

An Authenticated Face Recognition Application for e-Payment using Python

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Abstract - Now a day due to rapid technology growth theft over transactions is emerging at higher rate. Although passwords are used as a level of authentication, the problem is solved at a certain extent. Another level of authentication may be introduced to provide secure transactions. Many biometric security provisions are employed today and selection of approach varies from application to application. Face recognition is one of popular authentication especially in the transaction areas. The major advantage of face based identification over other biometrics is uniqueness and acceptance. This system compares the image of the user with already registered image in the repository based on feature extraction, if it matches then the system proceeds to further processing. Whenever the user provides credentials in the form of password, an OTP is generated and is send to the registered mobile number. Later the system dynamically captures the facial image of the user through webcam of the system, Search in the registered repository on feature extraction approach basis then goes for comparison. If it found match then permits for e-payment procedure. Biometric applications implementation mostly use python environment due to adequate python features. Python is open source, portable, objects oriented software.

Keywords - Face recognition, Biometric, Repository, Feature extraction, Pattern recognition, Webcam.

I. INTRODUCTION

Face recognition is an interesting area and has successful applications of pattern recognition and image analysis. Face processing is based on the fact formation about user's identity that can be extracted from the images and the system can act accordingly. Face recognition technology is gradually evolving to universal biometric solution as it requires virtually zero efforts from the user end while compared with other biometric options. The face recognition technique captures the image from without actual interaction with a person. These applications for public safety authorities use to locate certain individuals like criminals, suspected terrorists, and missing children. The facial recognition system is useful for the public safety authorities in their mission too. The simplest method for face recognition is image processing technique.

This system proposes online payment using face recognition that can make online payment automatically after the face is recognized correctly. First, the face region is extracted from the image by applying pre-processing activities. The local features such as eyes and mouth are extracted from the face region. The distance between the eye balls and the distance

between the mouth end points are calculated using the distance calculation algorithm. These values are given as the input to the training algorithm and then the values are used at the time of recognition of the face for registered user i.e. at the time of making online payment the features are extracted from the current image and is compared with the previously generated face repository.

II. LITERATURE REVIEW

Kaushik S., Dubey R. B., Madan A. (2014) proposed a new application for face recognition task on mobile device. The work is based on the web service, able to store the normalized distances in the database, to verify the correct building of the classifier's model and to match the test normalized distances with the training normalized distances already stored in the database. This innovative technique is named Bridge Approach (BA). The Bridge Approach allows both to speed up the processing and to use the face recognition system in all locations where an internet network is available. The application uses the OpenCV library for dynamic targeting of face, eyes, nose and mouth and WEKA library for the classification purpose. Authors conducted Experimental work on 500 face images belonging to 10

individuals (50 images each). Finally, the goal of the performance work is shown in terms of computational time and classifier's accuracy.

Kanti J. and Papola A. (2014) described face recognition systems have been grabbing high attention from commercial market point of view as well as pattern recognition field. Face recognition has received substantial attention from researchers in biometrics, pattern recognition field and computer vision communities. The face recognition systems can extract the features of face and compare this with the existing database. The faces considered here for comparison are still faces. Machine recognition of faces from still and video images is emerging as an active research area. The author formulated based on still or video images captured either by a digital camera or by a web cam. The face recognition system detects only the faces from the image scene, extracts the descriptive features. It later compares with the database of faces, which is collection of faces in different poses

Neelesh S., Priyank P., Kavita Sonawane (2012) detected the face is the identity of a person. The methods to exploit this physical feature have seen a great change since the advent of image processing techniques. The accurate recognition of a person is the sole aim of a face recognition system and this identification maybe used for further processing. Traditional face recognition systems employ methods to identify a face from the given input but the results are not usually accurate and precise as desired. The system described in the paper aims to deviate from traditional systems and introduce a new approach to identify a person using a face recognition system i.e. the generation of a 3D Facial Model. The described working of the face recognition system that will be deployed as an Automated Attendance System in a classroom environment. The use of Fuzzy Logic and the concepts of Content Based Image Retrieval (CBIR) will be the main aspect of the automated system.

Turk M. A. and Pentland A. P. (1991) detected the facial recognition system store video or photographs and tried to find recognizable facial characteristics and match them against known facial templates to identify individuals. Most current facial recognition system processes the 2D camera image, although recent products have emerged that try to map the face in 3D using multiple camera angles. Face recognition has the greatest advantage of not requiring any sort of contact, so there are no hygienic concerns. The biometric samples here are typically taken as 2D images of the frontal section of the face, using one or more digital cameras. Typical technical approaches to achieve this recognition include geometrical, eigenfaces, template and graph matching, neural networks and Hidden Markov Models, or a combination of these.

III. SOFTWARE PROCESS

3.1 User Software Process

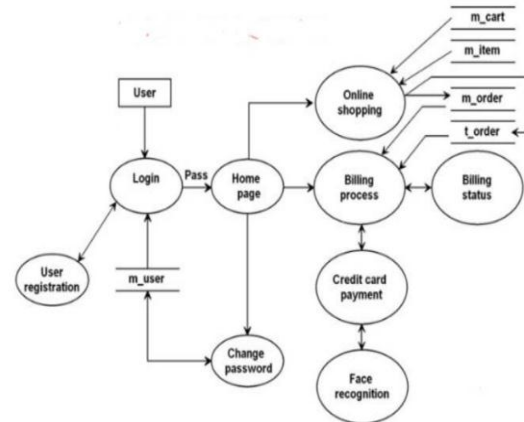


Fig. 1 User Software Process

Fig.1 represents the high level abstraction details of software components. End user facial image will be the input to the face recognition system. It is compared with the acquired photographs of the repository. Then, feature extraction techniques are applied to train the system and recognize the face accordingly. Once recognized correctly, the online payment is awarded to the registered user.

3.2 Admin Software Process

First, the system needs to be initialized by feeding it a set of training images of faces. This is used to define the face space which is set of images that are face like. A database is created which contains these set of training images of faces with the person's information like name, customer id etc. which is basically called label. Next, when a face is encountered it calculates the local features such as eyes and mouth are extracted from the face region. The distance between the eye balls and the distance between the mouth end points are calculated using the distance calculation algorithm. Then the distance values between the left eye and the left mouth end point, the right eye and the right mouth end point, the left eye and the right mouth end point, the right eye and the left mouth end point. By comparing it with known faces and using some statistical analysis.

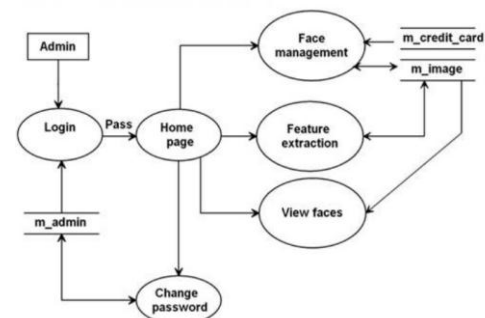


Fig. 2 Admin Software Process

If an image is determined to be a face the system will determine whether it knows the identity of it or not. The previously shown Fig. 2 shows the Admin process which describes the phases in which it has been divided i.e. user registration phase then feature extraction and face recognition phase and the last phase consists of having the online payment done of the person if his face has been recognized correctly. Admin has all the privileges over the software.

3.3 System Description

The System is designed with two phases. One phase deals with Face Recognition System and other with online payment System.

3.3.1 Face Recognition System

This Face Recognition system involves several sub-stages:

- 1) Source Stage
- 2) Source Transformation Stage
- 3) Face Extraction Stage
- 4) Pre-recognition Transformation Stage
- 5) Face Recognition Stage
- 6) Presentation Stage

3.3.2 Online payment System

Online payment System is software developed for online payment using face of individual. It facilitates to access the online payment access of a particular person. The information is sorted by the operators, which will be provided by the payment gateway for a particular person. This system will also help in doing online payment faster than the traditional method.

3.3.3 Facial Recognition

Fig 3 shows the procedure involved in identifying the identity. It is represented through a block diagram. The repository is shown as database in the figure.

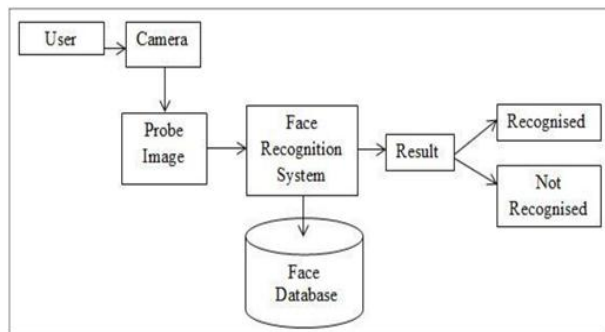


Fig.3 Facial recognition Process

IV. RESULT AND DISCUSSION

4.1 Login Screen

```

enter the login id:nagaraju
enter the password:123456
Login details matched
Look at the camera
Login Successful
Your Account Balance is:42500
Enter Your choice
0.Show Data
1.Deposit
2.Withdrawl
3.Change Phone number
4.Change Email Address
5.Change Password
6.MONEY TRANSFER
7.Logout
:2
Enter the amount to Withdrawl:3000
verify your facial ID
Look at the camera
OpenCV Error: Assertion failed (s >= 0) in c

ID verified
Amount Withdrawl
Total Amount=39500
Enter Your choice
0.Show Data
1.Deposit
2.Withdrawl
3.Change Phone number
4.Change Email Address
5.Change Password
6.MONEY TRANSFER
7.Logout
:7
logout Successfully
Type 'Y' for relogin:
  
```

Fig. 4.1 Login Successful

```

PS C:\Users\Bhupender yadav\desktop\payment\fr> python fr.py
Preparing data...
Data prepared
Total faces: 48
Total labels: 48
enter the login id:bhu
enter the password:rv
Invalid input!!try again? type 'Y' for reenter:
  
```

Fig. 4.2 Access denied

The Fig. 4.1 shows the data preparation as well as credential verification.. After successful login credentials are provided by the end user, if successful other level of security with the capture of image is done. Once matched with the training data found then the details of the bank account record are displayed User can select the options Change details , Transfer provided . If mismatched in the image captured

then access is denied for the process which is shown on Fig 4.2

4.2 User Registration

	A	B	C	D	E
1	login	passkey	amount	email	phone
2	aditya	aditya	34000	adityagau	9.51E+09
3	ritish	ritish	1000	ritishct151	7.71E+09
4	jyoti	jyoti	63000	jyotiyadav	8.9E+09
5	nagaraju	123456	39500	jhnrj7@gr	7.76E+09

Fig. 4.3 User Registration

Fig. 4.3 is a simple excel sheet to register the user details. From this the login details and verified to proceed further.

4.3 Real-Time Image Capturing



Fig. 4.4 Real-time image capturing

Fig. 4.4 shows that at real-time capturing of image and region of interest is cropped out. The image captured is the test data for the software. This test data is compared with the training set data which is shown in Fig. 4.5

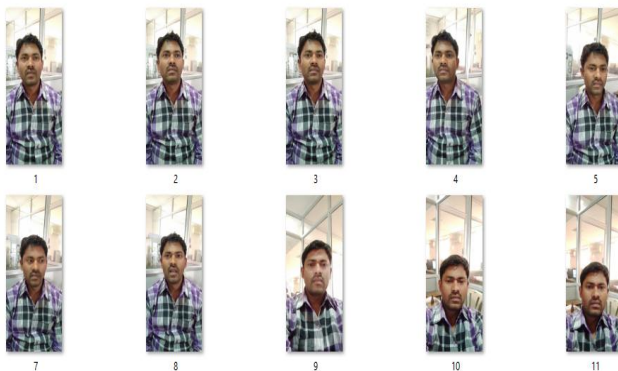


Fig. 4.5 Training dataset

4.4 Logout screen

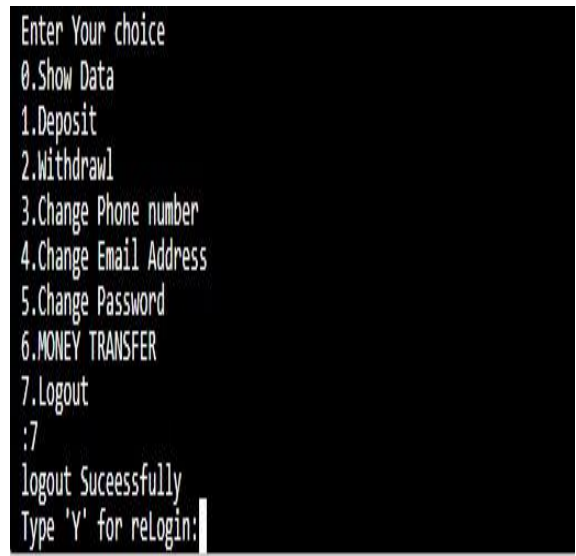


Fig. 4.6 Exit

V. CONCLUSION AND FUTURE SCOPE

The system extracts the image from a real-time video by face detection and cropping. The features of the current image and the previously stored image in repository are compared. If there is match then the matched features are shown on the screen. To complete the process various concepts of artificial neural network, digital image processing etc. were considered.. The system is operated at a high level of efficiency and the entire customer associated with the system. This system is integrated with online payment system to transfer money using mobile number which reduces the manual submission of online payment transfer. The camera plays a crucial role in the working of the system hence the image quality and performance of the camera in real-time scenario must be tested thoroughly before actual implementation. The method is secure enough, reliable and available for use, The comparison of the real time image with the image that is stored in the repository should be reliable and fast as the user of the system should not be made to wait for a long time.

Image quality affects how well facial-recognition algorithms work. The image quality of scanning video is quite low compared with that of a digital camera. Even high-definition video is, at best, 1080p (progressive scan); usually, it is 720p. The relative angle of the target's face influences the recognition score profoundly. When a face is enrolled in the recognition software, usually multiple angles are used (profile, frontal and 45-degree are common). Anything less than a frontal view affects the algorithm's capability to generate a template for the face.

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