentication testing. Samples consist of registered users whose iris images are captured and stored in the system database for experimental evaluation. The sample size is limited due to the prototype nature of the study.

5.3 Data Collection Tools Structured Questionnaire:

A structured questionnaire is used to collect primary data from participants regarding their awareness, acceptance,and perceived security of biometric- based ATM systems. The questionnaire includes close-ended questions related to ease of use, trust in iris recognition, and effectiveness of GSM-based alerts.

5.4 Semi-Structured Interviews:

Semi-structured interviews are conducted with selected participants to gain deeper insights into user experiences, concerns, and suggestions related to iris-based ATM authentication. This method allows flexibility while ensuring that key topics such as security, privacy, and usability are covered.

5.5 Data Analysis Techniques

The collected data is analyzed using **descriptive statistical techniques** such as percentages, frequency distributions, and mean values to interpret questionnaire responses. Experimental results from the iris recognition system are analyzed using **performance metrics** such as accuracy, false acceptance rate (FAR), and false rejection rate (FRR). Interview responses are analyzed using **qualitative content analysis** to identify common themes and user perceptions.

This methodology enables a comprehensive evaluation of the proposed iris- based ATM authentication system in terms of both technical performance and user acceptance.

VI.RESULTS

The results of the study demonstrate the effectiveness of the **Iris-Based Authentication for ATM Transactions using MATLAB and GSM Module** in enhancing transaction security and user confidence.

- **Iris Recognition Performance**

  The iris recognition system developed using MATLAB showed a high level of accuracy in user authentication. The system successfully matched registered iris images with live input images, indicating reliable feature extraction and matching. A low **False Acceptance Rate (FAR)** and **False Rejection Rate (FRR)** were observed, confirming the robustness of the biometric model.

- **Authentication Success Rate**

  Most authorized users were authenticated successfully within a short processing time, ensuring quick and efficient ATM access. Unauthorized access attempts were effectively rejected, highlighting the system's ability to prevent fraudulent transactions.

- **GSM Module Functionality**

  The GSM module successfully sent **real-time SMS alerts and OTPs** to the registered mobile numbers during transaction attempts. Users received instant notifications for both successful and failed authentication

attempts, improving transparency and security awareness.

- **User Acceptance and Feedback**

  Results from structured questionnaires and interviews indicated a positive user response toward iris-based ATM authentication. Participants expressed higher confidence in biometric security compared to traditional PIN-based systems and appreciated the additional GSM-based alert mechanism.

- **Overall System Effectiveness**

  The combined use of iris recognition and GSM-based communication provided a **multi-layer security framework**, significantly reducing the risk of unauthorized access. The results confirm that the proposed system is reliable, secure, and suitable for future enhancement and real-world ATM applications.

VII. FINDINGS AND SUGGESTIONS

- Iris-based authentication offers higher security than traditional ATM card and PIN systems due to the uniqueness of iris patterns.
- The MATLAB-implemented iris recognition system achieved high authentication accuracy with minimal false acceptance and rejection.
- The GSM module effectively provided real-time SMS alerts and OTP verification, enhancing transaction security.
- Users showed positive acceptance and trust in the iris-based ATM authentication system.
- The system can be enhanced by adding multi-biometric authentication such as fingerprint or face recognition.
- Future work should focus on real-time ATM and banking server integration for practical deployment.
- Stronger encryption methods can be applied to protect stored biometric data.
- The GSM-based alert system can be extended to include mobile app notifications for better user interaction.

VIII. CONCLUSION

The study concludes that iris-based authentication using MATLAB and GSM technology significantly enhances ATM transaction security. The system provides accurate user identification and prevents unauthorized access through unique iris recognition. The GSM module further strengthens security by sending real-time alerts and OTPs to users. Overall, the proposed method is secure, efficient, and suitable for future ATM security improvements.

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