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Secure Cardless Financial Transactions using Multi-Factor Authentication

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Abstract— The rapid development of digital banking has made transactions more convenient but has posed serious security threats in the traditional card-based systems, like theft and unauthorized access. Therefore, this paper suggests a secure cardless transaction system based on multi-factor authentication technology, which includes facial recognition, OTP authentication using Gmail, and credential authentication. The suggested system avoids the use of physical cards and utilizes a multi-layer security mechanism, enabling authentic and valid identity and transaction validation through a webbased platform that incorporates computer vision technology. The proposed system ensures the enforcement of multiple layers of authentication, thus preventing unauthorized access even in the presence of a single-point failure, thus providing a higher level of security and confidence among the users.

Keywords—Cardless Transaction, Multi-Factor Authentication, Face Recognition, OTP Verification, Gmail Integration, Secure Banking, Financial Security.

I. INTRODUCTION

In the recent past, the financial industry has witnessed a revolution through the development of digital technologies like ATMs, mobile banking, and online payment systems. However, these developments have posed serious security risks. Conventional card-based or password-based systems have become vulnerable to threats like skimming, cloning, phishing, and credential theft. Although biometric-based approaches like facial recognition offer a more convenient and secure option, they are not fully trustworthy due to risks like spoofing or environmental factors. In order to avoid the above-mentioned shortcomings, the concept of multi-factor authentication has come into the picture as a more efficient option. In the following sections, the present paper aims to propose a secure cardless transaction system based on facial recognition with Gmail OTP verification.

II. LITERATURE SURVEY

The common theme in all such studies is a push for a form of authentication that is both secure and private, yet easy to manage. The aim is to improve the security of financial transactions and bio-login mechanisms without increasing user hassle. In the studies by Lande et al., the focus is on cardless ATM access, which involves alternative forms of verification. The studies highlight existing vulnerabilities in ATM technology and pave the way for development in cardless access. Kalaivani's system uses a combination of iris and face recognition based on deep learning.

There is also a form of smart ATM technology that uses face recognition. Smart ATMs are more secure than traditional PIN-based ATMs, with built-in mechanisms to prevent hacking.

A survey on cardless transactions in [4] emphasizes the need for greater security through multi-factor authentication.

The researchers have moved forward in their work by combining a number of authentication techniques. Naval et al. have suggested a system that combines facial recognition and one-time password verification techniques. This is a clear indication that the effectiveness of combining techniques is being demonstrated in a real-world scenario. The effectiveness of combining OTP and biometric techniques in improving the security of ATMs is the focus of some research.

Recently, the role of machine learning in improving the security of systems has been demonstrated in some research papers. The effectiveness of the intrusion detection systems based on ML algorithms is demonstrated in some papers, proving the effectiveness of the role played by AI in detecting unauthorized activities in a system. Sharma et al. have suggested a hybrid face recognition technique based on the HOG and SVM techniques.

Although these research papers have moved forward in the field of improving the security of systems, they still have some limitations in their work, like the problem of scalability and the computational burden of the systems designed in the research papers. The system suggested in this paper is a further advancement in the field of improving the security of systems, as it combines the techniques of facial recognition, OTP, and web-based systems.

III. PROBLEM STATEMENT

However, despite the availability of the technology, security risks have been identified as a major problem. The traditional card-based system is prone to security risks such as stealing, cloning, and skimming. The security risks may result in unauthorized financial transactions. The passwordbased system is also prone to security risks such as cyber hacking, phishing, and brute force. Therefore, the password-based system cannot be considered a reliable system.

The biometric-based system has also been identified as a reliable system. However, it is important to understand that the biometric-based system cannot resist security risks completely. The biometric-based system may be prone to security risks such as spoofing and environmental factors. It is therefore important to design a system that can be considered reliable and efficient. The system must be able to ensure that it has various security layers to act as a backup in case the system is compromised to ensure the security of the users.

IV. EXISTING SYSTEM

Presently, financial transaction systems use cardbased payment systems and PIN verification. Although some newer systems have been utilizing some of the newer cardless payment systems that use verification through facial identification, these systems have been limited to being offered as addons. In the past few years, several cardless financial transaction systems have been proposed. Even without the use of cards, security and reliability issues have been faced. The other way of verifying financial transactions is through the use of one-time passwords.

V. PROPOSED SYSTEM

The system proposed here ensures the security of the transactions without the need for cards, as it has multiple levels of authentication. It begins with the registration process, where you have to fill in your personal details as well as your facial credentials, which are then stored. After the registration, the credentials are verified, and the face scan follows. After the face credentials have been verified, the system generates a one-time password, which is sent to your Gmail account. The transactions take place after you have entered the OTP, which you have verified.

VI. SYSTEM ARCHITECTURE

The mechanism for this would be biometric and OTP-based, which would enable us to conduct our financial transactions in a smooth manner. As we go through the mechanism of this process, as represented in the above diagram in Fig. 1, we would first need to register, in which process our personal and facial details would be stored in

encoded form. Then, we would need to provide our credentials, and then we would need to go through the process of facial recognition, in which process we would be identified based on our facial details.

Then, in case we are successful in our identification process, we would then receive an OTP on our Gmail id, which would then be required to be entered in order to proceed further. However, in case we are not successful in this process, we would then need to stop and ensure that we do not allow people to misuse this process.

VII. METHODOLOGY

This will ensure the security of the transaction at all stages of authenticating the user. The system will start with the registration of the user. In this case, the details of the user will be stored as facial encodings. The details provided during the process of logging in will be verified. The face of the user will be verified. The identity of the user will be verified through the generation of OTP, which will be sent to the email of the user. The transaction will take place after verifying the OTP.

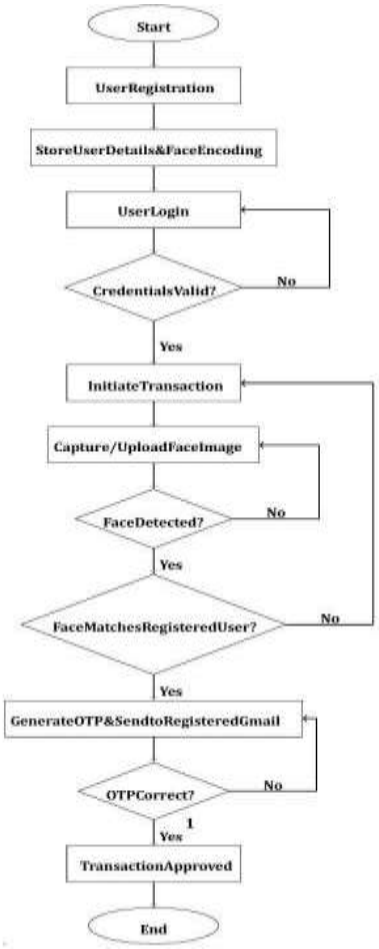

Fig.1.System Flow Chart

VIII.IMPLEMENTATION

The process begins at the face registration module, where users are required to register their facial data in the system. This module is designed to help users take good quality images of their faces by providing them with guidelines on how to take good images, including issues concerning illumination and visibility. As depicted in Fig. 2, this registration page gives users two options: to take a picture using a camera or to upload their image directly.

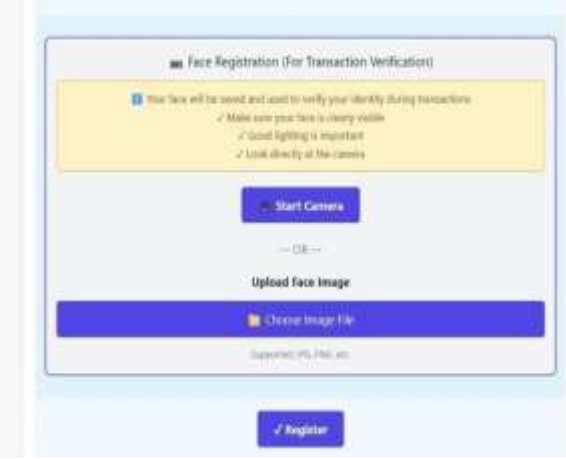

Fig.2.Face Registration Page

After the user takes the initiative to activate the camera, real-time face detection is enabled. At this point, the user is given the option to capture or stop the camera. As shown in Fig. 3, the user is given the option to capture a proper image before proceeding to the next step.

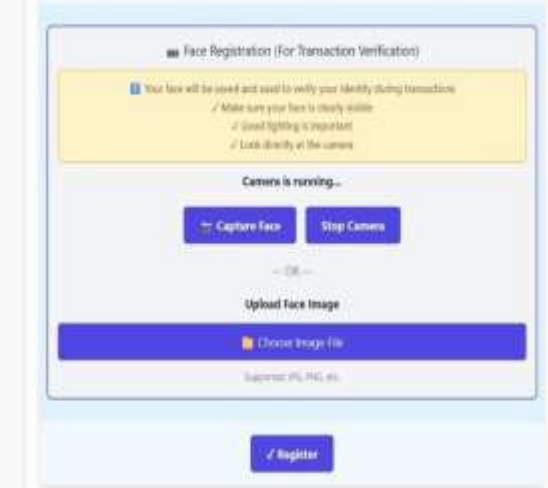

Fig.3. Camera running screen

After that, the image processing takes place, which recognizes the face and finds the distinguishing features of the face, such as the face structure. These distinguishing features are then securely stored as data. After that, the system checks if the image has been taken correctly, as shown in Fig. 4.

. Fig.4 OTP Verification

Apart from this, a module for OTP verification is also integrated into the system. When a user is verified using facial verification in any of the transactions, a password is sent to the Gmail account created by the user. The interface for OTP is as shown in Fig. 5. Apart from this, users are also allowed to view information regarding OTP.

Fig.5.OTP Verification

This is done through the use of secure SMTP protocols, which ensure the delivery of the OTP as well as the prevention of any unauthorized access. The multi-layer authentication ensures that in the case of a security breach of any of the layers of the system, the other layers of the system are able to ensure the transaction process.

IX. CONCLUSION

Finally, it can be concluded that the proposed system is safe for cardless financial transactions. The proposed system comprises all aspects of authentication. The proposed system comprises face recognition and OTP via Gmail. The proposed system does not comprise the disadvantages of the other aspects of authentication.
The proposed system comprises all aspects of security. This ensures that the proposed system is safe from all the risks. The proposed system is safe and convenient for the user, as it does not involve the use of a card. The observations made during the experiment prove that the proposed system is highly efficient and convenient.

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