

3G ATM USING FACE RECOGNITION BASED AUTHENTICATION IN OPEN CV

A.GEETHANJALI , M.ROHITHA

Abstract — Automated teller machines (ATMs) are well known devices typically used by individuals to carry out a variety of personal and business financial transactions and/or banking functions. ATMs have become very popular with the general public for their availability and general user friendliness. ATMs are now found in many locations having a regular or high volume of consumer traffic. For example, ATMs are typically found in restaurants, supermarkets, Convenience stores, malls, schools, gas stations, hotels, work locations, banking centers, airports, entertainment establishments, transportation facilities and a myriad of other locations. ATMs are typically available to consumers on a continuous basis such that consumers have the ability to carry out their ATM financial transactions and/or banking functions at any time of the day and on any day of the week. For this purpose ,we are using the face recognition step with Haar Cascade Classifier to find out the features of face. When the face is detected then it will give access to do transactions otherwise not allow.

The number of ATM's a bank has can be a factor in considering the strength of a bank. As there is increase in the number of ATM's, there is also increase in the fraudulent activities in the ATM. The main motivation of this project is to increase the security feature of the use of ATM. The current method uses static key (PIN) for security. The proposed method uses Face-id as a key incorporated with current method. The advantages can be found as that the face-id is unique for everybody; it cannot be used by anybody other than the user. For the implementation ,we are using the face recognition step with Haar Cascade Classifier to find out the features of face. When the face is detected then it will give access to do transactions otherwise not allow.

Keywords— ATM, Financial Transactions, Banking Functions, Consumers,Banking Centers, Locations, Haar Cascade Classifier, Face Recognition.

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I. INTRODUCTION

Now a days, the uses of ATMs are inevitable in our day-to-day lives. Before the introduction of ATM, people used to travel with cash in their hands. This caused the risk of getting robbed or the cash might get lost due to the negligence of the user. To overcome this issues ATM played a big role. It is like cash in a card. As the ATM technology got improved the idea of misusing it also got improved. The main disadvantage of this system is that if the PIN is known anybody can use it to take money. To address this issue, Face-id is used as a key. The main use of the Biometric is that it is unique for a person. The proposed innovation is not an alternative for the conventional ATM security system. The proposed innovation is considered as an additional support for the existing method. In India, nearly 2000 ATM crimes are occurring every year.

The proposed method will surely reduce this rate to a greater extent. Computer Vision is one of the most fascinating and challenging tasks in the field of Artificial Intelligence. Computer Vision serves as a link between computer software and the visuals we see around us. It enables computer software to comprehend and learn about the visuals in its environment. As an example: The fruit is determined by its color, shape, and size. This job may seem simple for the human brain, but in the Computer Vision pipeline, we first collect data, then conduct data processing operations, and then train and educate the model to learn how to differentiate between fruits based on size, shape, and color. The main goal is to identify and comprehend the images and offer new images that are more useful for us in different life fields.

II. RELATED WORK

The term "OpenCV" is an abbreviation for "open source computer vision." The architecture is made up of software, databases, and plugins that are pre-programmed with support for integrating computer vision applications. It is one of the most used toolkits with a large developer group. It is well-known for the size at which it builds real-world usage cases for industrial use. OpenCV follows C/C++, Python, Java programming languages and can be used to build computer vision software for desktop and smartphone platforms such as Windows, Linux, macOS, Android, and iOS. The most recent releases are OpenCV-4.5.2 and OpenCV-3.4.14. It is free and open-source, as well as simple to use and install.

It is intended for numerical productivity with a heavy emphasis on real-time applications. The first version was in the C programming language; however, its success increased with the release of Version 2.0, which had a C++ implementation. C++ is used to create new features Photos must be in BGR or Gray scale format in order to be displayed or saved via Open CV. Otherwise, unfavorable outcomes could occur.

Face detection is a form of computer vision that aids in detecting and visualizing facial features in captured pictures or real-time videos. This type of object detection technique detects instances of semantic artifacts of a given class (such as people, cars, and houses) in digital pictures and videos. Face recognition has become increasingly important as technology has advanced, especially in fields such as photography, defense, and marketing. Recognition is a modern field of study that has piqued the interest of researchers since it becomes simple to use by using Open CV-based Python. Face recognition technologies have a variety of applications in public protection, entertainment, man-machine contact, and social networking, such as Facebook's automated tag recommendation on images. It's also been seen in educational and non educational institutes attendance control, financial offices, voter registration, and other areas.

In this thesis, we emphasize the important role of OpenCV in face detection and face recognition,

what algorithm can be used in OpenCV for face detection and face recognition, then state the Open CV modules and explain Open CV based on Python and mention the applications for Open CV. Finally, we assessment and compared recent literature reviews that use Open CV to detect and recognize the human face in a variety of fields in order to improve human life.

III. EXISTING SYSTEM

In existing system RFID card is used as ATM card, IR sensor in order to sense the presence of the card holders and to turn on Fan and Light, if ATM is tampered then SMS is sent to two main stations via GSM.

- Based on WI fall detection get security, that network access is not that much secured.
- The biometrics like finger print and eye ball authentication are prone for easy spoofing.

Drawbacks:

- Card less transaction is not possible
- RFID based ATM access are prone to security issues.

IV. PROPOSED SYSTEM

Most people use an ATM for a lot of purposes and in a lot of scenarios. The most common three scenarios are considered here and the solutions are found.

- ✓ The user as himself using the ATM machine.
- ✓ If the user is threatened by somebody to get money without the user's willing.
- ✓ If the user's friend uses the card of the user.

First of all, when a user enters the ATM, two choices are given. Whether the user comes with his card (Number 1) or if the user's friend comes with the card (Number 2).

A. User uses the ATM by himself

When a user by himself uses the ATM machine, first the card must be inserted. Now a camera captures the image of the user. Now, the captured image is compared with the image stored in the database. If both the image is matched (Eigenface algorithm does the comparison part) then a successfully authenticated message is displayed. Now the user needs to enter the PIN. If the PIN

entered is correct then further transactions can be done.

B. User is threatened by somebody

Now the user is threatened by somebody to get money. For this scenario we have a robust solution. First the face of the user will match. Now for entering the right PIN, the user must enter a wrong PIN. This causes a alert at the police portal which is at the backend. The police portal will be at idle stage if the transactions were smooth. If the wrong PIN is entered then the alert is received.

C. User's friend user the card

When the user's friend uses the card, obviously the face will not be matched. For this case, we proposed a clear method. The user should set a PIN and withdrawal limit in the mobile app. This must be set for each and every transaction. Now the user's friend must enter this secret PIN. If the PIN matches, then the amount set by the user will be automatically withdrawn.

The thesis is focused on Design and Implementation of Face Detection based ATM Security System using Embedded Linux Platform. The system is implemented with extended capability of open source Computer Vision (Open CV) software which is used for Image processing operation. High level security mechanism is provided by the consecutive actions such as initially system captures the human face and check whether the human face is detected properly or not. If the face is not detected properly, it warns the user to adjust him/her properly to detect the face. Still the face is not detected properly the system will lock the door of the ATM cabin for security purpose.

- Preprocessing
- Haar cascade
- Face detection
- Gcm feature
- Neural network

Advantage :

It can easily recognize the face for security purpose

V. DESIGN & IMPLEMENTATION

1) Design & Implementation ATM Alarm Data Analysis System:

Nowadays, people pursuit of fast and convenient way of life, fast and convenient service of ATM is made for people to avoid waiting in line at the bank for a long time. In order to serve people conveniently, it is need to monitor the ATM equipment to guarantee its normal operation, and deal with the unexpected problems in time. Therefore, this paper builds a cloud platform for alarm service, does some alarm analysis, which appears at different times in different locations of the ATM machine. This can provide better service for ATM users. This system is called ATM Alarm Data Analysis System.

2) Data Driven Analytics for Automated Cell Outage Detection in Self Organizing Networks

In this thesis, we address the challenge of autonomous cell outage detection (COD) in Self-Organizing Networks (SON). COD is a prerequisite to trigger fully automated self-healing recovery actions following cell outages or network failures. A special case of cell outage, referred to as Sleeping Cell (SC) remains particularly challenging to detect in state-of-the-art SON, since it triggers no alarms for Operation and Maintenance (O&M) entity. Consequently, no SON compensation function can be launched unless site visits or drive tests are performed, or complaints are received by affected customers.

3) New Generation ATM Terminal Services

This thesis aims at realization of the Automated Teller Machine network all around the globe using IPv6, thereby reducing the complexity and total number of transactions involved in the entire process of cash withdrawal. But the major challenge involved in connecting ATM network to public domain is the security. A Near-Field Communication (NFC) is proposed to be used where in the user, after inserting ATM Card, would communicate via only their NFC enabled mobile phones. Reserving NFC spectrum band to the government is proposed to be made mandatory for ensuring no eavesdropping.

4) Anaconda Platform :

Anaconda is distribution of Python & R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. The distribution includes data-science packages suitable for Windows, Linux, and macOS. It is developed and maintained by Anaconda, Inc., which was founded by Peter Wang and Travis Oliphant in 2012. As an Anaconda, Inc. product, it is also known as Anaconda Distribution or Anaconda Individual Edition, while other products from the company are Anaconda Team Edition and Anaconda Enterprise Edition, both of which are not free. Package versions in Anaconda are managed by the package management system conda.

This package manager was spun out as a separate open source package as it ended up being useful on its own and for things other than Python. There is also a small, bootstrap version of Anaconda called Mini conda, which includes only conda, Python, the packages they depend on, and a small number of other packages. Anaconda distribution comes with over 250 packages automatically installed, and over 7,500 additional open-source packages can be installed from PyPI as well as the conda package and virtual environment manager. It also includes a GUI, Anaconda Navigator, as a graphical alternative to the command-line interface (CLI). The big difference between conda and the pip package manager is in how package dependencies are managed, which is a significant challenge for Python data science and the reason conda exists

VI. METHODOLOGY

The Unified Modeling Language (UML) is used to specify, visualize, modify, construct and document the artifacts of an object-oriented software intensive system under development. UML offers a standard way to visualize a system's architectural blueprints, including elements such as:

- Actors
- business processes
- (logical) components
- activities
- programming language statements

- database schemas, and
- Reusable software components.

UML combines best techniques from data modeling (entity relationship diagrams), business modeling (work flows), object modeling, and component modeling. It can be used with all processes, throughout the software development life cycle, and across different implementation technologies. UML has synthesized the

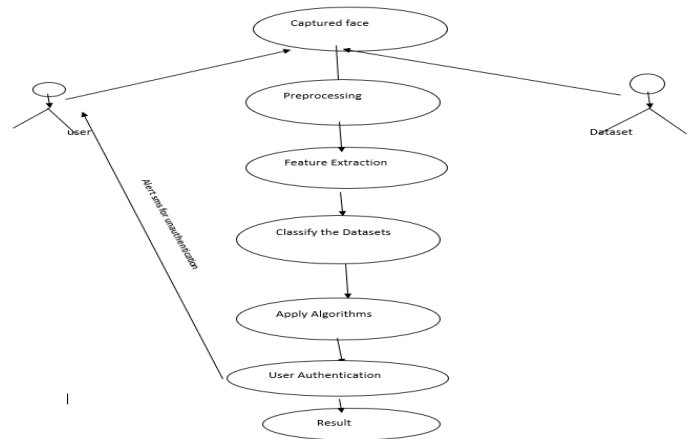
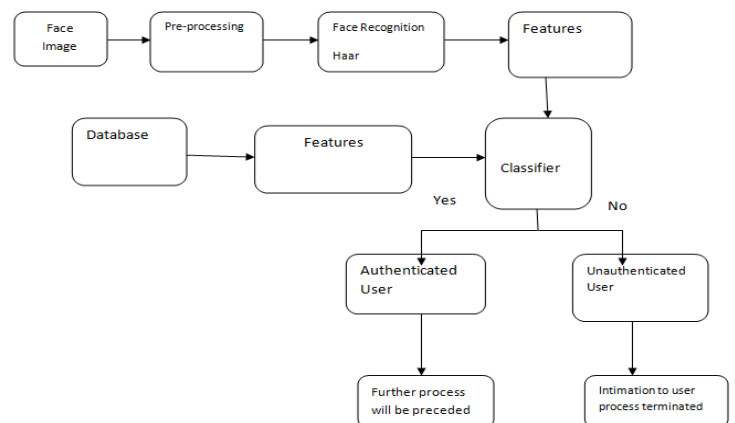


Figure1: UML diagram

Block Diagram



VII. DESIGN & IMPLEMENTATION PROCESS

1) Preprocessing

Image Pre-processing is a common name for operations with images at the lowest level of abstraction. Its input and output are intensity images. The aim of preprocessing is an improvement of the image data that suppresses

unwanted distortions or enhances some image features important for further processing. Image pre-processing is the term for operations on images at the lowest level of abstraction. These operations do not increase image information content but they decrease it if entropy is an information measure. The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features relevant for further processing and analysis task.

There are 4 different types of Image Pre-Processing techniques and they are listed below.

1. Pixel brightness transformations/ Brightness corrections
2. Geometric Transformations
3. Image Filtering and Segmentation
4. Fourier transform and Image restoration

Image restoration is the operation of taking a corrupted/noisy image and estimating the clean original image. Corruption may come in many forms such as motion blur, noise, and camera misfocus. Image restoration is different from image enhancement in that the latter is designed to emphasize features of the image that make the image more pleasing to the observer, but not necessarily to produce realistic data from a scientific point of view.

Image enhancement techniques (like contrast stretching or de-blurring by a nearest neighbor procedure) provided by "Imaging packages" use no a priori model of the process that created the image. With image enhancement noise can be effectively be removed by sacrificing some resolution, but this is not acceptable in many applications. In a Fluorescence Microscope resolution in the z-direction is bad as it is. More advanced image processing techniques must be applied to recover the object. De-Convolution is an example of image restoration method. It is capable of: Increasing resolution, especially in the axial direction removing noise increasing contrast.

2) Haar Cascade Classifier

Haar Cascade classifier is an effective object detection approach which was proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of

Simple Features" in 2001. Haar-like features are rectangular patterns in data. A cascade is a series of "Haar-like features" that are combined to form a classifier. A Haar wavelet is a mathematical function that produces square wave output.

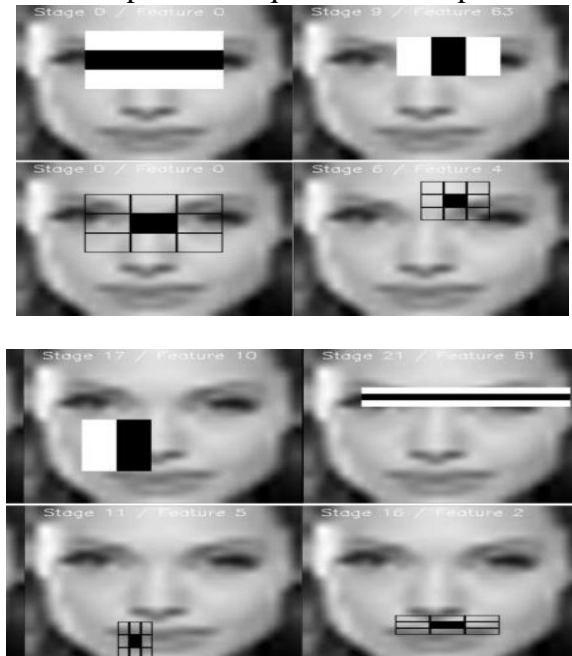


Figure 2: View of Haar Cascade Classifier

The above picture shows Haar like features, the background of a template is painted gray to highlight the pattern's support. Only those pixels marked in black or white are used when the corresponding feature is calculated. Since no objective distribution can describe the actual prior probability for a given image to have a face, the algorithm must minimize both the false negative and false positive rates in order to achieve an acceptable performance. This then requires an accurate numerical description of what sets human faces apart from other objects. Characteristics that define a face can be extracted from the images with a remarkable committee learning algorithm called Adaboost. Adaboost (Adaptive boost) relies on a committee of weak classifiers that combine to form a strong one through a voting mechanism.

A classifier is weak if, in general, it cannot meet a predefined classification target in error terms. The operational algorithm to be used must also work with a reasonable computational budget. Such techniques as the integral image and attention cascades have made the Viola-Jones algorithm

highly efficient: fed with a real time image sequence generated from a standard webcam or camera, it performs well on a standard PC.

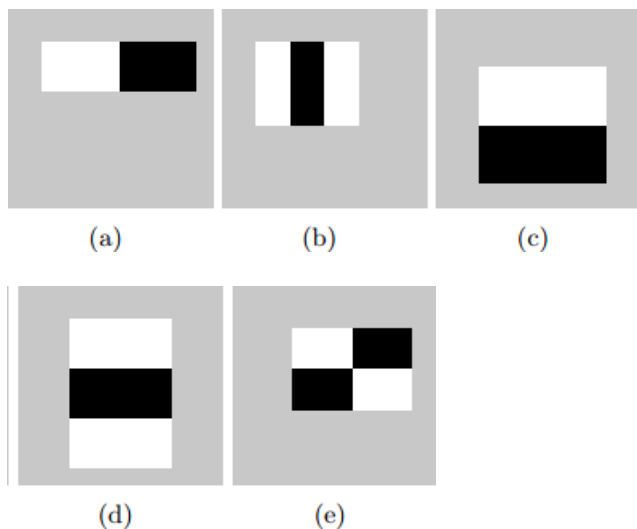


Figure 3: Haar like feature with different sizes and orientation

The size and position of a pattern's support can vary provided its black and white rectangles have the same dimension, border each other and keep their relative positions. Thanks to this constraint, the number of features one can draw from an image is somewhat manageable: a 24×24 image, for instance, has 43200, 27600, 43200, 27600 and 20736 features of category (a), (b), (c), (d) and (e) respectively as shown in above figure, hence 162336 features in all. In practice, five patterns are considered. The derived features are assumed to hold all the information needed to characterize a face. Since faces are large and regular by nature, the use of Haar-like patterns.

3) Working of Haar like features

A scale is chosen for the features say 24×24 pixels. This is then slide across the image. The average pixel values under the white area and the black area are then computed.

If the difference between the areas is above some threshold then the feature matches. In face detection, since the eyes are of different color tone from the nose, the Haar feature from Figure,



Figure 4: How the Haar like feature of figure can be used to scale the eyes

One Haar feature is however not enough as there are several features that could match it (like the zip drive and white areas at the background of the image of figure 6.2,1.1 it is called a "weak classifier." Haar cascades, the basis of Viola Jones detection framework therefore consists of a series of weak classifiers whose accuracy is at least 50% correct. If an area passes a single classifier, it moves to the next weak classifier and so on, otherwise, the area does not match.

VIII. RESULT ANALYSIS

The Result of 3G ATM using Face Recognition based Authentication in Open CV has two features

There are two chances

1. Case 1: When face matched
2. Case 2: When face not matched

CASE 1: When the face is matched

When we select face transaction in the ATM machine, WEB CAM (ON stage) starts working -to capture the face of the bank user, face recognition is started , if the face is matched with the face in the bank database, then the transaction is successful.

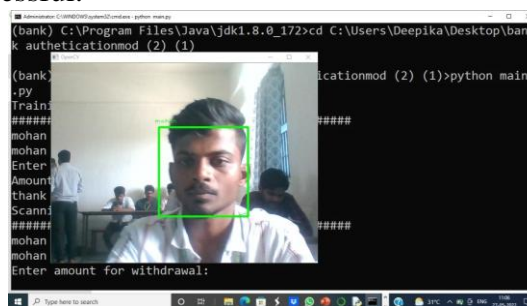


Figure 5 : Caputuring image as input



Figure 6 : Scanning continuously until face matches

Case 2: When the face is not matched

If the face matches, the transaction will be done successfully. If the capturing face database is not matched with bank database then the transaction is not successful. Though the system will work to get the correct database. So, the system scans again and again until the face matches .

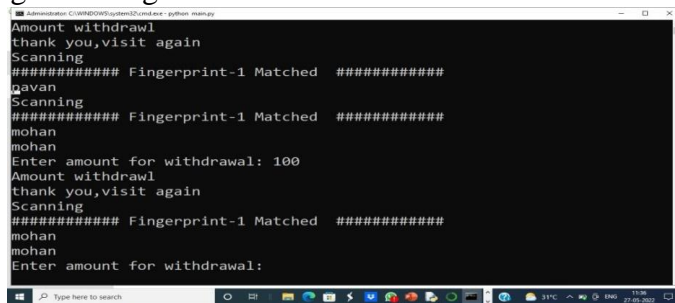


Figure 7 : With drawl of amount

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IX. CONCLUSION

Nowadays, most of the ATM has been attacked by the robberies. In this paper, areal-time monitoring system for ATM security based on accelerometer sensor, camera module, and fingerprint module is proposed. The proposed work concludes with the following points

- A secure way of accessing an ATM by authorized persons using face recognition module.
- Eliminates the drawback of previous system like manual controlling camera modules and doors.

- The system is cost effective as compare to existing manual technique.
- The real time video of the ATM centre can be monitored through web server which make ATM better safe from thefts.

This paper is aimed to reduce the risk involved in ATM machines that were installed in remote area, also the issue related to fraudulent transaction like misusing others card to withdraw money and etc. So, in order to overcome these challenges, we have developed solution that will leverage the ML & AI to restrict card access to only the authorized users those are identified by face recognition algorithm.

FUTURE SCOPE

In future we increased the performance of this process and able to get more accuracy by using more number of computational algorithms and classifiers like Convolutional Neural Networks (CNN), Artificial Neural Networks(ANN) to recognize the speech emotion from speech signals. As facial recognition technique seems more challenging as compared to other biometrics, thus more efficient algorithm can be developed. The inability to detect face when beard and aging can be rectified and eliminated or reduced. Instead of using Face recognition, we can also implement this using retinal or iris recognition can be used if the cost is reduced.

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