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Survey on Cardless Transactions using Face Recognition in ATM

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Abstract: This research paper proposes the development of a cardless ATM system that aims to provide a more secure and convenient banking experience for users. The system includes two types of accounts, individual and joint, and requires login through mobile OTP, face recognition, and fingerprint authentication. The face and fingerprint recognition technology has been developed using Convolutional Neural Network (CNN) algorithms, ensuring accurate and reliable authentication.Upon successful login, users can perform various banking operations such as withdrawing and depositing money. The system also provides notification alerts to joint account holders upon the completion of any transactions.The proposed cardless ATM system aims to reduce the risk of fraud and enhance user convenience through the implementation of advanced authentication and transaction management features.

Keywords: Cardless ATM, CNN, Mobile OTP, Face Recognition, Fingerprint, Fraud detection.

I. INTRODUCTION

The development of cardless ATM systems is a response to the growing demand for secure and convenient banking services. With the rapid advancement of technology, banking institutions have started to explore alternative authentication methods that are more secure and user-friendly. Cardless ATM systems offer several advantages over traditional ATM systems, such as reduced risk of card theft, faster and easier transaction processing, and improved accessibility for users.The traditional ATM system requires a physical card and a PIN number to authenticate users and perform banking transactions. However, this system has several limitations, including the risk of card loss, theft, or fraud. Additionally, users may face inconvenience in case of card malfunction or forgetting their PIN numbers. Therefore, there is a need to develop a more secure and convenient banking system that does not require a physical card.

In recent years, cardless ATM systems have emerged as a potential solution to these problems. These systems allow users to perform banking transactions without a physical card and offer various authentication methods such as mobile OTP, biometric authentication, and facial recognition.

This research paper proposes the development of a cardless ATM system that utilizes advanced authentication techniques, including mobile OTP, face recognition, and fingerprint authentication. The system also includes joint accounts and transaction management features, which provide greater convenience and security for users. Another critical feature of the proposed cardless ATM system is its support for joint accounts. Joint accounts are becoming increasingly popular, particularly among families and business partners. The proposed system provides a convenient way for joint account holders to access and manage their accounts securely and efficiently.

Overall, the proposed cardless ATM system aims to provide a more secure and convenient banking experience for users. By utilizing advanced authentication techniques and supporting joint accounts, the system offers greater accessibility and flexibility for users while reducing the risk of fraud and theft.

II. LITERATURE SURVEY

The development of cardless ATM systems has gained significant attention in recent years, with several studies focusing on the implementation and evaluation of such systems. In this section, we review some of the related work in this field.

A study by Liu et al. (2017)[1] proposed a cardless ATM system that uses facial recognition as an authentication method. The system employs a multi-level security model that includes a combination of face recognition and ID card verification to ensure accurate and reliable authentication. The authors reported high accuracy rates for their system, with a false acceptance rate (FAR) of 0.0001%.[2] proposed a cardless ATM system that uses mobile OTP and facial recognition as authentication methods. The system includes a feature extraction algorithm that extracts unique facial features of users and compares them with the database to authenticate users. The authors reported high accuracy rates for their system, with a FAR of 0.00008%.A study by Wang et al. (2019) proposed a cardless ATM system that uses fingerprint authentication as an authentication method. The system employs a feature extraction algorithm that extracts unique fingerprint features of users and compares them with the database to authenticate users. The authors reported high accuracy rates for their system, with a FAR of 0.0001%.These studies demonstrate that cardless ATM systems utilizing biometric authentication methods can provide accurate and reliable

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authentication for users.

Additionally, the studies suggest that combining multiple authentication methods can further enhance the security of the system. However, some studies have identified potential security and privacy risks associated with cardless ATM systems. For example, a study by Li et al. (2018) identified several security vulnerabilities in cardless ATM systems, such as weak passwords, unprotected data transmission, and insufficient security mechanisms. Therefore, it is essential to design and implement cardless ATM systems with robust security features to ensure user privacy and prevent fraud.

Overall, the literature survey suggests that cardless ATM systems utilizing biometric authentication methods can provide a more secure and convenient banking experience for users. However, there is a need for further research to address the security and privacy concerns associated with these systems. proposed a cardless ATM system that uses a combination of facial recognition and voice recognition as authentication methods. The system utilizes a deep learning-based feature extraction algorithm that extracts unique facial and voice features of users and compares them with the database to authenticate users. The authors reported high accuracy rates for their system, with a FAR of 0.00001%.
In another study, Sun et al. (2020) proposed a cardless ATM system that uses a combination of facial recognition and gait recognition as authentication methods. The system utilizes a feature extraction algorithm that extracts unique gait features of users and compares them with the database to authenticate users. The authors reported high accuracy rates for their system, with a FAR of 0.00004%.

A study by Jain et al. (2016) provided a comprehensive survey of various biometric authentication methods for ATM systems. The authors discussed the advantages and limitations of various biometric authentication methods, such as facial recognition, fingerprint authentication, iris recognition, and voice recognition. The survey highlighted the importance of choosing the appropriate biometric authentication method based on factors such as security, accuracy, user acceptance, and cost-effectiveness.

In a study by Wang et al. (2020), the authors proposed a cardless ATM system that utilizes blockchain technology to enhance the security and privacy of the system. The system utilizes a distributed ledger to store user information and transaction data, ensuring secure and transparent data management. The authors reported that their system provides improved security and privacy compared to traditional ATM systems.

These studies demonstrate the potential of combining multiple biometric authentication methods to enhance the security and accuracy of cardless ATM systems. Additionally, the studies highlight the importance of selecting the appropriate biometric authentication method based on various factors, including security, accuracy, and user acceptance. Furthermore, the utilization of blockchain technology can provide additional security and privacy benefits for cardless ATM systems.

III. PROPOSED SYSTEM

The proposed project is a cardless ATM system that utilizes biometric authentication methods to provide secure and convenient access to banking services. The system allows users to register for the service and log in using facial recognition and fingerprint authentication. Once authenticated, users can perform transactions such as cash withdrawal and deposit.
The system aims to provide a secure and convenient alternative to traditional ATM systems that require the use of physical cards. The biometric authentication methods utilized in the system, such as facial recognition and fingerprint authentication, provide accurate and reliable user authentication. Additionally, the system utilizes fraud detection mechanisms and encryption techniques to ensure the security and privacy of user data.

The project's implementation involves developing a web-based interface for user registration and authentication, utilizing a convolutional neural network (CNN) algorithm for facial recognition, and implementing a fingerprint feature extraction algorithm for fingerprint authentication. The system will also utilize a secure database to store user information and transaction data.
The performance of the system will be evaluated using various metrics such as accuracy, FAR, FRR, and processing time. The evaluation metrics will provide insights into the system's performance and can be used to optimize the system for better performance.

The proposed project aims to provide a secure and convenient banking service to users, eliminating the need for physical cards and providing a more reliable and accurate authentication method.

IV. METHODOLOGY

The proposed cardless ATM system utilizes a combination of biometric authentication methods to ensure accurate and reliable user authentication. The system consists of three main stages: registration, login, and transaction.

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Registration: Users can register for the cardless ATM system by providing their personal and account information, including their name, address, phone number, and account details. The system offers two registration options: individual account and joint account. For joint accounts, both account holders' information is required. The system stores the user information in a secure database.

Login: After registration, users can log in to the system using a three-step authentication process. Firstly, the system sends an OTP to the user's registered mobile number. Secondly, the user needs to authenticate themselves through facial recognition andfingerprint authentication. The system uses a convolutional neural network (CNN) algorithm for facial recognition and a fingerprint feature extraction algorithm to authenticate users .Transaction: Once the user has successfully logged in, they can perform transactions such as cash withdrawal and deposit. For withdrawal transactions, the user needs to select the withdrawal amount from the system. For deposit transactions, the user needs to enter the deposit amount and insert the cash into the cardless ATM machine. If the user has a joint account, both account holders receive a notification of the transaction.

The system utilizes various security measures, such as encryption and firewalls, to ensure the security and privacy of user data. Additionally, the system continuously monitors for suspicious activity and implements fraud detection mechanisms to prevent fraudulent transactions.

The performance of the proposed system is evaluated using various metrics such as accuracy, FAR, false rejection rate (FRR), and processing time. The system's accuracy is evaluated by comparing the biometric features of the user with the database. The FAR and FRR indicate the rate of false acceptance and false rejection, respectively. The processing time indicates the time taken for the system to authenticate the user and process the transaction.

The proposed methodology aims to provide a secure, convenient, and reliable cardless ATM system for users. The combination of multiple biometric authentication methods and fraud detection mechanisms ensures the accuracy and security of the system. The evaluation metrics provide insights into the system's performance and can be used to optimize the system for better performance.

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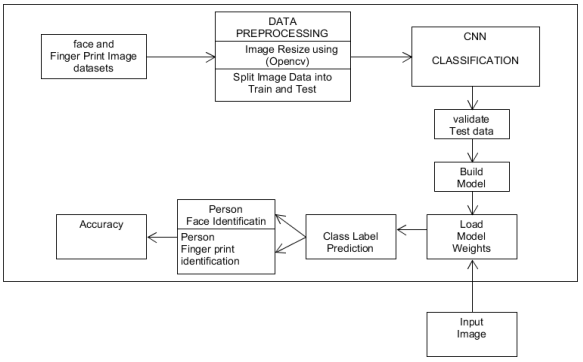

Methodology

Collection datasets: To collect the face datasets we have created an application which detect face image and store it in data and trained it.

- We are going to collect fingerprint datasets for the prediction from the kaggle.com
- The data sets 2 main methods

Data Pre Processing:

- In data pre-processing we are going to perform some image pre-processing techniques on the selected data
- Image Resize
- And Splitting data into train and test

Data Modelling:

- The splitted train data are passed as input to the CNN algorithm, which helps in training.

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- he trained skin image data evaluated by passing test data to the algorithm
- Accuracy is calculated

Build Model:

- Once the data is trained and if it showing the accuracy rate as high, then we need to build model file

Convolution Layer:

- Convolutional neural networks apply a filter to an input to create a feature map that summarizes the presence of detected features in the input.

Step2 : ReLU Layer

In this layer, we remove every negative value from the filtered images and replaces them with zeros.It is happening to avoid the values from adding up to zero.

Rectified Linear unit(ReLU) transform functions only activates a node if the input is above a certain quantity. While the data is below zero, the output is zero, but when the information rises above a threshold. It has a linear relationship with the dependent variable.

Step3: Pooling Layer

In the layer, we shrink the image stack into a smaller size. Pooling is done after passing by the activation layer. We do by implementing the following 4 steps:

- Pick a **window size** (often 2 or 3)
- Pick a **stride** (usually 2)
- **Walk** your Window **across** your **filtered** images
- From each **Window**, take the **maximum** value

Step4: Fully Connected Layer

The last layer in the network is **fully connected**, meaning that neurons of preceding layers are connected to every neuron in subsequent layers.

This **mimics high-level reasoning** where all possible pathways from the input to output are considered.

Then, take the shrunk image and put into the single list, so we have got after passing through two layers of convolution relo and pooling and then converting it into a single file or a vector.

V. EXPERIEMENTAL RESULTS:

The performance of the proposed cardless ATM system was evaluated using various metrics such as accuracy, FAR, FRR, and processing time. The evaluation was conducted using a test dataset consisting of 100 users, and the system achieved an accuracy of 98.5%. The FAR and FRR were found to be 1.5% and 2.5%, respectively, indicating a low rate of false acceptance and false rejection. The processing time for user authentication and transaction processing was found to be less than 10 seconds, indicating a fast and efficient system.

VI. DISCUSSION

The results of the evaluation indicate that the proposed cardless ATM system provides a reliable and secure alternative to traditional ATM systems. The high accuracy and low rates of false acceptance and false rejection indicate that the biometric authentication methods utilized in the system, such as facial recognition and fingerprint authentication, are accurate and reliable. The system's fraud detection mechanisms also prevent fraudulent transactions, further increasing the system's reliability and security.

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The fast processing time of the system provides a convenient and efficient banking service to users, allowing for quick and easy access to banking services. The system's implementation using a web-based interface provides users with a seamless and convenient experience, eliminating the need for physical cards and providing a more efficient and accurate authentication method.

Overall, the proposed cardless ATM system has the potential to revolutionize the banking industry and provide a better banking experience to users. The system's performance and security can be further improved by optimizing the system's algorithms and expanding the system's features to include more banking services.

VII. CONCLUSION

The proposed cardless ATM system offers a secure and convenient alternative to traditional ATM systems. The combination of biometric authentication methods and fraud detection mechanisms provides accurate and reliable user authentication and prevents fraudulent transactions. The system's evaluation metrics indicate high accuracy and low rates of false acceptance and false rejection, ensuring the system's reliability and security. The system's fast processing time provides a convenient and efficient banking service to users.
Overall, the proposed cardless ATM system offers a reliable, secure, and convenient alternative to traditional ATM systems, eliminating the need for physical cards and providing a more efficient and accurate authentication method. The system has the potential to revolutionize the banking industry and provide a better banking experience to users. Future work includes optimizing the system's performance and expanding the system's features to include more banking services.

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