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Live Video Face Recognition

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Abstract- It sheds light on how Live Video Face Recognition is done & what techniques are used. It talks about the task at helm which is Face Recognition and Detection at large along with the clever use & development of Cascades used for training a machine. The Face recognition is a technology by the help of which one can verify Faces in a Live Video or in a uploaded Video and in still images. Although Image Face Recognition is very common and is in use for over half-decade, while Video Face Recognition is fairly new & is righteously un-tested at higher levels, whereas in addition to that Live Video Face Recognition is now becoming the new norm these days due to demand, technological enhancement, plus a lot of major stakeholders all over the World have shown interest in it. In this paper, we mainly focus on using OpenCV which is the prime package available for detection of faces in a video and an image. If we say that we are doing this thing in a video then I may sound a lot simple but it actually isn't. There are a lot more things which come into play when we talk about Face Recognition in a video. We have to manage the frame rate and we have to train the machine with proper cascades in order for it to be able to detect a face. When face recognition comes into play we need to manage a database of every person and store it. We have to have multiple images of a person in order to train the machine to recognize that person in the live video.

Index Terms- Classifiers, Face Recognition, Live, Video, HAAR, Detection, Techniques, Cascades

1 INTRODUCTION

Face-Recognition is basically a kind of process or steps through which we go or take in order to match faces which we have detected earlier by the help of any system specifically in this case by our own system then the detected faces in the pics are matched with the evidences pics or trail pics we have & if it matches then face is recognized appears else no face recognized appears. This process runs through the information & identify various patterns in our data. The phenomenon is basically defined as a verification of the face of an individual from a digital picture or a video using a particular algorithm and by training the machine. The basic stages/ways Facial Recognition work is as follows:

The Recognition starts with, the detected faces are verified with the Database

If verification results in "yes", the name below the detected face in the box appears
And if the result is "no", the detected face in the box is shown as it is

So, this is roughly what happens in the process or procedure of the Video Based Facial Detection & Recognition. For 2nd thought, imagine that we wish to specify whom faces is present inside pictures, there is multiple aspects we get to bother first to achieve for the pattern:

- Facial width & height.
- When image is rescaled the height & width may change & become non-reliable.
- Facial Color.
- Other parts Facial width like lips, nose.

Whereas, the Live Video Face Recognition is something which is quite new and is currently on the rise among huge stakeholders in every industry especially in security. While in addition to that Live Video Face Recognition is now becoming the new norm these days due to demand and the technological enhancement. The proposed work aims at building a system which is likely to be used for Live Video Face Recognition with a option to extend it for Face Recognition in uploaded/captured Videos.

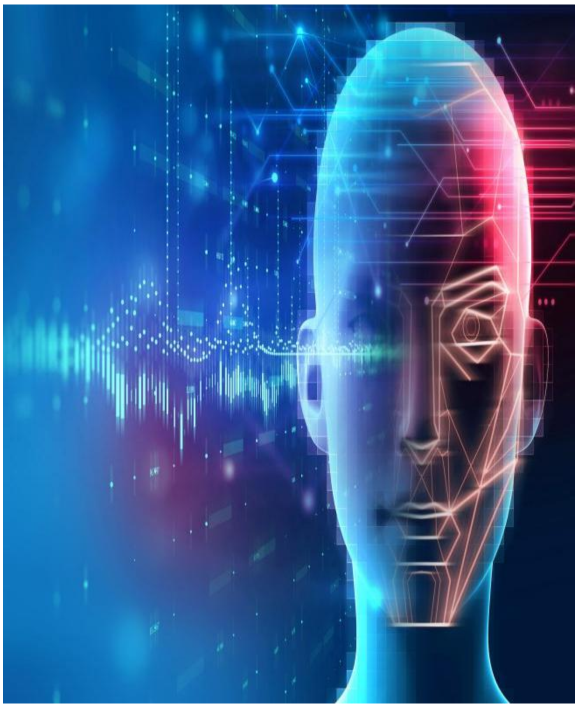

Fig (1)- Image depicts Face Recognition of a Individual by Feature Extraction

The basic approach used here in building this project or continuing to start this research from scratch included the use of one of the most common programming languages which is used for any Machine Learning based project, which is Python programming. The language is simple and easy to learn & provides ease of use in case of compatibility with OpenCV library. OpenCV library on other-hand is a simple and very easy method which is used for Face Recognition.

2 RELATED WORK

This section gives an overview of the already present work about the Video Face Recognition or Face Recognition in general. The literature here principally focuses on Face Recognition and the work already present in the field. Plus, it explores the angle of Video Face Recognition, more specifically Live Video Face Recognition. The [1], discusses Face Recognition at large with the advancement in the field as well as new avenues arising for further development & exploration. It also represents different scenarios based on Video Face Recognition as well as Image Face Recognition. In [2], it provides and update on the concept of Video Face Recognition and discusses future of the already present system. Plus, it also reveals the force and interest behind keeping the system going on. In [3], it further deeps dive into the concept of OpenCV mechanism along with its applicability, its usage and the capability. It also highlights the applications as well as talks about use of eigen values and eigen features. The [4], takes a look at how the program which contains a collection of easy subroutines, each of them work on a particular portion of a picture & generate combination of them which makes the complete process flexible and adaptive. In [5], the focus shifts on the usage of Python Programming and what actually is Python Programming. It also enlightens the importance, ease of use as well as efficient behaviour of the Python Programming. The [6], talks about the OpenCV, its usage as well as explains it in depth with its applications and new advancements. It basically gives a overview of OpenCV as a whole. In [7][8]. the discussion moves towards the eigen values, eigen features and eigen vectors. They both explain it in deep as well as define its usage, capability at large. They also mention how face space is defined using eigen-faces, plus puts forward a framework to learn for detecting/extracting features in a unsupervised way. The [9], sheds light on the famous Viola-Jones technique for Face/Object detection & recognition. It further explains Adaboost as well as uses cascading by HAAR Classifier or LBP Classifier. It is mostly used in real-time Recognition Applications. In [10], the focus is on eigen faces and the space domain resolution for Face Recognition. It uses this to get high resolution images in order to get better face recognition and further improve efficiency of the system. The [11], discusses the LBPH algorithm used for Face Recognition and it furthers shows the implementation alongside its applications. As well as explains about the usage capacity, its capability and efficiency. In [12], the focus shifts back on shape/face detection then recognition using OpenCV software. It also explains how to implement it and use the software at its fullest with high level of efficiency.

3 IMPLEMENTATION

In order to detect faces in a frame using ML algorithms there are a lot of factors which can be taken into consideration while recognizing a face which are as follows: The Ratio of the height and width of the face- The ratio of height and width of the face is important because the image of the person can be scaled to a different width.

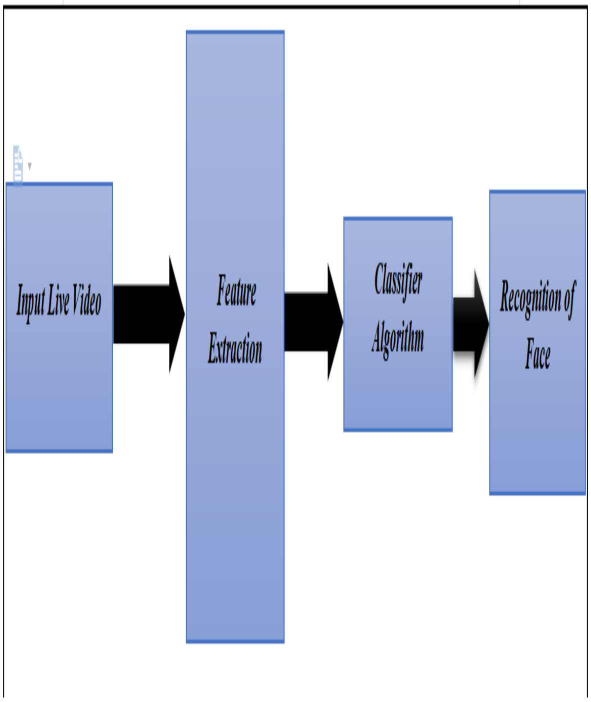

Fig (2)- Depicts the process of Face Recognition

However, what remains the same is the ratio of the width and the height which no one can change. The color of the face- The algorithms also study the color of the face of that person. There are 3 basic colors which are considered Red, Green and blue.

We need to provide the machine with a dataset of these values which it would study in order to get the result. The machine studies all these values which we provide in the form of a document. One the basis of these values the predictions are made.

There are a lot of other factors which can be added to make the algorithms a lot more effective. For a normal human processing these values might not be possible in such a short period of time let alone study all those and make a prediction. This is where the machine comes in handy. It processes all that data which is provided to it. Reads the new image in which we want to identify the person and then based on the values collected now and the values previously, it identifies the person.

3.1 LBPH

It stands for Local Binary Patter Histogram. In our day to day activities we humans do recognize a lot of faces without any effort, just with the help of our memory. We can do this task of recognize faces very easily but at the same time this task is quite difficult for machines. So we now have to train these machines such that these should be able to recognize a face in a video. In order to accomplish that we first have to tell the machines how face looks like so that it can atleast detect a face in a video. In order to train a machine how a face looks like, we have to make cascades in XML language which has addresses of thousands of images of different faces which will be used to train the machines. So, with the help of these cascades the machine would know what to detect which are faces of people in this case.

Algorithm:

1. It extracts a pixel from the face from the Live Video
2. Further RGB value is given to each pixel
3. It checks the value (threshold) of central pixel against other pixels

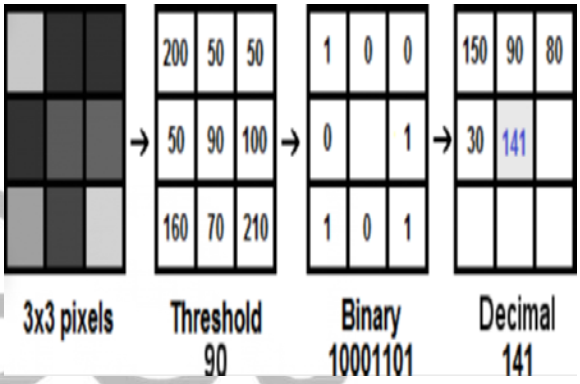

Fig (3)- Depicts the working of LBPH

4. If found greater, assigns value 1 to neighbor otherwise 0
5. Binary value is given starting left to right in row-wise fashion
6. Binary value is derived using Threshold
7. Gives value of each pixel for Histogram
8. Face Recognition is done by finding difference between the histograms

For comparing or finding the difference between the Histograms, the preferred method which is used is Euclidean Distance:

$$D = \sqrt{\sum_{i=1}^{n} (hist1_i - hist2_i)^2}$$

4 RESULT ANALYSIS

The result achieved from the rigorous process of experimentation/implementation for Live Video Face Recognition was above 95%. Not only we were able to recognize a human face but further on we went ahead & recognized the face of a animal in this case that is a cat. The whole process was quite simple as well as easy. The technique used was input a video and then extracting frames from it at a specified rate then the face image is extracted from the video. Further the face image is converted into grayscale image then the Recognition of the Face is done using the different features like nose, ears, eyes & etc. We achieved our goal with minimum effort and a lot of hardwork, further our intent is to continue the work in this field with exciting ideas and finding new ways to increase the efficiency, capability of the system. As such no major errors were detected in the system apart from a little bit lag due to usage of online Colab service by google.

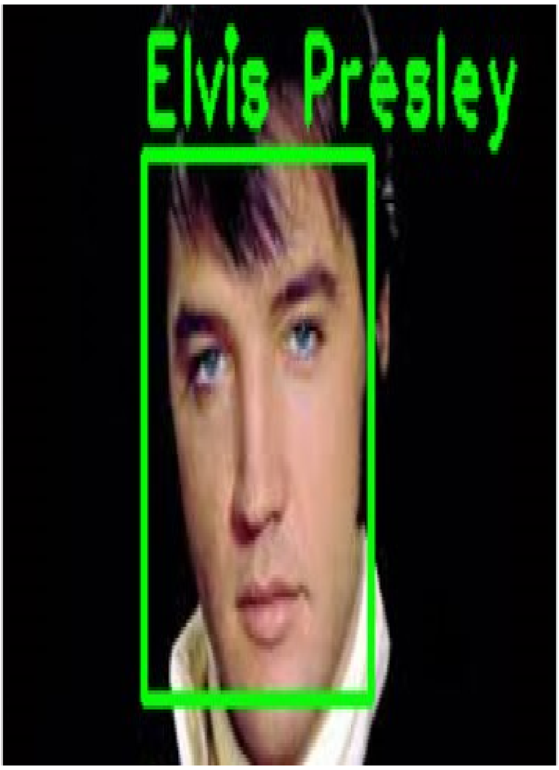

Fig (4)- Image depicts the Face Recognition of a famous singer Elvis Presley

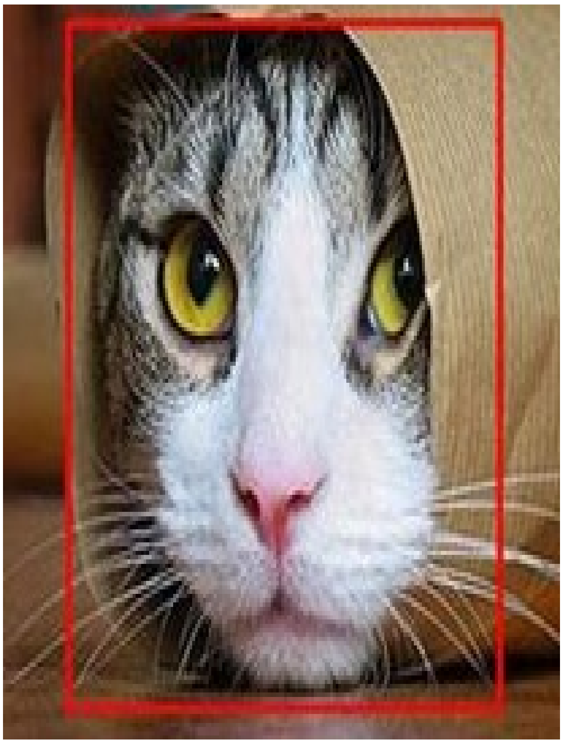

Fig (5)- Image depicts the Face Recognition of a cat

5 CONCLUSION

So far, we have findings that in general Face Recognition is very easy to say but actually is very hard to implement & moreover implementing it on a Live Video is a tough job to handle. Because there are many faces and the detection become a difficult part and if detection is done then the recognition has challenges like complete face is sometimes not available, video is a bit blur, the face is just for a quick second or so in the video, etc. We were able to successfully achieve the Face Recognition in a Live Video by extracting it frame by frame. The Video can be taken as an input in any of the two ways, by uploading a video in the system or by capturing the live video by attaching a camera to the system. We chose to use the second way that was using a Live Video. We were able to use different types of cascades in order to detect various parts of a face such as front profile, side profiles, ears etc. All these things help in training the computer so that it should be able to Recognize a face in a video. The more we train the computer with better cascades the more effectively the computer will be able to Recognize the faces in a video. But at last, we were able to achieve Face Recognition in a Live Video.

The probable application is its use at Industrial as well as Theoretical level, due to its robust design, capability to provide secure place to work and it can come handy as a Live Attendance evaluating tool. We can also make different cascades in order to detect different types of objects such as watch, phones etc.

REFERENCES

[1] Suneetha, J. "A survey on video-based face recognition approaches." International Journal of Application or Innovation in Engineering And Management (IJAIEM) 3.2 (2014).

[2] Patil, S., and D. Deore. "Video-based face recognition: a survey." World Journal of Science and Technology 2.4 (2012): 136-139.

[3] Dinalankara, Lahiru. (2017). Face Detection & Face Recognition Using Open Computer Vision Classifies.

[4] Kanade, Takeo. Computer recognition of human faces. Vol. 47. Basel: Birkhäuser, 1977.

[5] Chun, W. (2001). Core python programming (Vol. 1). Prentice Hall Professional.

[6] Bradski, G., & Kaehler, A. (2000). OpenCV Dr. Dobb's journal of software tools, 3.

[7] Turk, M. A., & Pentland, A. P. (1991, June). Face recognition using eigenfaces. In proceedings 1991 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (pp. 586-591). IEEE.

[8] Kshirsagar, V. P., Baviskar, M. R., & Gaikwad, M. E. (2011, March). Face recognition using Eigenfaces. In 2011 3rd International Conference on Computer Research and Development (Vol. 2, pp. 302-306). IEEE.

[9] Viola, Paul, and Michael Jones. "Rapid object detection using a boosted cascade of simple features." CVPR (1) 1 (2001): 511-518.

[10] Gunturk, B. K., Batur, A. U., Altunbasak, Y., Hayes, M. H., and Mersereau, R. M. (2003). Eigenface-domain super-resolution for face recognition. IEEE transactions on image processing, 12(5), 597-606.

[11] Kelvin Salton do Prado. https://towardsdatascience.com/face-recognition-how-lbph-works/90ec258c3d6b

[12] Rosebrock, A. (2016). Local Binary Patterns with Python & OpenCV-PyImageSearch.