Face Recognition System

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Abstract

The face recognition system is one of the biometric data forms, its appropriateness is simpler and the working extent is bigger than others, i.e.; unique finger impression, iris filtering, signature, and so forth. The framework utilizes a mix of strategies in two themes; face discovery and acknowledgment. The face identification is performed on live procured pictures with no application field as the main priority. Procedures used in the framework are white equalization amendment, skin like district division, Facial component extraction and face picture extraction on a face applicant. At that point a face characterization technique that utilizations FeedForward Neural Network is coordinated into the framework. The framework is tried with a database of 50 individuals. The tried framework has a worthy execution to perceive faces inside proposed limits. The framework is additionally equipped for distinguishing and perceiving various faces in live gained pictures.

1. INTRODUCTION

The system identifies 80 nodal points on a human face. In this context, nodal points are endpoints used to measure variables of a person's face, such as the length or width of the nose, the depth of the eye sockets and the shape of the cheekbones. The system works by capturing data for nodal points on a digital image of an individual's face and storing the resulting data as a faceprint. The faceprint is then used as a basis for comparison with data captured from faces in an image or video. A facial recognition system is a technology capable of identifying or verifying a person from a digital image or a video frame from a video source. There are multiple methods in which facial recognition systems work, but this system work by comparing selected facial features from the given image with faces within a database. It is also described as a Biometric Artificial Intelligence based application that can uniquely identify a person by analyzing patterns based on the person's facial textures and shape. The steps used in this face recognition system are shown below.

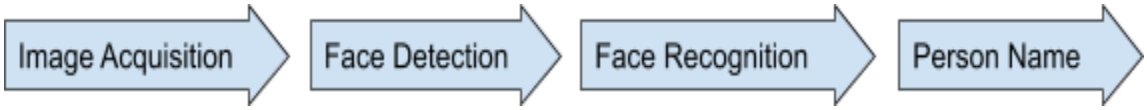


Fig 1. Steps of face recognition

After faces are detected, the faces should be recognized to identify the persons in the face images. Methods for face detection and recognition systems can be affected by pose, presence or absence of structural components, facial expression, occlusion, image orientation, imaging conditions, and time delay (for recognition). Available applications developed by researchers can usually handle one or two effects only, therefore they have limited capabilities with a focus on some well-structured application.

A robust face recognition system is difficult to develop which works under all conditions with a wide scope of effect.

2. Face Recognition System Design

2.1 Input:

The input part is a prerequisite for the face recognition system. Image selected converted into a bitmap of that image and Image acquisition operation is performed in this part. Live captured images are converted to digital data for performing image-processing computations. These bitmaps are sent to the face detection algorithm.

2.2 Face Detection

The image is converted to grayscale from RGB because it is easy to detect a face in grayscale. For face detection, we are using face landmarks i.e. the width of the nose, the distance between eyebrows, eyebrow lengths, etc(Shown in Fig 2). These landmarks are extracted from the image by converting it into a bitmap and using pixels.

After that, the image manipulation used, in which the resizing, cropping, blurring and sharpening of the images done if needed. The next step is image segmentation, which is used for contour detection or segments the multiple objects in a single image so that the classifier can quickly detect the objects and faces in the picture. The next step is to use the Haar-Like features algorithm, which is proposed by Viola and Jones for face detection. This algorithm used for finding the location of the human faces in a frame or image. All human faces shares some universal properties of the human face like the eyes region is darker than its neighbor pixels and nose region is brighter than the eye region.

The haar-like algorithm is also used for feature selection or feature extraction for an object in an image, with the help of edge detection, line detection, center detection for detecting eyes, nose, mouth, etc. in the picture. It is used to select the essential features in an image and extract these features for face detection.

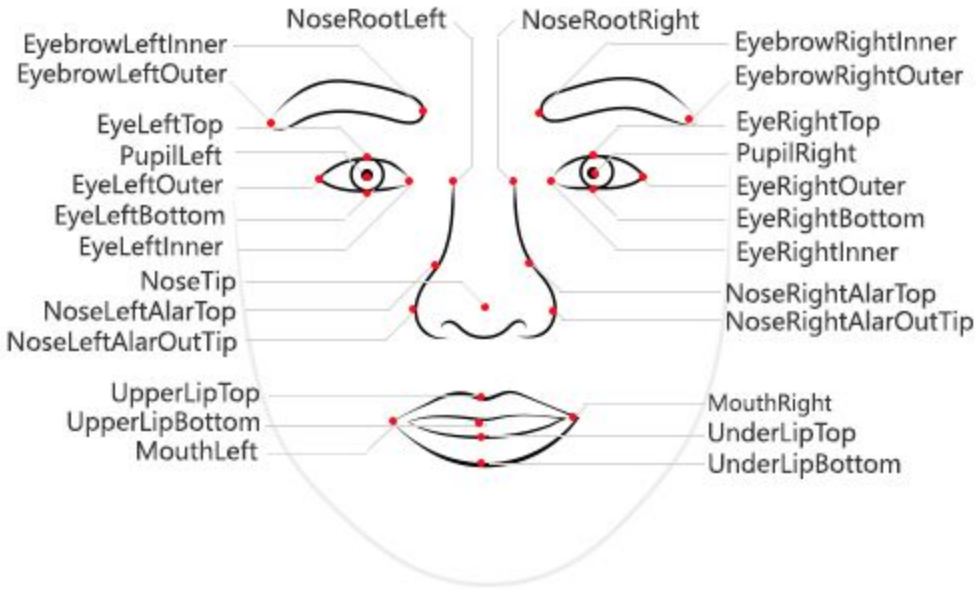


Fig 2. Face landmarks used in face detection

The next step is to give the coordinates of x, y, w, h which makes a rectangle box in the picture to show the location of the face or we can say that to show the region of interest in the image. After this, it can make a rectangle box in the area of interest where it detects the face. There are also many other detection techniques that are used together for detection such as smile detection, eye detection, blink detection, etc.

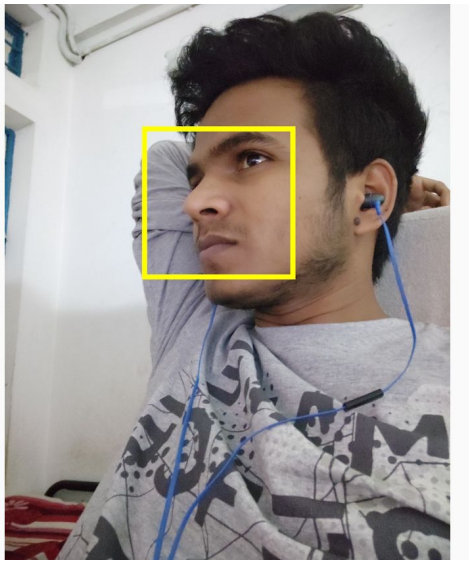


Fig 3.Face detection result

2.2 Face Recognition

Set of detected faces in sent to the face recognition algorithm. Changed face picture which is gotten in the Face acknowledgment framework, ought to be characterized to recognize the individual in the database. The face acknowledgment part is made out of preprocessing face picture, vectorizing picture grid, database age, and afterward arrangement. The arrangement is accomplished by utilizing the FeedForward Neural Network. In classifier, FeedForward Neural Network (FFNN) is utilized.FFNN is the most straightforward structure in the neural system. This sort of system structure is commonly utilized for design acknowledgment applications. The framework organizes properties are: the input layer has 900 information sources, the concealed layer has 41 neurons and the yield layer has 26 neurons. The yield layer has 26 neurons since the number of individuals in the database is 26. After the structure is produced, at that point the system ought to be prepared to group the given pictures as for the face database. In this way, the face database is made before any tests.

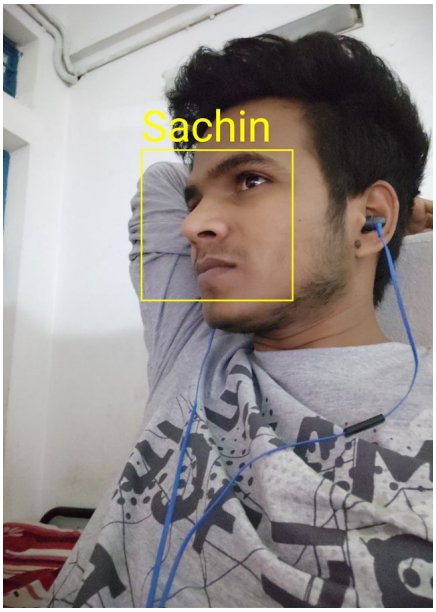


Fig 4.Face recognition result

A database is made for 26 individuals with 4 examples for every individual. This outcomes 104 preparing tests. Because of that, a 900-by-104 size grid will prepare the network. Preparing the network vector component is masterminded with four gatherings because of the number of tests for every individual. However, the initial 26 vector component has a place with the first examples of 26 individuals, and it proceeds. Preparing network's segments are produced using preprocessing picture and afterward vectorizing to face picture which creates a database. In the wake of preparing a grid and target lattice is made, at that point preparing of NN can be performed. Back engendering is utilized to prepare the system. Preparing execution and objective mistakes are set to 1e-17 to characterize a given picture accurately.

3. Conclusion

This application can be used to identify people to whom you are meeting after a long time you don't remember the name. The application helps people to remember people's names and also identify people in group photos.

4. Results

3.1 Hardware

The face recognition system developed on android studio 3.5 and using java. For the usage of this system, an android mobile phone with a camera is required. For the detailed usage see appendix.

3.2 Face detection

Detected faces are marked with yellow rectangles in Fig 5.

Face Detection First usage of framework is performed on the identification of countenances in the procured pictures. Hence, face recognition has begun with skin like district division. Other than RGB gives the best result, shades of divider inside the lab can be skin like shading because of white parity estimation of camera. Undesirable skin like shading districts can influence recognition and twist face shape. This shading issue can be wiped out by white parity rectification of the obtained picture.

Fig 5. Face detection result in a group photo

3.3 Face recognition

Fig 6. face recognition system results

References

- Azure face API https://docs.microsoft.com/en-us/azure/cognitive-services/face/
- Design of face recognition system by Cahit Gürel, Atilim University, and Abdulkadir Erden, Beytepe Engineering Academy.
- JavaServer Faces https://en.wikipedia.org/wiki/JavaServer_Faces
- Android studio by Intellij https://www.jetbrains.com/idea/download/#section=linux

APPENDIX

- Application usages

1. Select image

Press the browse button to select an image. It will show you the option to grab a pic from the gallery or use a camera.

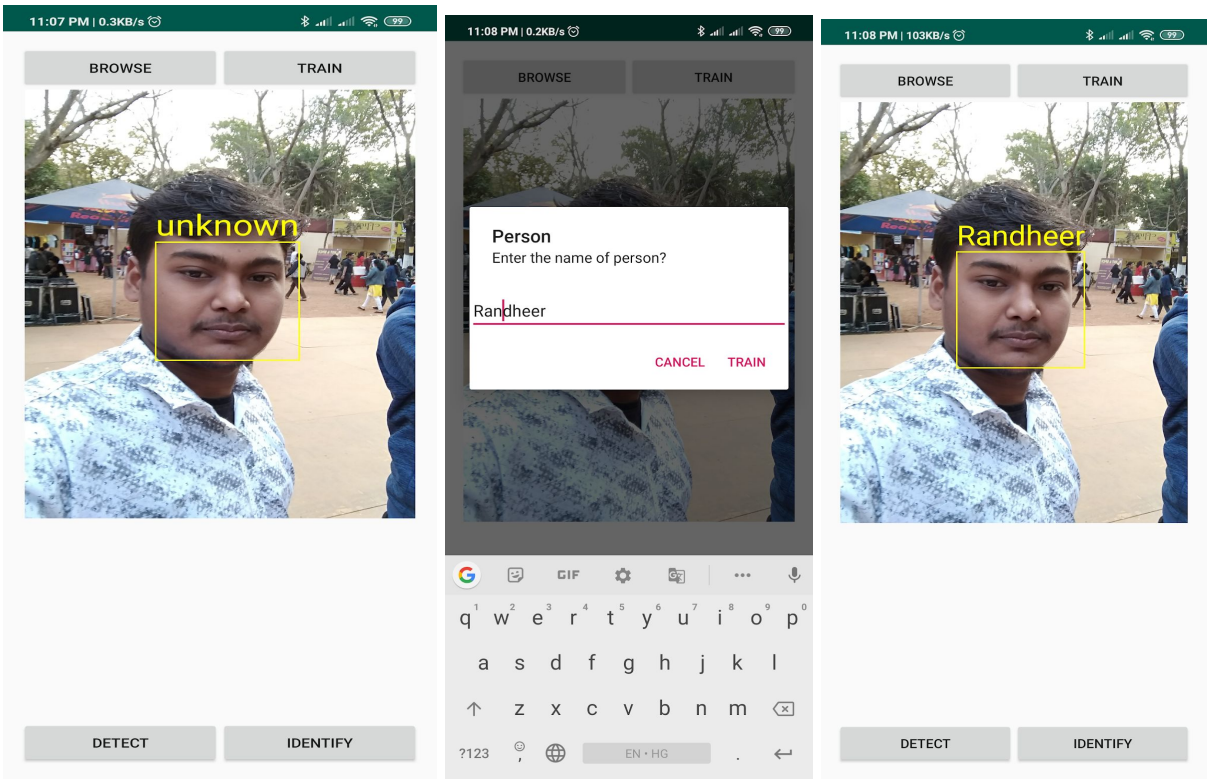
2. Face detection

Press the detect button to detect faces.

3. Recognize person

Press the identity button to show names over faces.

4. Training for an image if it does not exist in trained model.



If there is unknown shown over the face you can press the Train button. It will show you the field for the name of the person to train the model.