

Non-Contact Advanced ATM Security through Eye based Password Input for Enhanced Security

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Abstract: Automated Teller Machine (ATM) was introduced in the year 1959 for encouraging self-service in retail banking. The single smart card ATM for multiple bank accounts is used for security applications for withdrawing cash from ATM machines. In this security system the person can enter by using embedded system smart card, we can give access to the authorized person through the smart card (RFID) and Node MCU Module based OTP (One Time Password) and eye tracking module. The embedded system is going to be developed based on ARM7LPC 2148 microcontroller, whenever the person puts his smartcard on the reader the system will detect the authorized person then it asks for pin entry through eye ball movement. For unauthorized person Node MCU technology is used. The Node MCU module interfaced to the ARM7 microcontroller and the pin is entered by using Oven CV technology.

Keywords: ARM7, Node MCU, LCD, RFID, Open CV, Facial landmark algorithm, Eye Aspect ratio, HAAR Cascade.

1. Introduction

Eye tracking has been introduced as a way of direct interaction which could pave the way for new technologies and devices to be introduced for end-users. It is becoming a popular way of interaction. Gaze coordinates could be used to pinpoint the target selected by the user on the screen, then proceed to do a command more efficiently. We hypothesize that the limitations and disadvantages mentioned for touch screen interfaces can be improved by adding gaze capabilities. It is worth mentioning that gaze along with the touch method.

Therefore, the targeting can be done via gaze and the selection by touch, which will improve the efficiency and also the screen is not obscured by hand during targeting.

The multi modal approach will benefit the users with a user-friendly interface and aims to make the PIN entry secure and to improve the accuracy of target selection and reduce unwanted selections.

2. Literature Survey

A. Survey Paper 1

Farha Kouser, Nagaratna, “Highly Secure Multiple Account Bank Affinity Card-A Successor for ATM Card”, 2018

International Conference on Design Innovations for 3Cs Compute Communicate Control (2018).

Multiple bank access through single ATM card to reduce the cost of interbank transaction as it is a resource consuming process. Fingerprint based authentication and face recognition which provides high security accompanying SMS based OTP (One Time Password) is also used to prevent fraud.

B. Survey Paper 2

A. Syed Mustafa, Aparna Nair, “Automated eye tracking mechanism for password authentication”, IRJET, Aug. 2020.

Continuous display of look based pin passage application utilizing the camera. Pin verification with hands off look based such as no physical impression only gaze based confirmation. This gaze based eye discovers will be secure secret phrase passage choice.

3. Proposed Methodology

A. Architecture

RFID card can access multiple bank account through a single smart card. RFID reader module is a device used to read the information from the RFID tag. RFID is being interfaced to ARMLPC2148. From ARM the output is displayed on LCD. 4*4 keypad is used to enter the pin. Here camera captures the image of the user and is stored in data set. In eye authentication process face of an individual is captured and individual face ID is given. Password is entered using virtual keypad for enhanced authentication purpose. Node MCU allows unauthorized person to access the Account.

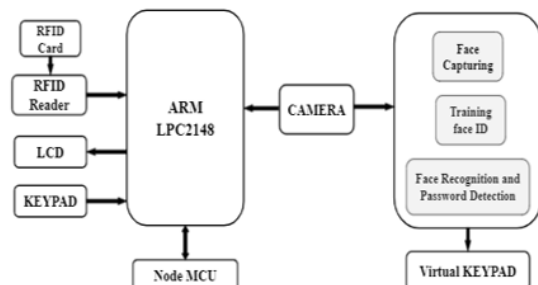


Fig. 1. System architecture

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4. Implementation

A. Eye Detection

Eye detection is detection of eye region from the given image by the means of Haar cascade algorithm. Haar cascade algorithm is the machine learning object detection algorithm used to identify objects.

Haar cascade algorithm steps:

- Haar feature Selection
- Creating integral image
- Adaboost training
- Cascading Classifiers

B. Feature Detection

- Facial land mark algorithm detect and label the facial land mark of the image.
- By focusing on the facial area detects the key facial structure of the image.
- There are 68 landmark points over the boundary area.

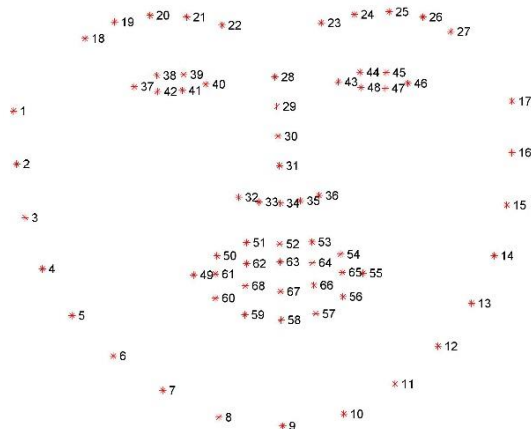


Fig. 2. Facial landmark points

C. Eye Aspect Ratio

- Face recognition and password detection is done using eye aspect ratio
- Coordinates of eye is used to draw polygon over eye region from P1 to P6.
- P1 and P4 are corners of eye
- P2 and P3 are upper mid center of eye.
- P5 and P6 are lower mid center of eye.

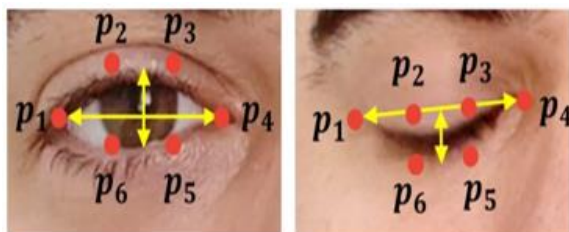


Fig. 3. Eye aspect ratio

D. Data Flow

Once the person swipes the card, the RFID number gets displayed on LCD. If the entered pin matches, then the process can be continued or else the process of transaction ends. Person

can enter the password through camera by eye movement. During this process Face capturing, Training Face ID, Face Recognition and Password Detection are involved by calculating Gaze ratio and Blinking Ratio.

The gaze ratio should be lesser than or equal to 0.9 and blinking ratio should be greater than or equal to 5. This is calculated by the eye aspect ratio and Facial Landmark Algorithm. If these conditions are verified, then the person can enter 2 digit of pass code through virtual keypad.

This Virtual Keypad is used to enter the Pass code through the eye movement with the help of eye aspect ratio i.e., P1 to P6 is calculated using formula. If Pass code matches, then the Bank List is displayed on LCD, if not transaction is declined.

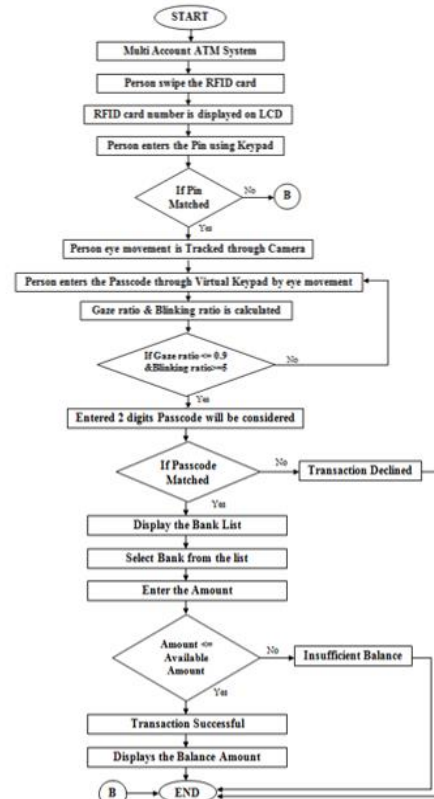


Fig. 4. Data Flow Diagram

5. Requirements

A. Software Requirements

- Windows 10/ Linux is the operation system we are using to achieve the project goals.
- The coding Language is Python.
- The Integrated Development Environment is an Open source computer vision.

B. Hardware Requirements

1) ARM LPC21248

ARM7 LPC2148 microcontroller board is based on a 16-bit/32-bit ARM is basically a microcontroller and a microprocessor which is suitable for critical code size application because it can easily reduce the code size to 30% without reducing the performance. LPC here refers to Low Power Low Cost microcontroller. Due to their tiny size and low

power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

2) Camera

Eye Tracking is detected using individual gaze location through webcam rather than real eye tracker with infrared illuminators. The captured image acts as input to Open CV. Webcam can do it remotely behind the screen. These captured images are sent to the Eye detection module.

3) Node MCU

- Node MCU has 16 GPIO pins and 1 Analog pin.
- Node MCU is basically a WIFI module which connects the local WIFI network for internet
- If any third party access is done, through BOT father the message is notified to the card holder.

6. System Outcomes

The Eye tracker system include three steps i.e., Face capturing, Training Face ID, Face Recognition & password detection. Face capturing and Training face ID are the two steps which include algorithm which is done while creating the account.

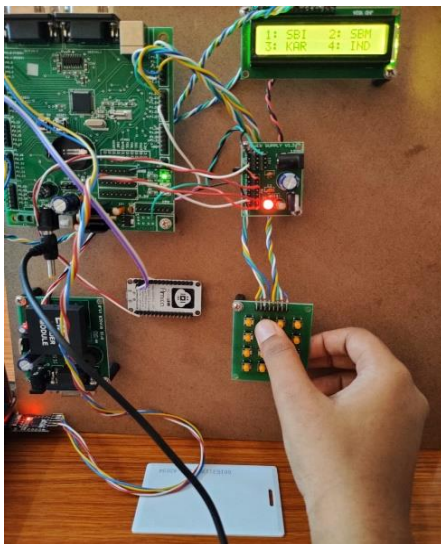


Fig. 5. Proposed system

A. Face Capturing

- Camera here used to capture the images of a user which is stored in Open CV.
- Haar Cascade Algorithm detects human face and converts the color image to Grey level image.

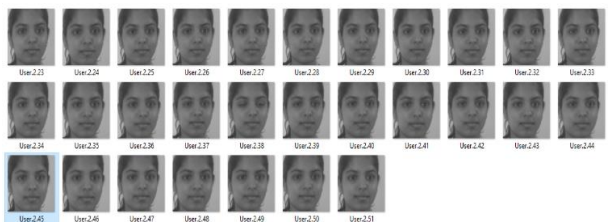


Fig. 6. Captured image converted from color to grey images

B. Training Face ID

Training Face ID is where the picture is captured and gives individual ID to each user.

C. Face Recognition and Password Detection

After this two process of identifying and giving individual ID, Haar cascade calculation is performed like as face recognition to distinguish eye. By the guidance of eye aspect ratio, the coordinates of the eye are used to draw the polygon over the eye region from P1 to P6.

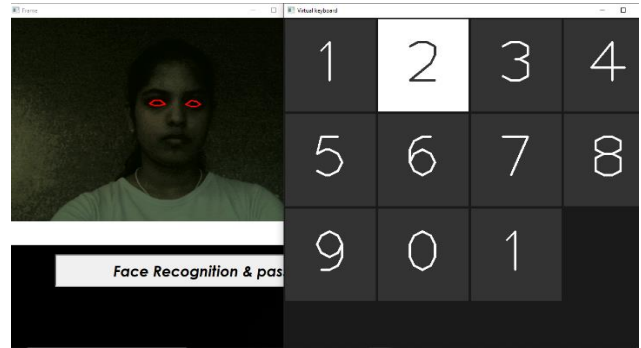


Fig. 7. For face recognition polygon is drawn over the eye

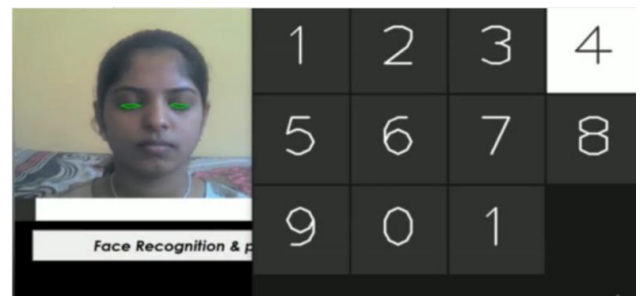


Fig. 8. Password is entered through eye movement

7. Conclusion

A smart-camera based eye-tracking system has been incorporated as a new application for gaze-based PIN identification. The user can perform transactions for all of his bank Accounts using single smart ATM card with Enhanced security system such as OTP and Eye tracking. By implementing this, ATM fraud i.e. skimming etc., can be avoided. This project also enables unauthorized user to access the ATM using Node MCU.

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