Journal of Engineering Sciences
Vol 11, Issue 1, JAN/2020
ISSN NO:0377-9254

THE COMPREHENSIVE STUDY OF FACE RECOGNITION SYSTEM USING SIFT AND ADABOOST IN VIDEO

[1]SHAIK SHIREEN, [2] SIVA CHANDRA
[1]M. Tech Student [2]Assistant Professor
[1]shaikshireen18@gmail.com
[1]Electronics and Communication Engineering,
[1]JNTUA College of Engineering Pulivendula, Pulivendula, India

Abstract: Face Recognition is a biometric technology that can distinctively identify or verify an individual by associating and analysing patterns created on the facial contours of the person. Face recognition is used to identify the different individuals by using their different features of the face like skin tone, jaws, cheekbones, eyes, nose, and mouth. CNN approach is trained and developed as the user input with GUI in the previous paper. CNN's disadvantage is that it provides less data; it performs poorly. Several different methods are used to address these weaknesses in the proposed methods. The approach proposed here is focused on face recognition, which focuses on the creation of Adaptive boosting classifier using the SIFT technique of feature extraction for video Graphical User Interface (GUI) is used in face recognition system. A MATLAB GUI integrates all the phases from video preprocessing to face authentication.Evaluation is performed by the Adaboost algorithm using standard data set images of 40 subjects from the AT & T database, achieving 90 percent accuracy in average minimum training time.

Keywords: Face recognition; Adaboost classifier; Feature extraction (SIFT); MATLAB; Graphical user interface (GUI).

I.INTRODUCTION:

Today people of a day use different combinations of numbers and alphanumeric characters to authenticate their accounts as their hidden pin. Although the PINs are different, the protection cannot be assured because it can be lost or the fraud criminals can steal the identity. The approach of biometrics is to identify individuals with specific biological characteristics that individuals possess like nose, finger and vein, iris, form of blood, DNA, etc. [1]. Many individuals cannot use face recognition without the account owner's presence. The process of recognizing the face is to identify people in images or video by matching the presence of faces in recorded images with a database. It can also be described as a biometric application based on Artificial Intelligence. A person can be defined uniquely by examining shapes created on the facial texture and form of the individual. Face recognition is a way to identify an individual based on that person's biological characteristics. Nonetheless, there are a lot of challenges in this process. Based on invariant lighting that may be owed in the direction of the bright source that moves the intensity of an image. It is look of one's reactions based on facial expression. Anger can trigger a frown, for example, which draws the eyebrows closer together. Despite variation in facial expression, a virtuous process must be able to recognize a good face recognition algorithm [2]. According to a biometric, the identification of the face is very unique, with a more positive sample. Face Recognition has many uses ranging from security and surveillance to biometric security to secure mobile accessibility, the Facial recognition algorithm often detects facial features and compares them to a database to find the finest match.

In face recognition, there are three different processes, namely expression verification, identification and authentication. Verification is a method for deciding if the two inputs of the system belong to the similar group or unique. Whereas Face Verification is the mechanism that verifies through such processes of challenges such as pose variation, hairstyle and face expression. Here the use of visual attributes that can be defined for face verification and image search is to describe its appearance [3]. Examples of facial characteristics are gender, age, shape of the jaw, size of the nose, etc. Here there are two procedures of face verify which often match face and face illustration [4]. Identification is the mechanism that provides a user identity that is usually represented as a user identity.

It is a method to detect a soul created on his physical features and personal unique traits. Identifying a soul built on his physical features and unique own characteristics is a technique. Then face authentication is the method in which user identity is established and validated. It has two stages of identification and authentication in this authentication. It verifies in certain clamming user identity as the user provided evidence. In existing face recognition, there are three different techniques: holistic-approach (appearance-based),

feature-based approach (structural approach) and hybrid approach [5]. In this practical face detections, large pictorial variations, such as those caused by pose, expression, and lighting, require an innovative discriminative model that pretty much exactly differentiates faces from backgrounds. Therefore, effective types tend to be computationally inexpensive for the problem. To overcome those challenges a cascade architecture in CNN is built [6].

The technique of transforming the scale-invariant function (SIFT) is used to remove the features for better classification. An image is recognised in a new image by comparing each feature of the new image with this database individually and identifying matching features based on the Euclidean distance of its feature vector [7].

Basically, AdaBoost is called as Adaptive boosting, it is a machine-learning meta-algorithm devised by Yoav Freund and Robert Schapire, who received the Gobel prize in 2003 for their research combination, which is cast-off toward progress performance in various extra forms of principles algorithms [8]. Adaboost is a first really successful binary classification boosting algorithm. Adaboost is often referred to as the best output box of the classifier through decision trees as the weak beginners.

This paper proposed a technique and a method which is face recognition in video. Here input video is divided converted into number frames, after that pre-processing of frames part can be done. Then by using feature extraction (SIFT) and Ad boost classifier face recognition rate and accuracy is obtained, finally ID of input video is obtained as output.

II.RELEATED WORK:

Several methods have been used to reduce the accurateness of face acknowledgement and to increase the rate of face recognition in the image as input, but only a few researchers focused on video. In existing papers as input image is used, then image pre-processing to the image then Convolutional Neural Network (CNN) cascade classifiers are used by using standard datasets for training process.

CNN cascade architecture:

CNN cascade architecture is designed to maintain high performance with very strong discriminative capability. CNN cascade works at multiple resolution; it easily rejects the context region in fast stages of low resolution and careful testing of a small number of difficult candidates at the last high-resolution stage. CNN is trained to show difference between images of human faces from computing different avatars as part of face recognition challenges. CNN will make complete use of limited training data.

Convolutional Neural Network:

The standard process consists of four stages of modern face recognition: identification, orientation, representation, classification. Explore alignment stage and representation step by means of explicit 3D face modeling to apply a piece affine transformation and derive a face representation from a deep neural network of nine layers [9]. Deep CNN is first method of CNN which describes as LeNet-5 network for the optimal character recognition. The applications of DCNN is human pose estimation, face parsing, facial key point detection, speech recognition and action classification.

In CNN process modules, there will be combination of segmentation, Feature Extraction and classification Stochastic Diagonal Levenberg Marquadt (SDLM) is a learning Technique that effectively utilizes LeNet-5 while training the Network. Here, in this method instead of searching a logical solution for the regression problem, it tries to obtain a significant resolution through gradient descent (GD). CNN kernel-based structure with trainable parameters is designed to extract local features and make local recommendations [10].

Fusion of convolutional and subsampling layer:

Computationally efficient is the simplified version of CNN. As shown in fig (1a) below, the convolutional and subsampling layers are fused together. Natural convolutional and subsampling is shown in fig (1b).

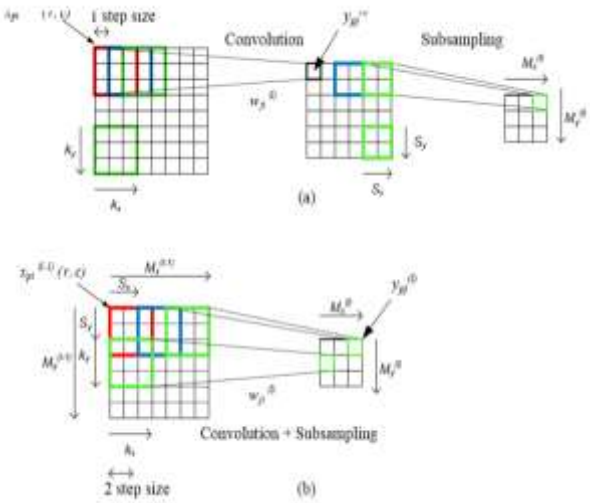


Fig1: a) Structure of non-fusion convolutional and subsampling layers. (b) Convolutional and sub-sampling

layers. CNN architecture consists of four layers; C1, C2, C3 and F4 are output layers.

The CNN architecture comprises of four layers; the output layer stays C1, C2, C3 and F4. There are 5 feature maps in C1 layer, 14 feature maps in C2 layer, 60 feature maps in C3 layer and 40 feature maps in F4 layer because there will be 40 subjects in the ORL database in classification as shown in figure 2 below.

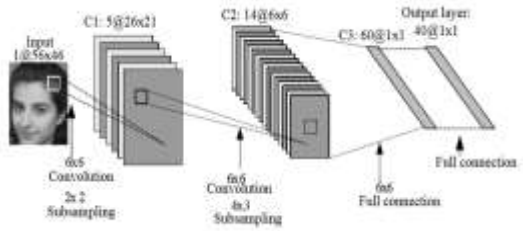


Fig 2: **CNN architecture for face recognition.**

In convolutional process the enterprise takes a concentrated size of feature maps because it ensures not to involve padding. Convolutional and subsampling is combining together, to reduce the number of layers required. Then ORL database is trained in CNN architecture.

MEX-file: As mentioned above, the pre-processing phase is performed window in MATLAB based environment while the CNN language is established by means of LINUX-based environment, both of which will be developed separately. All parts are needed toward produce a wide-ranging scheme combination. When MATLAB window-based environment is implemented by MEX-files which is also called as C.

Using CNN, there are some current face recognition functions. We applied such a typical towards a task considered to prevent machine-driven schemes popular 2012 cheung proposed in this study. As part of the ICMLA 2012 Face Recognition Challenge, here developed a CNN to differentiate images of human expressions after simulated [11]. A database of 6 films of CNN and CAPTCHA through 10 topics. The weakness of this CNN is that it has more than 5 layers. In this layout, a small CNN used for feature extractor is proposed to resolve these Khalajzadesh et al. between the entire input image pixels [12]. A four-layer CNN in 2013 is based on 40 topic AT & t database, and it gives little precision.

The main disadvantage of CNN is, it lays in the amount of data which provided is less, CNN performs poorly, it also has millions of parameters with small data sets which it run into an over-fitting problem. To overcome these limitations Ad boost classifier is used along with SIFT feature extraction will be discussed with different standard datasets in the research paper. There are number of extensions based on these face recognitions in MATLAB, and some methods in face recognition in images and video as an effective alternate method which does not have any limitations.

III. METHODOLOGY:

This project objective is to progress the presentation of the face recognition system, by these three different process face identifications, face verification and face authentication process and to progress the recognition rate and to reduce recognition time by using video as input.

ALGORITHM

STEP1: Aimed at the scheme is to interact with handlers, a (GUI) is established in MATLAB, this user interface consists of different components.

STEP2: Add new Standard data sets users into the system, select one input video from a folder and read the video file.

The standard data sets used in the system is AT & T "The database of faces" formerly ("The ORL database of faces"). For some subjects, each 50 different subjects have 10 dissimilar images, the pictures were taken at dissimilar times, as shown in figure 3 below, changing the illumination, facial expression (open / closed eyes, smiling / not smiling) and facial details (glasses / no glasses).

Fig 3: depict examples of AT&T.

STEP3: Scale-Invariant Feature Extraction (SIFT) is applied to this face recognition extract input picture. It is an algorithm used in image detection and definition of local features. The process was issued in 1999 by David Lowe. Applications such as object recognition, robotic

mapping and navigation, 3D modeling, motion recognition, video tracking, human wildlife detection and contest moving [13]. SIFT function is used to provide strong voice, accessory, pose and illumination variations robustness [14].

STEP4: Adaboost classifier is used to improve decision trees output and it is based on binary classification problems. It is also a best used for weak learners to boost the performance of machine learning algorithm [15][16].

Adaboost Training:

Adaboost classifier combines to form a strong classifier weak classifier algorithm. A solo process classifies the substances ailing. But if we combine several classifiers with training collection established at to each iteration and assign the correct quantity of weight in the final vote, we can have a good overall classifier accurateness score. Then iteratively requalifies the system through picking the keeping fit set built on previous training accuracy. The first practical boosting algorithm is AdaBoost, short for "Adaptive Boosting." The last sorting can be characterized by means of shown in below equation:

$$F(x) = \text{sign}\left(\sum_{M=1}^{M} \theta_m f_m(x)\right)$$

Where, f_m stands for the m_th weak classifier and theta_m is the corresponding weight. It is exactly the weighted combination of M weak classifiers.

STEP5: In this step, later the newly accomplished weights are kept calculation method, the training determination stop when new accuracy is gained.

STEP6: At that point the user ID of the input video will be shown later the calculation key is constrained. The handler ID must be alike with the ID tag involved to each input video. The block diagram for the proposed method is shown below fig (4).

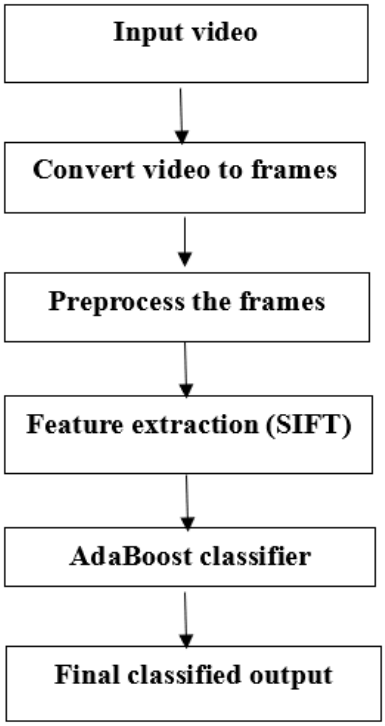


Fig 4: the proposed method block diagram.

IV.RESULTS AND DISCUSSION

The performance of these method which is used for face recognition in video has been accessed by using a (GUI) Which is developed to communicate with the user in MATLAB. The GUI consists of four components in this existing paper the first step is adding new handlers to the program. The next portion stands the pre-processing phase of the picture. Then images for training and testing samples will be divided into 8:2 ratio correspondingly. The 3rd portion is gaining new consistency for CNN preparation. In these proposed methods is tested by adding new standard datasets videos into the system. Each video is converting into frames and then video pre-processing is done during these processes in frame pictures of each handler drive be resized to 64×64 pixels. Those are divided into fraction 6:4 for working out and challenging trials respectively as revealed in under table. In evaluation process feature extraction and classifier is used to obtained accuracy and then user ID is displayed for each subject.

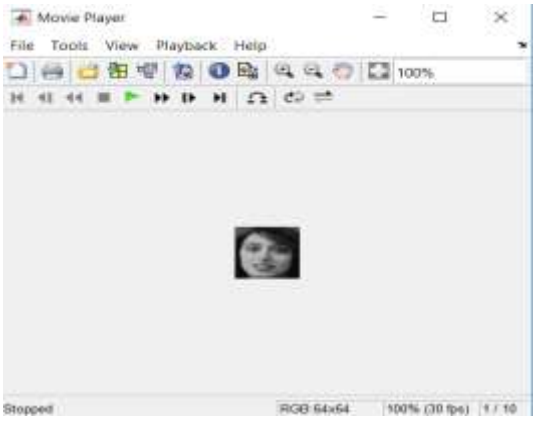


Fig 5: Input video.

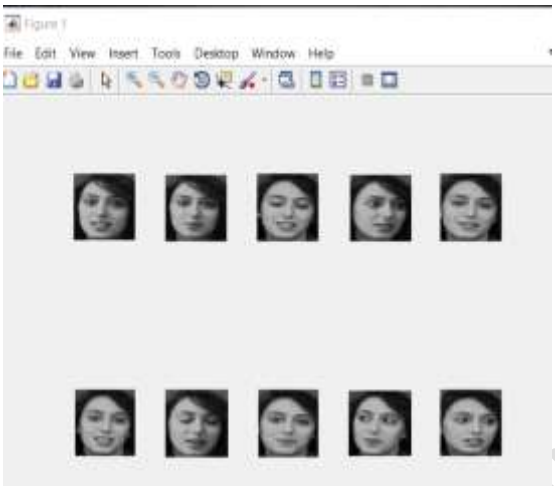


Fig 6: Convert video into frames.

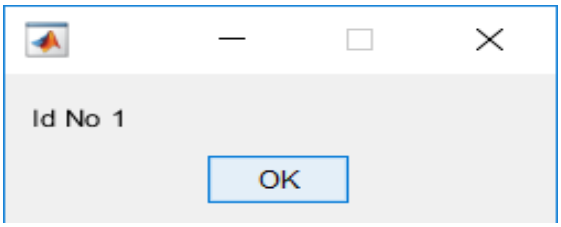


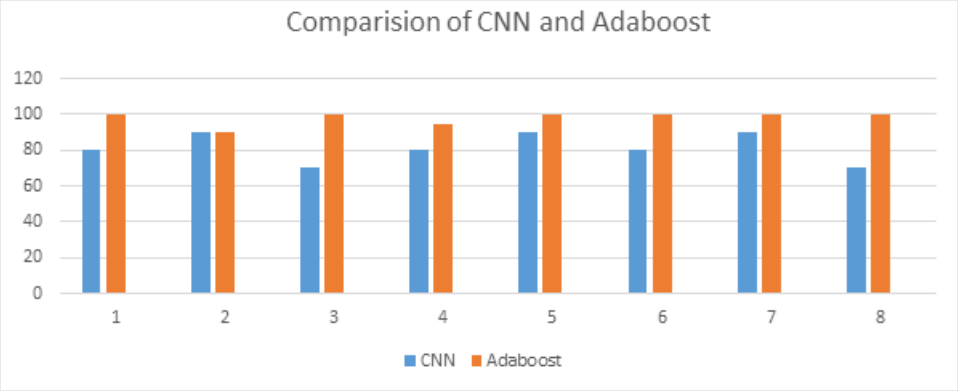
Fig 7: User ID display.

The above-mentioned results are the performance of face recognition fig (5) is a selected input video, fig (6) is a converted frames and fig (7) is an output.

Table: The performance evaluation values of output videos.

S.NO	Training images	Correct identified	Wrong identified	Testing images	Correct identified	Wrong identified	Accuracy (%)
1	6	4	2	4	4	0	80
2	6	5	1	4	3	1	80
3	6	6	0	4	3	1	90
4	6	3	3	4	3	1	60
5	6	5	1	4	4	0	90
6	6	6	0	4	4	0	100
7	6	5	1	4	4	0	90
8	6	5	1	4	3	1	80

From the table, it is shown that among 10 pictures of every subjects. Individuals 10 images drive be situated separated used for physical activity and assessment in the fraction of 6:4. The pre-processing step for ORL file involves through resize of images into 64×64 pixels then based on correct identified Id's the accuracy is calculated.



Graph: Graphical representation of face recognition

The above graph shows that the comparison of convolutional neural network and Adaptive boosting classifier by obtained accuracy of face recognition.

V.CONCLUSION:

In these paper complete MATLAB is based on face recognition with graphical user interface (GUI) is developed, by using video as input user. This system is based on SIFT feature extraction and AdaBoost classifier method it is involved for retraining new incoming subjects into the system, because it has a faster retraining process. The accuracy of this system is between 90%-100% of all the 40 subjects. Here there is an advantage of these system is by letting this network to focus on useful features, which improves the performance as demonstrated in this experiment.

REFERENCES

[1] Chandra, E., Kanagalakshmi, K. "Cancelable biometric template generation and protection schemes". A review. (2011) Electro Compute Technol5: 15-20.

[2] Valstar, M.F., Mehu, M., Pantik, M., et al. Meta-analysis of the first facial expression recognition challenge. (2012) IEEE Transactions Systems Man and Cybern B.

[3] Kumar, N., Berg, A.C., Nayar, S.K., et al. "Describable visual attributes for face verification and image search". (2011) IEEE Trans Pattern Anal Mach Intell 33(10): 1962-1977.

[4] Cao, Z., Yin, Q., Jian, S., et al. "Face cognition with learning-based descriptor". (2010) Computer Vision and Pattern Recognition (CVPR) 2707-2714.

[5] Parmar, D.N., Mehta, B.B. "Face Recognition Methods & applications". (2012) Int j comp tech applicant 4(1): 84-86.

[6] Li, H., Lin, Z., Shen, X., et al. "A Convolutional Neural Network Cascade for Face Detection,Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition". (2015)

[7] M. Bicego, A. Lagorio, E. Grosso, and M. Tistarelli, "On the use of SIFT features for face authentication", Proc. of IEEE Int Workshop on Biometrics, in association with CVPR, pp. 35-41, NY, 2006.

[8] ^ Freund, Schapire., "A Short Introduction to Boosting", (1999).

[9] Taigman, Y., Ming, Y., Marc, A.R., et al. Deepface: "Closing the gap to human-level performance in face verification". (2014) Comput Vision Pattern Recognit (CVPR).

[10] Shan Sung Liew, Mohamed, K.H., Syafeeza, A.R., et al. Gender classification: "A convolutional neural network approach". (2014) Turkish J Elect Eng Comput Sci 1-17.

[11] Cheung, B. "Convolutional Neural Networks Applied to Human Face Classification". (2012) 11th Int Conf Mach Learn Applicat (ICMLA) 2: 580-583.

[12] Khalajzadeh, H., mansouri, M., Teshnehlab, "M. Hierarchical structure based on Convolutional Neural Network for Face recognition". (2013) Int J comput Intell Applicat 12(03).

[13] Cong Geng, Xudong Jiang., “Face recognition using SIFT features”, IEEE international conference on image processing (ICIP).

[14] J. Luo, Y. Ma, E. Takikawa, S. H. Lao, M. Kawade and B. L. Lu, "Person-specific SIFT features for face recognition", International Conference on Acoustic, Speech and Signal Processing (ICASSP 2007), pp. 563-566, Hawaii, 2007.

[15] Kégl, Balázs. "The return of AdaBoost.MH: multi-class Hamming trees". (20 December 2013)

[16] Friedman, Jerome, Hastie, Trevor., Tibshirani., Robert. "Additive Logistic Regression: A Statistical View of Boosting". (1998)