Face Recognition Based Payment Processing System

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Abstract - *The use of many cards' transaction in various places like shopping, restaurants, lodges and online transaction in regarding booking hotels, movies, flights and train tickets etc., are on a rise each second. Hence the problem of people carrying payment card & cash along with themselves and keep the cards/cash secure to use it all the time; chances of being victim of theft. As in present work, biometric facial recognition transactions are used everywhere. Use of One-Time Password (OTP) to secure the transaction further helps us in avoiding need of memorizing different passwords. Face recognition transaction systems are safe and secure with ease. It's known for its reliability and more efficient compared to other payment technics. A general idea of an online transaction system using facial recognition is suggested. The technique chosen for facial identification are Local Binary Pattern Histogram (LBPH) and HAAR CASCADE.*

Key Words: OTP, LBPH, HAAR CASCADE

1.INTRODUCTION

(Misra & Dev, October 2020) In recent years, the security has become a vital and rigorous service to secure possessions and provide data privacy. Hence exist need for more reliable security system that has to be developed in order to avoid loss due to identity theft. Paving the way too many researchers to invent new answers for improvising security systems, especially in human identification. The conventional method of transaction is unreliable since it can be copied / manipulated and even stolen. Apart from these, conventional security methods like keys and payment cards can be lost or misplaced. Thus, a more simple and effective transaction system needs to be developed to avoid greater loss. Biometric based method is implemented for transaction, as a higher degree for security. (Mutteneni, Kasireddy, & Achanta, ISSN: 2277-3878, Volume-8 Issue-6, March 2020) Human face is unique, it cannot be manipulated by any means. The techniques used with facial recognition are very efficient than other. The face is a primary focus in our life that plays a vital role in connecting identity and even emotions, System that recognize and identify face can be applied to various applications that include online transactions, security systems and criminal identification. Face recognition and detection is difficult as these algorithms are stiff and complicated. Main difference between recognition and detection is that, in face detection we need to determine whether the face is present in the image, whereas in face recognition we need to input face from already existing database. In the present work we have used facial recognition technology for the online transaction, transactions in retail shops and malls etc.

2. LITERATURE SURVEY

2.1 Face Net (2015 IEEE): A Unified Embedding for Face Recognition and Clustering.

(Schroff, Kalenichenko, & Philbin, 2015) In this paper, presented system is called Face Net. Face Net learns how to directly map facial images to a packed Euclidean area. The space between the generated vectors giving us similarity between the faces. The created space is also used for different tasks such as facial recognition, verification and clustering with help of techniques with Face Net embedding as feature vectors. We broaden this concept to practice secure online transactions.

2.2 An Efficient Scheme for Face Detection based on contours and feature skin recognition

(Heshmat, Moheb & Abd-Elhafiez, & Elaw, 2015/12/01) This work is founded on skin color, contour drawing and attribute extraction to obtain an effective and simple way to detect human faces in pictures. The attributes under consideration include mouth, eyes and nose. The results are with great accuracy, speed and simple process.

2.3 Enhancing User Authentication of Online Credit Card Payment using Face Image Comparison with MPEG7-Edge Histogram Descriptor

(Jetsiktat, Panthuwadeethorn, & Phimoltares, November 2015) A credit card transaction system which integrates facial recognition and detection technology using Haar Casecade algorithms is developed. The training dataset includes the extracted attributes from the pictures and is saved in administrator database, which helps in authentication. We use CNN instead to increase efficiency and reduce complexity of system.

Technology and Engineering, recognition of currency notes is one of the serious problems faced by visually Challenged. So, a system with almost 99.07% accuracy level According to their project, bank notes with different was developed.

2.4 Facial Recognition using OpenCV

(Suciu & Emami, 2012) From "Facial Recognition using OpenCV" paper deduction is made on how to train dataset that contains user images stored in them. In training the first step is to make sure the size of all the images is same. As the images are only stored in grey scale for this algorithm to work, the LBPH operation is executed which creates boundaries of various objects present in image by comparing the light and intense dark contrast in the grey image. The light contrasts in the image are used by computer creating virtual lines on picture and using which comparison parameters along with already saved basic line structures the computer is able to detect the objects in picture and if programmed can be used specially to mark out faces in the picture.

3. EXISTING SYSTEM

Today's technology is moving towards biometrics. Researchers are doing research regularly on 'bioinformatics and biometric' to incorporate these latest technics with other system. The main reason for popularity of biometric is that, each individual has their own biological footprint that is unique and hence cannot be duplicated. Systems are created to make biometric enabled system robust. Loopholes in this system are recognized and work is done to remove said short coming. We have tried to build such a system in which the computer using optical vision can recognize the face of the person correctly in real-time and can help in facilitating cashless transaction in this project.

4. PROPOSED SYSTEM

Project has been developed to facilitate ease of transactions. OpenCV module in Python programming language are being used. We have created a database of face images of user and the details of user's account and registered phone number, trained it using algorithm and Haar cascade classifier and recognize a face from real time picture input using ada-boost algorithm. For transaction process once the machine identifies the user, an OTP is sent on registered SIM card for secure transaction.
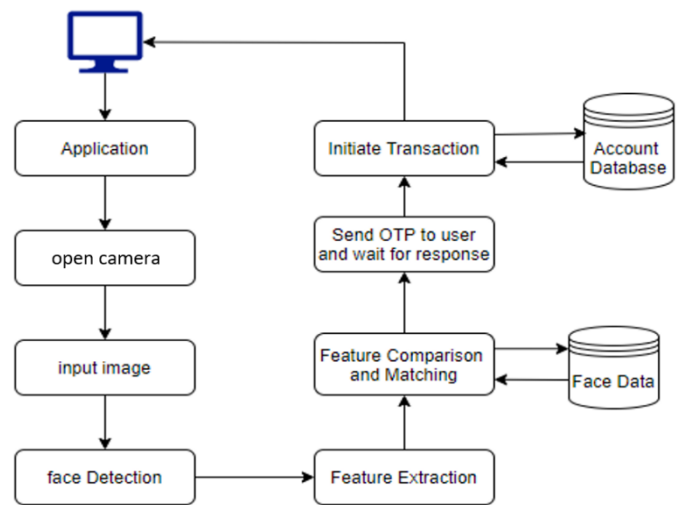
4.1 Overview

Fig. 1. Block Diagram of Methodology

The procedure is as follows:

1. At first image of the person who wants to do payment is captured. Dynamic image is captured.

2. After capturing the image it must be converted into greyscale so that every detail is being captured. A function CVTColor() is been used.

3. For the converted greyscale image, Haar Cascade Algorithm is been applied to detect the face and extract integral features. The techniques used for detection and extraction are:

○ "Haar features" extraction

○ Integral Images

○ AdaBoost: to improve classifier accuracy

○ Cascade of classifiers

4. Division of image into blocks takes place to apply LBPH algorithm. The histograms calculated is combined into single histogram for further process.

5. Evaluating the histogram, the face image is processed and face is recognized.

6. If the processed image matches, OTP is generated and is sent to the user.

7. Upon verification, transaction is carried out.

5. COMPONENTS

5.1 Face Detection Using Haar-Cascade Algorithm

A. Introduction

(L & Raga, Vol.6, Issue.5, pp.06-10, October (2018)) The Viola-Jones object detection framework is initial step to provide competitive object detection rates in real-time. It can be trained to detect a various of object classes, it is motivated by problem of face detection. This algorithm is implemented in OpenCV as cvHaarDetectObjects(). Other algorithms regularize a gallery of facial pictures and compress face data, keeping only the useful data in image recognition. Identification is done by facial attribute extraction or by examine relative positioning, sizes and shapes of Eyes, Cheekbones etc. These attributes are then used to find pictures with matching features. A probe is later compared with facial data.

B. Algorithm Stages

1. Conversion of RGB to Grayscale:

From cvtColor, we have used the function to convert RGB to Grayscale. Transformations such as elimination or addition of the alpha channel are to be carried out within the RGB space. RGB colour to grayscale conversion is done using RGB [A] to Grey: $\{Y \leftarrow 0.3 \cdot R + 0.59 \cdot G + 0.11 \cdot B\}$.
Grey=cv2.cvtColor(img,cv2.COLOR_BGR2GRY)
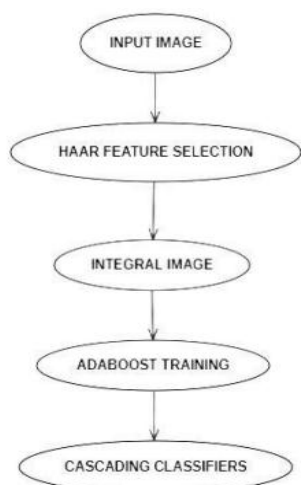
2. Haar Cascades:

Fig 2:Haar Cascades Algorithm

i)   Haar Features extraction:

Haar attribute or Haar-like attribute are those used to group generic objects. These are the main attribute for

facial detection using which system analyses whether a picture has a face or not. The picture is segmented by reducing down the area of interest. The attribute is a single value that is computed by the subtraction of pixels under the white and black regions. This data is saved in a file known as haar-cascade which is normally an XML format file. A more work is required to train the classifier system and produce the cascade file. Given in the diagram below:

Fig 3:Haar Features Extraction

ii)   Integral Images:

An Integral image lets you analyse aggregates of image sub regions. These aggregates are needed in various applications, like analysing HAAR wavelets. These are normally applied in face recognition and other alike algorithms. Suppose a picture is x pixels width and y pixels height. Then integral of this picture is x+1 pixels width and y+1 pixels height. The first column and row of the integral picture is zeros. Any other pixel shall have the sum of all the pixels before them as the value assigned to them.

Now, you can find sum as: (Bottom right + top left - top right - bottom left). So, for the box with 3,5,4,1, analysis is done as: (30+0-17-0 = 13). For box with 4,1, will be (0+15-10-0 = 5). Hence, we aggregate in rectangular regions can be analysed.

iii)   Ada-boost:

In Adaptive Boosting a.k.a. Ada-Boost, over 180,000 attribute results in a 24X24 panel. Not all attribute is used to identify a face. To select the unique attribute out of all available ones, a machine learning algorithm called Ada-boost is adapted. The core construct used here is the

identification of the best attributes essential for recognizing a face. It is performed by building of a strong classifier which is a linearly combined group of weak classifiers. As a result, a drastic reduction of attribute from 180,000 to 6000 is seen.

iv)   Cascade of Classifiers:

Cascade of classifiers helps to increase speed of haar cascade algorithm. The cascade classifier has of many stages where each stage consists of a strong classifier. This is helpful to end the need of applying all the attributes on the window at once. Instead, it groups the attribute into different mini windows and at every stage, the classifier decides whether the mini window is a face or not. If a face is not detected, the mini window and its attributes are discarded. However, if a face is identified, the mini window moves past the classifier and then carries onto the next stage where the second round of attributes are applied. The process can be seen in the diagram below.
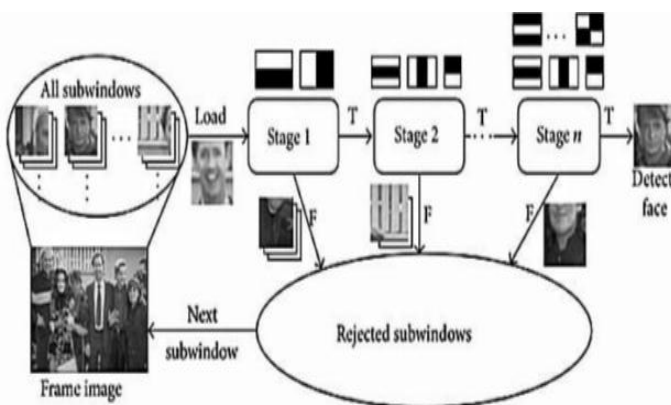

Fig 4. Cascade process

## 5.2 Local Binary Pattern Histogram

(Rani & Kamboj, Volume: 04 Issue: 08 | Aug -2017) Local Binary Pattern (LBP) is a simple, effective texture operator labelling pixels of a picture by thresholding neighborhood of each pixel and considering result as number in binary. It is grey scale image processing technique. Since the captured image is colored, first we convert it to grey scale with formula $x = 0.3R + 0.59G + 0.11B$.

Using LBP combined by histograms we correspond the facial pictures with a data vector.

A.   Flowchart
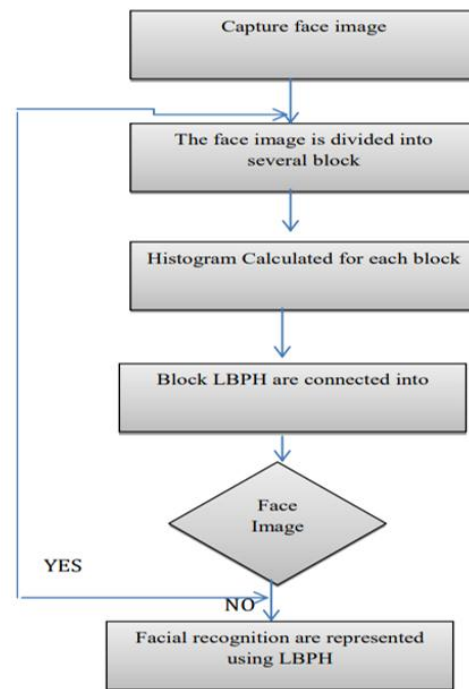
Fig 5. LBPH Flowchart
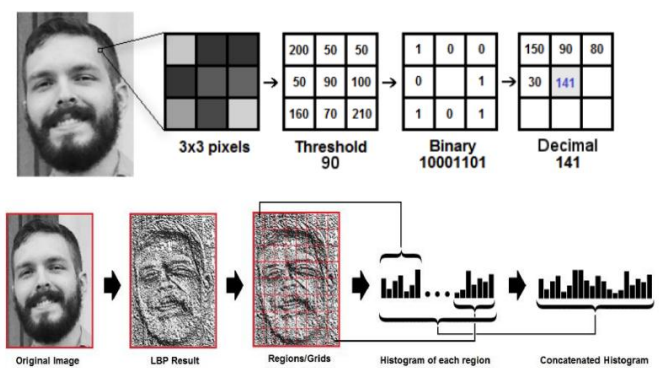
Fig 6. LBPH Process

B. Procedure

(L & Raga, Vol.6, Issue.5, pp.06-10, October (2018))

1. Divide the picture into cells (e.g., 8x8 pixels for every cell).

2. For every pixel in a cell keeping centre pixel value an indicator, analyse the pixel to each of its eight neighbours (all direction including diagonal) Applying the LBP operation:

3. When the centre pixel's value is more compared to neighbour's value, assign "1", or else "0". This gives an eight-digit binary number (converted to decimal) Verification or authentication of a facial picture

4. Compute the histogram, for each cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the centre)

5. Compute Euclidean distance to find match in system if it exists.

5.3 ONE TIME PASSWORD

Access controls exist to prevent unauthorized access. Companies makes sure that unauthorized access is denied and also authorized users are unable to make unnecessary changes. The controls exist in a various form, from Identification Badges and passwords to access authentication protocols and security standards.
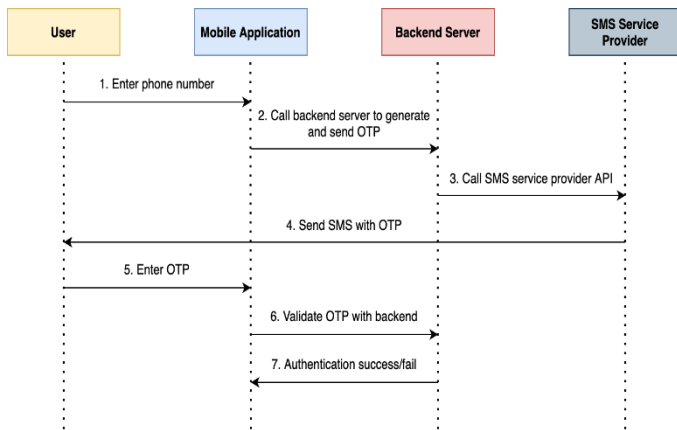

Fig 7: OTP Workflow

5.4 DATABASE

A database is essential components for many applications, used for saving a series of data in a single set. In other words, it is a group/package of information that is put in order so that it can be easily accessed, manage, and update.

6.   WORKING

First, we register the user as customer or merchant and assign unique identity to each with help of database.

Fig 8: Customer Data

While making transaction, customer ID is retrieved using facial recognition
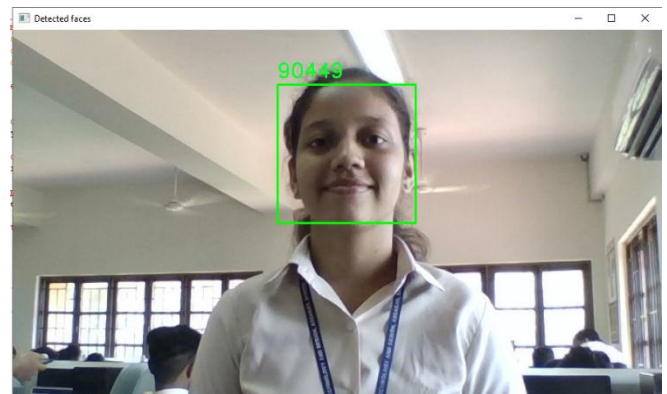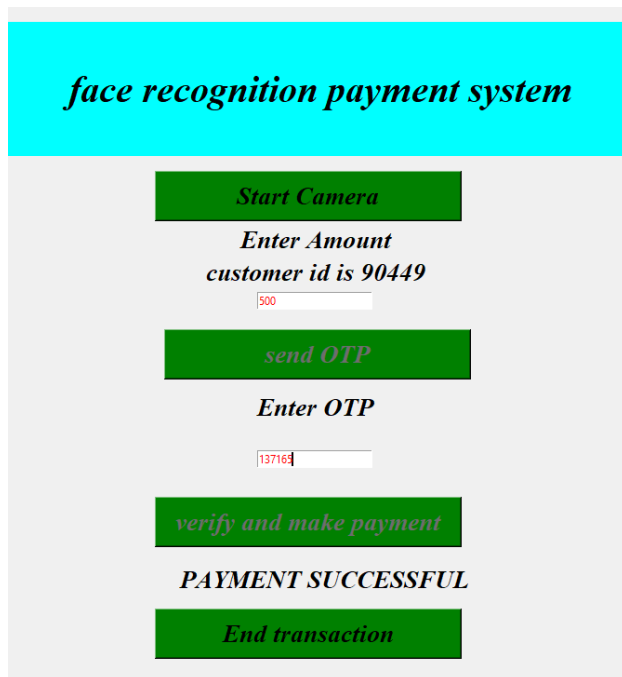

Fig 9: Recognition of user

Upon successful match, total amount is entered and OTP is sent to linked mobile number to that customer and based on balance in account, transaction may be completed or failed.

Fig 10: Transaction Process

7.Conclusion

We have implemented transaction processing system using facial recognition with help of Haar Cascade and LBPH algorithms. Use of OTP further secures the process of user authentication. The whole system is user friendly and works efficiently with very little error if any. More features can be included in future

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