SURVEY ON FACE DETECTION AND FACE RECOGNITION USING OPENCV

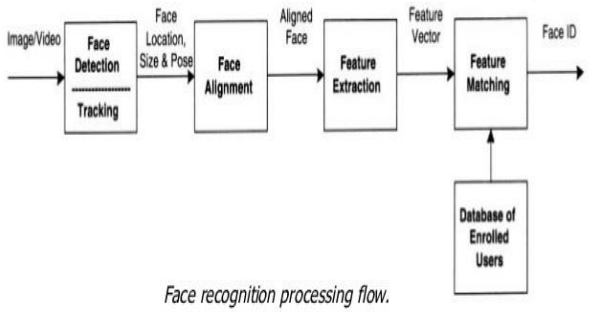
[1]Shashiraj Walsetwar, [2]Nikhil Takawale, [3] Sana Pabani, [4]Siddhesh Otari
[1] Student, [2] Student, [3] Student, [4] Student
[1]Information Technology
[1]PES Modern College of Engineering, Pune, India

Abstract : Face Recognition is the process of detecting and identifying a person's face using the facial characteristics. The face of human is a multidimensional and has 68 facial features which are used by the facial recognition system to recognize a person's face. The Face Recognition system is used by Governmental Organizations and Private Organizations like Educational Institutes, Social Media companies, Mobile Phone makers, Airlines, etc. There are many algorithms designed by the OpenCV scientists from all over the world. In this paper, we have used the sample faces for explaining the complete procedure of face detection and recognition. We have also described OpenCV libraries present and used for Face Recognition and its future scope.

***IndexTerms* – OpenCV, Face Detection, Face Recognition**

I. INTRODUCTION

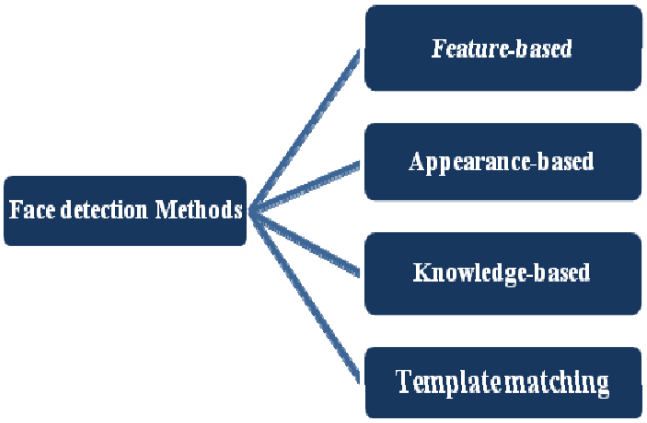
The face recognition is the way of recognizing a particular human by comparing his/her face with the faces already present in the database. It compares the target photo all the images present in the database to get a match. This helps to recognize the person and verify its identity.
The Face recognition system requires single or multiple pictures of a person for recognition and it depends upon the OpenCV library. The face recognition of a person depends upon the several factors which determine the accuracy of the results.
The Face Recognition system using OpenCV works as follows-



Face recognition processing flow.

1) Face Detection-

There are four methods of Face Detection as Follows-



a) Feature-based:
This is the method where the features of the face are extracted from the image for further processes. In this method, the function is first trained as a classifier so as to differentiate between facial and non-facial regions. This method has the success rate of 94%.

b) Appearance-based:

The method works and depends on the set of the face images to find the face models. The performance of Appearance-based method is superior to all the other methods as it is faster and more efficient.

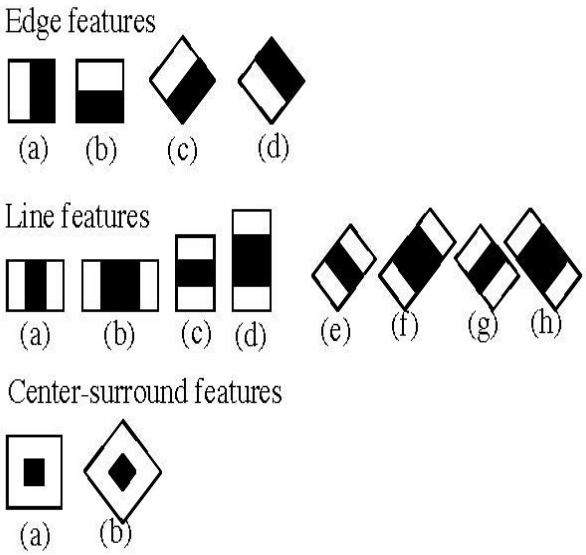
c) Knowledge-based:
This method has set of rules and it is based on the human k knowledge and logic for recognizing faces. For Example, the position of eyes are at top while the nose and lips are at lower positions accordingly. The main problem with this method is the difficulty and complexity in setting the rules. There is possibility of failure of system if the rules are too general or too detailed or defined.

d) Template-based:
The Template-based method uses the pre-defined and pre-processed image with constant parameters to locate and detect the faces by comparing the input image with the template. This method works in the general cases but is inadequate for face detection.

How Face Detection Works:
There are numerous techniques by using which we can detect and identify the face with higher accuracy. Almost all the techniques used for face detection uses the same process. These techniques are OpenCV, Neural Networks, Matlab, Tensorflow, etc.
Here we use OpenCV for face detection. The face detection operates in the following steps:

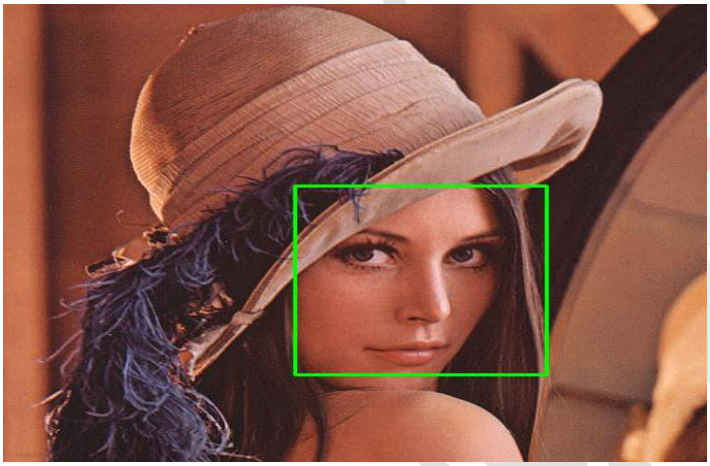
Step 1: The image is imported or directed to the source file. Then the image is converted into Gray scale as it is easy for processing the image in gray scale.


Step 2: In this step, we use the Haar-like features algorithm which is used to detect and locate the human faces in the image or a photo. This algorithm works on the basics of universal human facial properties like the nose region is brighter than the upper lip region, the upper region of eyes is brighter than the lower region of eyes, etc.



With the help of Haar-like algorithm, the features of the faces can be extracted by using line-detection, edge-detection, centre detection for detecting nose, mouth, ears, eyes, etc.

Step 3: Now the face has been detected, by passing the coordinated to the function we can draw the rectangular box on the image where it detects the face.

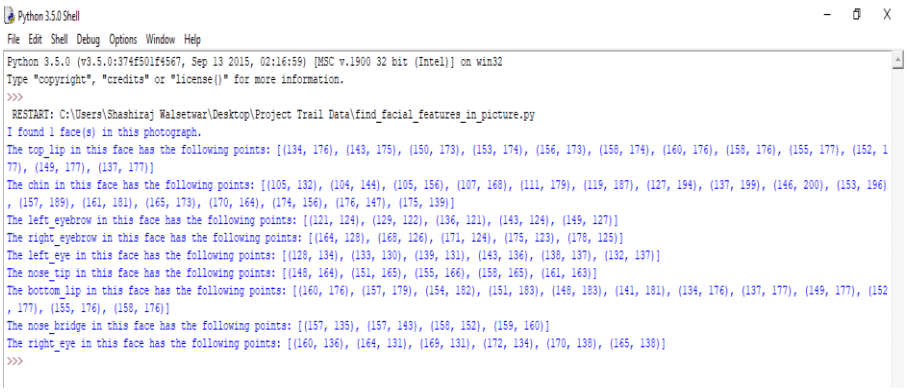


Now the Face has been detected, face recognition is the next step.

The face recognition works as follows-

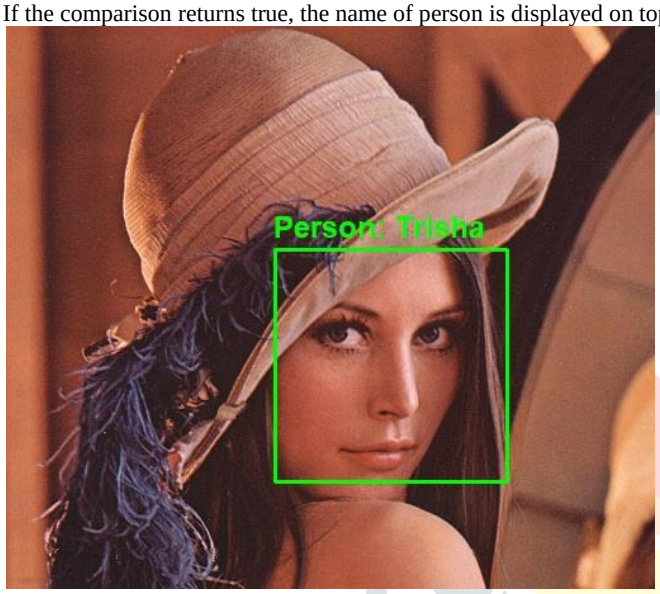
Step 1: We have detected the face, so now we have to map the facial features and record them so as to compare those with the images stored in the database.

The OpenCV found 67 feature coordinates which can be compared with the database images. The coordinates are of the Top lip, bottom lip, chin, left eyebrow, right eyebrow, left eye, right eye and, nose bridge.

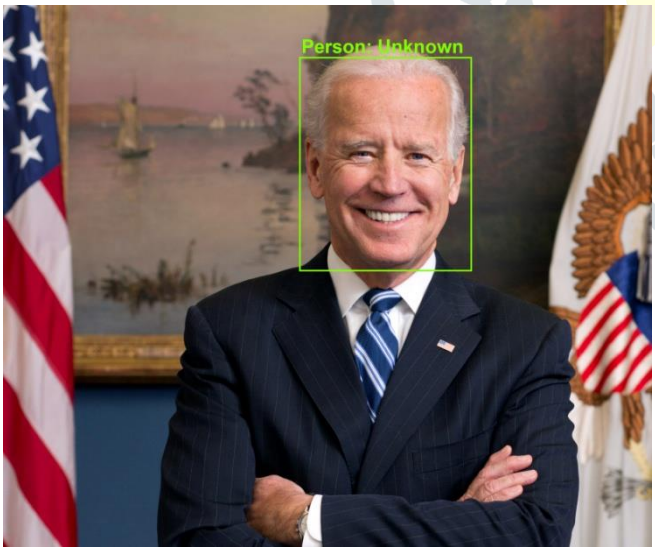


Now the final result, the recognition after comparing with the database images.

If the comparison returns true, the name of person is displayed on top of the rectangle.



If the person is not recognized, the unknown tag will be displayed at top of the rectangle.



OpenCV libraries for Face Detection and Recognition-

1) Dlib-

Dlib is a software library witten in C++ language for cross-platform. Dlib contains the Machine learning algorithms and tools for creating complex C++ software for solving real world problems. The Dlib library used in domains like mobile phones, embedded devices, robotics, and high end computer performances.

2) face_recognition-
This library is used to recognize and manipulate the faces using Python programming language or directly through command line. Face_recognition is build using Dlib's state-of-the-art face recognition. This model has accuracy of 99 .38% in best cases.

II. LITERATURE SURVEY

The three major problems with the OpenCV face recognition are the slow processing, IR distance of the camera and face angle for the face recognition. The first one is fairly obvious and can be optimized according to the application as well as purpose.

The second one is the IR distance or the distance at which the face is recognized with higher efficiency and correctness. To solve this problem, we can opt for the higher resolution camera which will provide the higher resolution images but that will create the problem of slow processing. So the balance of fast processing and higher resolution image should be maintained.

The third and the last issue is the face angle. The angle at which the camera captures the face of the person and still recognize the correct person determines the accuracy of the system. The person wearing goggle, scarf, helmet are not recognized in some cases as the part of their face is hidden hence the false alarm may trigger even for known person.

III. CONCLUSION AND FUTURE WORK

As we have studied the Face detection and Face recognition using OpenCV, there are many advantages and disadvantage. The advantages like faster performances, high reliability, free of cost, open source libraries, cross-platform support.

The Future Scope of Face Recognition using OpenCV as follows-

1) The processing speed of the system must be higher with high optimization for the high resolution images
2) The IR distance of the camera should be able to adjust via programming and should have a independent library for its settings.

3) The angle independence and partial faces should also be recognized by predictive face mapping.

4. REFERENCES

[1] Paper – Real-Time Implementation of Face Recognition System by Neel Ramakant Borkar, Sunia Kuwelkar Department Of Electronics and Telecommunication
Goa College Of Engineering
Ponda, India

[2] **Implementation of Advanced Authentication System using OpenCv by Capturing Motion Images** by Akanksha Sharma, Deepak Dembla, Shekhar
Department of MCA & IT, JECRC University,
Jaipur, India

[3] **Face Detection and Tracking** by Kruti Goyal, Kartikey Agarwal, Rishi Kumar
ASET, CSE, Amity, University Noida, India

[4] **Research on lip detection based on OpenCV by** Yang Pingxian, Guo Rong, Guo Peng and Fang Zhaoju