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Enhancement of ATM Security by 3D Facial Recognition System

Deep Bhupesh Patel[1], Akshit Kurani[2]

[1]*Student, Department of Computer Engineering, Indus University, Gujarat, India*
[2]*Student, Department of Computer Engineering, Indus University, Gujarat, India*

ABSTRACT: *In this modern era, the banking system has become easier with the rise in* ***technology****.* ***ATMs*** *have made cash transactions easier for customers with other banking services like passbook printing and balance statements. Currently, ATMs have 4 or 6 digits pin security systems, so to provide robust security, a 6 digit security feature along with* ***3D facial recognition software (FRS)*** *for an ATM system is designed to enhance the security feature to defeat the frauds. In this system, 3-dimensional facial recognition is used to authenticate the user's account details using* ***Python programming language and TensorFlow framework****. This security feature will provide advanced* ***security*** *to the ATM system that results in customer satisfaction.*

Keywords: *ATMs, Privacy, Detection, Security, Cyber Frauds.*

1. INTRODUCTION

Due to rapid development in science and technology, upcoming innovations are being built-up with strong security. But on the other hand, threats are also being posed to destroy this security level[1]. Though enhancement in automation has made a positive impact overall, but various financial institutions like banks and applications like ATM are still subjected to thefts and frauds[2]. The advancement of financial transactions in the modern world has gone passed from cash to cheques, and then to payment cards such as credit cards and debit cards[3]. Barclays bank introduced the first ever ATM in 1967, in its Hendson branch in London, which could dispense fixed amount of cash when a user insert a special coded card. Since then, ATM has become smaller, faster and easier[4]. The project of enhancing ATM security is to add a 3D Face Recognition System for the Verification process and enhance ATM's security features.

The project's main objective is to introduce a 3D Face Recognition System in ATM to remind the security features. This project is on 24×7 bases for all ATMs across the world. It requires both software and hardware to conclude the project. The software used is "Python," and the framework used in this is "TensorFlow" .'TensorFlow' is a python library developed and published by Google for fast numerical computing. When ATM cards are lost or stolen, an unauthorized user can often come up with the correct personal codes[3]. This technology can help reduce this crimes.

1.1 Need and Motivation

With the rise in technology, ATM has become the heart of the banking process. The increase in the number of banking services and ATMs and the number of fraudulent attacks also increase. According to Government fraud transactions above Rs 1 lac in FY 2016-17 are 1,367; FY 2017-18 are 2,127; FY 2018-19 are 1,477 for Using ATM & banking service. To degrade the frauds that are taking place worldwide, we can inject a 3D Face Recognition System into ATMs.

This project of 3D face recognition in ATM systems can reduce force transaction to a great extent. It will give customers great satisfaction as their money is secure.

2. LITERATURE SURVEY

Thousands of cyber frauds take place in the modern era of technology. Cons like phishing, Spoofing, Brute-force attack, et cetera are examples that take place while using electronic devices like ATM, Computer, Mobile Phones, et cetera. A new technique of face recognition to improve the security of ATM transactions is being introduced.

The Face recognition system is a new technique to improve the existing security in ATM systems. The current scenario of ATM systems has security features with minimal protection, which requires an ATM card and 4 or 6 digit pin to access the ATM card. Still, frauds are gradually increasing day by day, and attacks like phishing, Spoofing, Brute-force attacks, et cetera.

This software system provides improved user security. The face recognition feature prevents access to accounts through stolen or duplicate cards. The card is not enough to access the report as it requires the person to do the transaction. However, the drawback of using face recognition is that it can sometimes be spoofing by fake masks of an account holder's photos.

2.1 Objectives

- It helps in preventing cyberbanking frauds that take place all over the world.
- Finding the valid or invalid user and avoiding the invalid user to access the ATM.
- Users will be satisfied by using this enhanced security system.

3. REQUIREMENTS

3.1 Functional Requirements

- The system must be able to recognize human faces.
- The system must be able to search faces in images as input and search for matching faces in the folder to verify the beginning.
- The result should be viewed by showing the name of the face match of the information to the most similar look in the folder.
- In live video, the device must be able to draw the contours of moving objects.

3.2 Non-Functional Requirements

- The user should be able to adjust Infrared intensity.
- Inner and outer boundaries should detect the face. It must ignore the background.
- It should show User Critical errors and information in a textbox where it has auto-scroll when the box's space is not enough.
- The system should immediately delete detected faces after completion of the transaction for security purposes.

3.3 Hardware Requirements

- Ram: 2 GB or more
- Hard Disk: 10GB or more
- ATM with high-quality Webcam

3.4 Software Requirements

- Windows 7 or later
- Processor 1.8 GHz or more
- Language: Python
- Framework: Tensor Flow

3.5 Rapid Application Development Model (RAD)

Rapid Application Development (RAD) is a development life cycle planned to give much faster growth and advanced quality systems than the traditional life cycle. RAD method is used to develop software in a short period.

The software can be implemented using this model if the project can be broken down into small modules where each module can be assigned independently to separate teams. These modules can finally be combined to form the final project.

3.6 FEASIBILITY STUDY

3.6.1 Economic Feasibility

Its analysis is the most commonly used tool for assessing the efficacy of a new or proposed scheme. More commonly known as cost examination, the technique is to determine the benefits and savings expected from a candidate structure and compare them with the costs needed to be spent for implementation and operation.

In terms of cost benefits, banking and financial organizations are expected to appreciate the benefits immediately.

3.6.2 Technical Feasibility

The trickiest part of a feasibility report is the determination of technical feasibility. This is because there is no complete design of the system. After all, it is challenging to access issues like performance, costs, et cetera.

Many issues have to be considered while doing a technical analysis and understanding the different technologies involved in the proposed system. Before starting the project, we have to be very clear about what are the technologies that are to be required for the development of the new system. All the tools necessary for this system are readily available.

3.6.3 Operational Feasibility

As seen earlier, there are many problems faced by users for storing physical files. Hence they will automatically adapt to the new system as this alternative satisfies and solves the user requirements and concerns.

4. SYSTEM ARCHITECTURE

4.1 Client-Server Architecture

In this project, we are using a client- server architecture as system architecture; in this architecture, clients(users) send requests to the server, and the server responds in the context of requests received. They send requests for accessing cards, to do any transactions like Withdraw money, Mini Statement, Change Pin, et cetera. All the data and information about users are stored in the database, so when the user accesses the system, all data and information would be fetched by the server and sent to the ATM.

4.2 System Architecture of ATM

After identifying the requirements and scope of ATM security, we discussed how to integrate our facial recognition component in the ATM network architecture. According to it, the user plane is the plane that directly interacts with the user. User planes must also have security services such as access control, authentication, data confidentiality, and integrity to achieve the user's security goals.

4.3 Presence Detection

Upon entering the ATM terminal area, the camera detects the face of the person and captures it. It then attempts to match the probe image with stored images, upon which a successful match grants the user the right to insert the card and proceed to financial services.

5. DESIGN AND IMPLEMENTATION

5.1 Product Features

The significant features of the face recognition system in ATMs are listed below.

- Identity Verification: Facial verification function and identification document reader.
- Improve operational efficiency through AI and IoT.
- Enhanced ATM security with face recognition and 4-digit pin.
- Easy to use with improved GUI in the ATM.

5.2 Class Diagram

These are used to define the kinds of objects and their relationships in a system. They use design elements, including classes, items, packages, model class structure, and contents. A lesson is an object of a given framework that provides an encapsulated implementation of a given entity's certain functionality. A class's properties are called attributes. A lesson is represented by a rectangle containing a rectangle.

5.3 Sequence Diagram

UML Sequence diagrams are a simple and intuitive way of presenting the environment to explain a system's behaviour. A map of the series displays an interaction structured in a time sequence.

5.4 State Diagram

State diagrams are used to explain a system's actions. As an event happens, they define all of the potential states of an entity. They illustrate an object's stories across several instances of the use of the method.

5.5 E-R Diagram

This illustrates the data entities, their linked characteristics and the relationships between the entities. It is widely used in database design.

5.6 Use-Case Diagram

A use case is a compilation of situations that describe an interaction between the user and the system. The diagram displays the relationships among the actors and uses points. An actor represents a user or another system that will interact with the system to be modelled. The use case is an external view of the system that means some action that the user might perform to complete a task.

6. Testing and Result

6.1 Unit Testing

It is the micro-level of testing to make sure that each unit is working correctly. A company can be a specific functionality; it can be a program or a particular procedure within the system. It helps to verify the internal design and logic.

6.2 Integration Testing

It is usually done immediately after unit testing. Here individual units are combined and are tested on how they work as a group. It also identifies interface issues between modules.

6.3 System Testing

System testing is the next phase of testing. As the name implies, all the software components are tested as a whole to ensure that the overall product is working correctly as expected.

6.4 Acceptance Testing

The final level of testing is Acceptance Testing or UAT (User Acceptance testing). It determines whether or not the software is ready to be released. As the requirements keep changing, in this level of testing, the user ensures that all the needs are met before the product is released.

6.5 Result

Test Case no.	Test case description	Test Scenario	Expected Outcome
1)	Card	Enter Card in ATM system	Card must be detected and must welcome user

		Enter invalid Card system	Card must not be detected a
2)	Face Detection	Legit User show his/her face when asked	User can do transaction once verified.
		Fake User shows his/her face when asked	Fake user cannot do transaction. Must show invalid user
3)	Update customer account	Enter the field that are to be updates	Desired fields should be updates
4)	Insert ATM required record	Enter your information like password	Customer record will be created
5)	Update Face record	Enter the face that are to be updates	Desired face should be updated
6)	Reset face	Enter valid fingerprint	ATM system is updated

7. Conclusion

ATM access control has clearly shown a robust security specification that standardizes authentication in ATMs. However, there is still a range of problems and drawbacks in the identification and access control. We have intensely looked at the various security mechanisms of authentication available for identification and access control. We have analysed passwords, PINs, smartcards, and biometrics for their strengths and weaknesses. It is essential to have a robust non-intrusive access control mechanism to ensure that computerized resources are secure from unauthorized users.

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