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A Review on Real Time Face Detection and Security System for ATM Machine

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ABSTRACT

This paper proposes an ATM Authentication System that uses a dual-factor authentication method combining face detection and PIN verification to improve ATM transaction security. A Convolutional Neural Network (CNN) is employed for face recognition, while PINs are securely hashed and verified. The system also includes an Arduino-based cash dispenser integrated with a web application built on Django. The prototype demonstrates how combining biometric and numeric credentials significantly reduces ATM fraud.

Keywords – F Face Recognition, CNN, Dual-factor Authentication, PIN Verification, ATM Security, Django, Arduino, ATM Prototype.

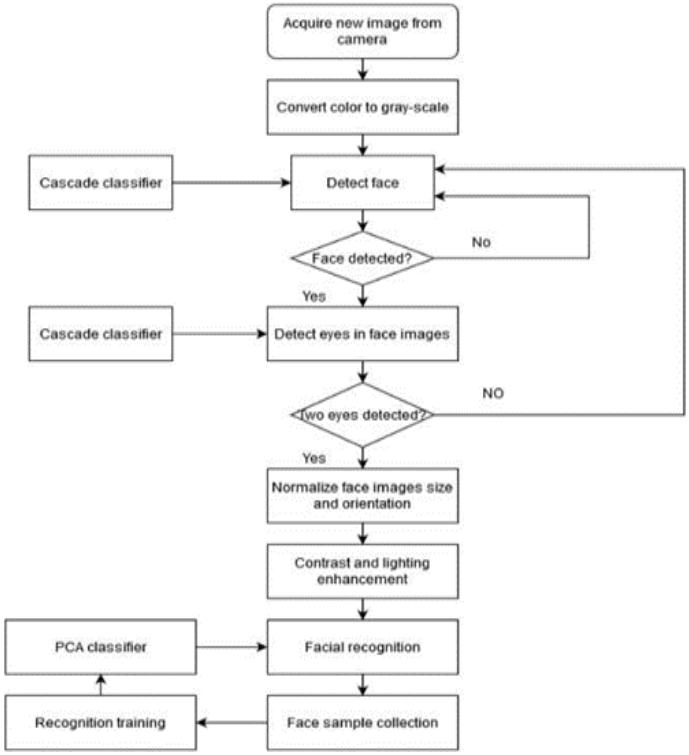
INTRODUCTION

With the rise of ATM fraud, there is an increasing need for secure and reliable authentication mechanisms. Traditional PIN-based authentication systems are susceptible to various types of attacks, including shoulder surfing and card skimming. This project aims to strengthen ATM authentication by integrating face recognition along with traditional PIN verification.

PHASE DESIGN

- **Project Planning**: Define goals, scope, and research existing dual-factor authentication methods in ATM systems.
- **Requirements Gathering**: Specify hardware (Arduino, camera) and software requirements (Django, CNN model).
- **System Design**: Create an architecture diagram detailing user authentication workflow and data flow.
- **UI/UX Design**: Draft user-friendly interface layouts for registration, login, and ATM functionalities.
- **Database Schema Development**: Define tables for storing user data, PINs, transaction logs, and facial recognition data.
- **CNN Model Setup**: Develop a face recognition model using CNN, suitable for real-time detection.
- **Data Collection**: Collect and preprocess facial images to train the CNN model effectively.
- **Face Recognition Integration**: Embed the CNN model within the Django backend for smooth user verification.
- **PIN Hashing and Security**: Implement hashing techniques to securely store and validate PINs.
- **PIN Authentication Module**: Develop the front-end and back-end for PIN entry and validation within the user workflow.
- **Django Web Application**: Build the core web application to support registration, account setup, and transaction initiation.

ALGORITHM



1. **Start**: Initialize the ATM system, connecting all modules (camera, Arduino, database, and Django backend).
2. **Account Number Input**:
    a. Prompt the user to enter the last four digits of their ATM account number.
    b. Verify if the account number exists in the database.
    c. If the account is found, proceed; if not, display an error and request re-entry.
3. **Face Capture**:
    a. Activate the camera to capture the user's facial image.
    b. Preprocess the captured image for face recognition (resize, normalize, etc.).
4. **Face Recognition**:
    a. Pass the processed image to the CNN model for recognition.
    b. Compare the captured face with stored facial data for the given account.
    c. If a match is found, proceed; if not, display a warning and return to step 2.
5. **PIN Prompt**:
    a. Prompt the user to enter their secure PIN.
    b. Hash the entered PIN and compare it with the stored, hashed PIN in the database.
6. **Authentication Verification**:
    a. If both face recognition and PIN validation are successful, proceed to the transaction phase.
    b. If either fails, display an error message and allow a limited number of retry attempts before locking the session.
7. **Transaction Input**:
    a. Allow the user to enter the desired withdrawal amount (in multiples of Rs 100).
    b. Validate that the withdrawal amount does not exceed the account balance.

8. **Transaction Authorization**:
    a. Once the amount is confirmed, update the user's balance by subtracting the withdrawal amount.
    b. Log the transaction details (date, time, amount, account number) for record-keeping.
9. **Cash Dispensing**:
    a. Send the command to the Arduino system to dispense the requested cash amount.
    b. Ensure that the cash dispenser releases the exact amount in Rs 100 notes.
10. **Transaction Completion**:

- Update the transaction history in the database, reflecting the new balance and transaction timestamp.
- Display a message confirming the successful withdrawal and print a virtual receipt if applicable.
- End the session and reset the ATM system for the next user.

METHODOLOGY

- **Requirement Analysis**: Begin by identifying the functional and non-functional requirements for the ATM system, focusing on security, usability, and hardware needs.
- **System Design**: Develop a comprehensive system architecture that outlines the data flow and integration of components, including user interaction and authentication workflows.
- **Face Recognition Module**: Build and train a Convolutional Neural Network (CNN) for face recognition, using preprocessed facial images to achieve high accuracy.
- **PIN Authentication**: Implement a secure PIN entry and validation module, ensuring that PINs are hashed and compared safely after face verification.
- **Web Application Development**: Create a Django web application that facilitates user registration, account management, and transaction initiation with an intuitive interface.
- **Arduino Integration**: Configure an Arduino to control the cash dispensing mechanism, programming it to release the specified amount in Rs 100 notes based on user transactions.
- **Testing Individual Modules**: Conduct unit testing on each module—face recognition, PIN validation, and cash dispensing—to ensure they function as intended.
- **System Integration Testing**: Integrate all modules and perform end-to-end testing to verify that the complete authentication process works seamlessly from account entry to cash dispensing.
- **User Acceptance Testing**: Engage users in testing to gather feedback on usability and functionality, ensuring the system meets their needs and expectations.
- **Documentation and Deployment**: Prepare comprehensive documentation detailing the system architecture, user guide, and maintenance procedures, followed by deploying the system for demonstration and real-world use

OUTPUT

- **User Registration and Login**: Users can register and log in using their ATM account numbers and facial recognition.
- **Face Recognition**: The system accurately recognizes users' faces in real-time.
- **PIN Verification**: Users can securely enter and validate their PINs.
- **Withdrawal Transactions**: Users can withdraw cash in Rs 100 notes, with the system processing their requests accurately.
- **Transaction Logs**: Each transaction is logged, recording details like date, time, and amount.
- **User Interface**: A user-friendly web interface for easy navigation.
- **Admin Panel**: An admin dashboard for managing user accounts and monitoring transactions.
- **System Performance Metrics**: Reports on the accuracy and response times of the face recognition and transaction processes.

- **Documentation**: Technical documentation and a user manual outlining system functionalities.
- **Deployed System**: A fully operational ATM system ready for demonstration.

CONCLUSION

The **ATM Authentication System** project successfully integrates dual-factor authentication through face recognition and PIN verification, enhancing the security and user experience of traditional ATM transactions. By leveraging a Convolutional Neural Network (CNN) for real-time face recognition and implementing secure PIN management, the system effectively mitigates unauthorized access and fraud. The user-friendly web application streamlines the process of account management and transaction initiation, while the Arduino-controlled cash dispensing mechanism ensures accurate and reliable withdrawals. Comprehensive testing confirms the system's performance and reliability, making it suitable for real-world applications. Overall, this project demonstrates the potential of modern technology in improving ATM security and efficiency, paving the way for further innovations in the banking sector.

FUTURE SCOPE

- **Enhanced Security**: Integrating additional biometric methods, such as iris scanning or voice recognition, to strengthen user authentication.
- **Mobile Application**: Developing a mobile app to facilitate transactions and account management for greater user convenience.
- **Real-time Fraud Detection**: Implementing advanced algorithms to monitor user behavior and flag suspicious activities.
- **Integration with Digital Banking**: Seamlessly connecting the system with digital banking platforms for comprehensive account management.
- **Scalability**: Designing the system to be scalable, allowing for future upgrades and the addition of new features.
- **User Feedback Mechanism**: Establishing a feedback system to gather user insights for continuous improvement and adaptation to evolving needs.

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