Facial Recognition using Machine Learning

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Abstract- Security and Authentication is an indispensable phase of any industry. In Real-time, Human face recognition can be performed in two tiers such as Face detection and Face recognition. This paper implements “Haar-Cascade algorithm” to pick out human faces which are equipped in Open CV by Python language and " Local binary sample algorithm” to recognize faces. Collating with different current algorithms, this classifier produces a high recognition price even with varying expressions, environment friendly function selection and a low assortment of false-positive features. Haar feature-based cascade classifier system makes use of solely 200 points out of 6000 features to yield a recognition charge of 85-95%.

Keywords- LBPH, OpenCV, Webcam, Haar Cascade

I. INTRODUCTION

Face recognition is a biometric software program software tailored to identify people by monitoring and detecting. The foremost intention of this paper is to recognize the faces of people. This method can be executed virtually in crowded areas like airports, railway stations, universities and department stores for security. The primary goal of this paper is to enhance the recognition rate.

After the event of 9/11, growing safety systems has become of greater concern. Hence it is imperative to furnish safety to the citizens, especially in crowded areas like airports, railway stations, in borders, agencies the place detection and consciousness.

To become aware of the individuals, Surveillance camera with face consciousness system can be provided. Face focus machine has the dexterity to mitigate the threat and finally ward off any future assault from happening.

There are endless purposes for this facial recognition device over the world. It has also increased in functions in many social media platforms. It will endorse the person to tag the character who has been detected in images.

II. FACE DETECTION

Face detection is the first step in the process of facial recognition. In this step various algorithms are formulated and then trained for spotting faces in an image. This can be done for already stored pictures or for real-time vision using cameras. It is done with the help of OpenCV with Haar Cascade Classifiers. OpenCV is an open source programming library that enables users to get routines in API (Application Programming Interface) utilized for computer vision applications. Classification refers to the process of assigning a pre-established label or category to the given data points. A classifier utilizes some training data to find co-relation between the presented input data and the pre-established classes.

This method of face detection is based on Viola-James object detection framework. This framework is used mainly for facial detection. It is an algorithm that uses a lot of positive images with faces and negative images or non-faces to train a classifier so that it can differentiate between the two when present in the image. It has mainly four stages:

1. Haar feature selection
2. Creating an Integral Image
3. Training
4. Cascading Classifiers

Haar cascade classifiers make use of Haar features. All human faces share a certain degree of resemblance like the bridge of the nose is brighter than the eyes. Along with this, the location of facial features like the eyes, nose mouth of all people is located in the same geometry. These parities in all faces can be equated with Haar features. A Haar feature considers adjoining rectangular regions at a particular position in the detection window, sums up these pixel intensities in every such positions and calculates the difference between these sums. To analyse a photograph using Haar cascades, a scale is selected in such a way that it is smaller than the proposed image. It is then positioned on the image, and the average of the values of pixels in each area is taken. If the difference between the two values cross a given threshold, it is regarded as a match.

III. FACE RECOGNITION

Once the facial pictures have been processed- extracted, cropped and resized (and mostly converted to grayscale) the face recognition algorithm is used to find the traits that are characteristic to the image. It fundamentally contrasts the provided facial picture and every single facial picture from a dataset with the intent to discover the one that matches that face. It is essentially a 1xN examination.

For this purpose, LBPH (Linear Binary Patterns Histogram) algorithm can be used. Local Binary Pattern (LBP) is a basic yet very proficient texture operator which marks the pixels of a picture by thresholding the vicinity of every pixel and acknowledges the outcome as a binary number. It has additionally been resolved that when LBP is joined with the Histogram of situated slopes (HOG) descriptor, it improves the performance impressively on some datasets.

The LBPH algorithm works on the following 4 basic parameters:

1. *Radius*: This pattern builds the circular local binary pattern and is the radius around the central pixel. Its value is conventionally fixed as 1.

2. *Neighbors*: This parameter refers to the test focuses to construct the binary pattern. However, the more neighbors we include, the higher is the computational cost. It is usually set as 8.

3. *Grid X*: the range of cells in the horizontal direction. The more cells, the finer the grid, the greater the dimensionality of the ensuing feature vector. It is typically set to 8.

4. *Grid Y*: the wide variety of cells in the vertical direction. The more cells, the finer the grid, the better the dimensionality of the ensuing feature vector. It is typically set to 8.

The first step in the process is training the algorithm. For that we want to use a dataset with the facial photos of the humans we desire to recognize. We have to likewise set an ID (it might be a number or the name of the individual) for each picture, so the algorithm will utilize this data to recognize an input photograph and provide you an output. Images of the similar individual must have the identical ID. The first computational step of the LBPH is to create an intermediate photograph that describes the original photo in a superior manner, by featuring the facial qualities. To do this, the alggorithm utilizes an idea of a sliding window, in light of the parameters- radius and neighbors.

The LBP function vector, in its easiest form, is created in the following manner:

1. Partition the inspected window into cells (for example 16x16 pixels for every cell).

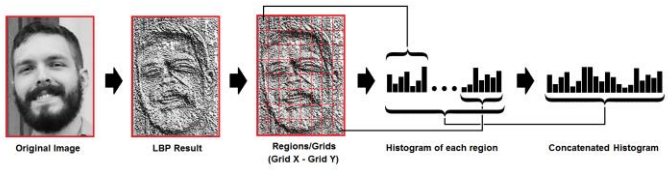
2. For every pixel in a cell, contrast the pixel with every one of its 8 neighbors (to its left side top, left-center, left-base, right-top, and so forth.). Pursue the pixels along a circle, for example clockwise or counter-clockwise.

3. Where the middle pixel's worth is more prominent than the neighbor's worth, state "0". Something else, state "1". This gives a 8-digit paired number (which is generally changed over to decimal for comfort).

4. Process the histogram, over the cell, of the recurrence of each "number" happening (i.e., every blend of which pixels are lesser and which are more noteworthy than the middle). This histogram can be viewed as a 256-dimensional component vector.

5. Alternatively standardize the histogram.

6. Connect (standardized) histograms everything being equal. This gives a component vector for the whole window. The component vector would now be able to be prepared utilizing the Support vector machine, extraordinary learning machines, or some other machine learning methods to characterize pictures. Such classifiers can be used for face recognition or texture analysis.



So to discover the picture that matches the given picture we simply need to look at two histograms and return the picture with the nearest histogram. We can utilize different ways to analyse the histograms (ascertain the separation between two histograms), for instance: Euclidean separation, chi-square, absolute value, and so forth.

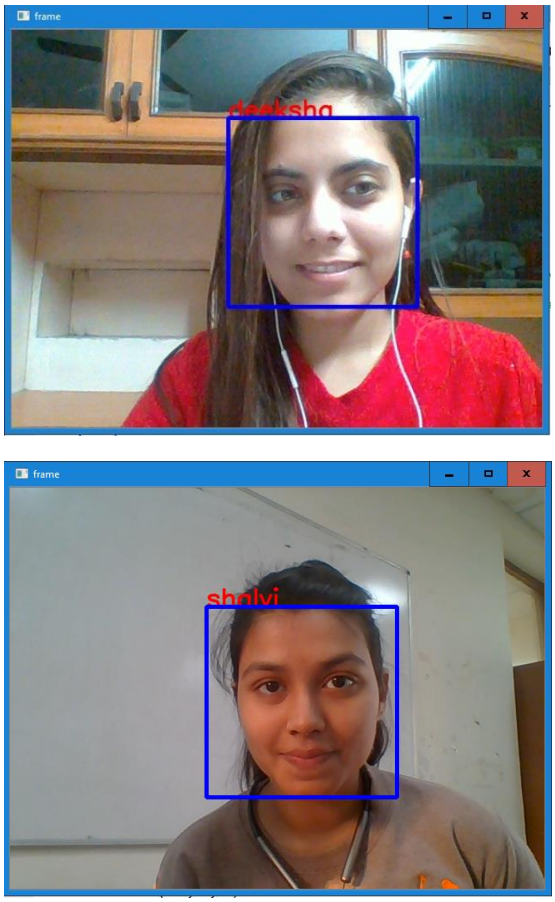
So, the algorithm yield is the ID from the picture with the nearest histogram. The calculation ought to likewise provide the determined separation, which can be utilized as a 'confidence' estimation. In contrast to general conventions, lower confidences are better since it implies the separation between the two histograms is nearer.

We would then be able to utilize a threshold and the 'confidence' to naturally evaluate if the algorithm has effectively recognized the picture. We can accept that the algorithm has effectively recognized if the certainty is lower than the specified threshold.

Fig. 1. The Haar-feature set of our detector.

IV. RESULTS

Here comes the most crucial step for your research publication. Ensure the drafted journal is critically reviewed by your peers or any subject matter experts. Always try to get maximum review comments even if you are well confident about your paper.



V. FUTURE SCOPE

The proposed work can further be extended by making use of cascades that can detect side profiles as well. Another aspect that can be improved is the recognition in the presence of various amounts of light or different illumination present in the pictures. This can be implemented using light compensation process or conversion of obtained frames to neutral faces can also be implemented to improve results. The face recognition database usually contains pictures that are front facing and emotionless. However, the real-time pictures that are obtained during execution have some expressions like happiness, sorrow, anger, surprise etc. This often leads to faltering in the results and failing of the algorithm. To counter this problem and improve results, we can contort the obtained frame from the camera to convert it into a neutral face.

VI. CONCLUSION

The face recognition was done using LBPH (**Local Binary Patterns Histograms (LBPH)**). Reduction in the false-positives easily and increase the efficiency in this research, we are using haar cascade for recognition of face we are using LBPH (local binary pattern histogram). · This reference design can be used for authentication in banks, and other public places. Thus for a safety purpose in real time we designed a face recognition system in minimum expenses using raspberry pi, open cv and LBPH algorithm.

REFERENCES

[1] C.C. Chibelushi and F. Bourel "Facial *Expression Recognition: A Brief Tutorial overview*", 2002.

[2] P.Ji, Y. Kim, Y. Yang and Y.S.Kim, "*Face Occlusion Detection Using Skin Color Ratio and LBP Features for Intelligent Video Surveillance Systems*", Federated Conference on Computer Science and Information Systems (FedCSIS), 2016, pp. 253–259, ISBN: 978-8-3608-1090-3.

[3] Z.Jun, H. Jizhao, T.Zhenglan and W. Feng, "*Face detection based on LBP*", 2017 IEEE 13th IEEE International Conference on Electronic Measurement & Instruments (ICEMI), 2017, pp. 421-425, ISBN: 978-1-5090-5035-2.

[4] Ali, A. Hussain, S. Haroon, F Hussain, S. Khan, M.F. —"*Face Recognition with Local Binary Patterns*". Bahria University Journal of Information Communication Technology, pp 46–50, 2012.

[5] Souhail Guennouni, Anass Mansouri."*Face Detection: Comparing Haar-like combined with Cascade Classifiers and Edge Orientation Matching*", International Conference on Wireless Technologies, Embedded and Intelligent Systems (WITS), pp. 02-04, 2017.

[6] S L Suma, Sarika Raga. "*Real Time Face Recognition of Human Faces by using LBPH and Viola Jones Algorithm*." International Journal of Scientific Research in Computer Science and Engineering, Vol.6, Issue.5, pp.01- 03, Oct. 2018.

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