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Face detection and Recognition: A review

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Abstract

Face Detection is one of the type of biometric technique which refers to the detection of face automatically by computerized systems by taking a look at face. It is a popular feature used in biometrics, digital cameras and social tagging. Face detection and recognition has gained more research attentions in last few years. In this paper we studied different approach of face detection and implement it on the MATLAB software.

Keywords: Face Detection, Face Recognition, Biometrics, Face Identification.

Introduction

Face detection and recognition becomes the most biometrics authentication techniques from the past few years. Face recognition is the process of using the face properties in the biometric systems. Face recognition system has two main tasks: verification and identification. Face identification means a 1:N problem that compares a query face image against all image templates in a face database. We perform face recognition, an extremely complex visual task, almost instantaneously and our own recognition ability is far more robust than any computer's can hope to be. We can recognize a familiar individual under very adverse lighting conditions, from varying angles or view points. Scaling differences (a face being near or far away), different backgrounds do not affect our ability to

recognize faces and we can even recognize individuals with just a fraction of their face visible or even after several years have past. Furthermore, we are able to recognize the

faces of several thousand individuals whom we have met during our lifetime. In the Face recognition process the input image is compared with the database. Theinput image is also called as probe and the database is called as gallery. Then it gives a match report and then the classification is done to identify the sub-population to which new observations belong.

There are basically three approaches for face recognition :

- **Feature base approach:** In feature based approach the local features like nose, eyes are segmented and it can be used as input data in face detection to easier the task of face recognition.
- **Holistic approach:** In holistic approach the whole face taken as the input in the face detection system to perform face recognition.
- **Hybrid approach** : Hybrid approach is combination of feature based and holistic approach. In this approach both local and whole face is used as the input to face detection system.

In this paper, implementation of the face recognition algorithm to detect and recognize faces accurately is on the MATLAB.

Face detection

The problem of face recognition is all about face detection. Face detection is further classified as face detection in images and real-time face detection. In this project we will attempt to detect faces in still images by using image invariants. To do this it would be useful to study the grey-scale intensity distribution of an average human face. The following 'average human face was constructed from a sample of human faces. A suitably scaled color map has been used to highlight grayscale intensity differences.

The grey-scale differences, which are invariant across all the sample faces are strikingly apparent. The eye-eyebrow area seem to always contain dark intensity (low) gray-levels while nose forehead and cheeks contain bright intensity (high) grey levels. After a great deal of experimentation, the researcher found that the following areas of the human face were suitable for a face detection system based on image invariants and a deformable template.

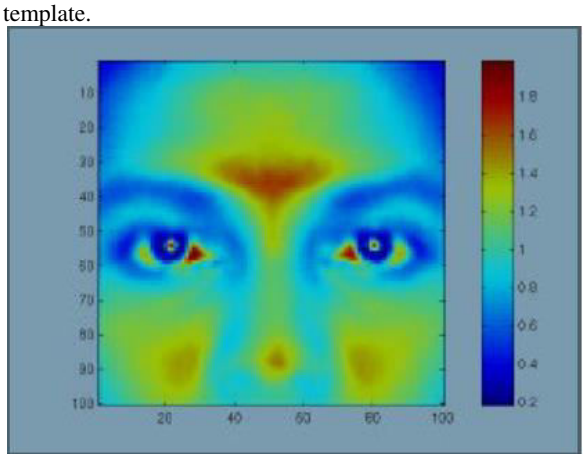


Figure 1: Scaler Colourmap

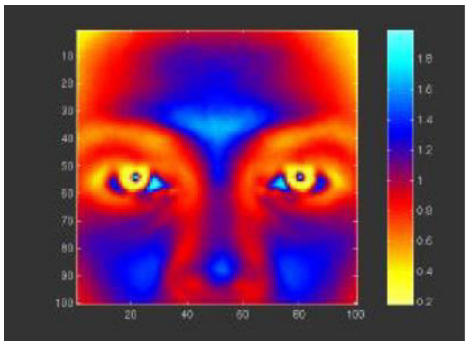


Figure 2: Scaled colourmap (negative)

The above facial area performs well as a basis for a face template, probably because of the clear divisions of the bright intensity invariant area by the dark intensity invariant regions. Once this pixel area is located by the face detection system, any particular area required can be segmented based on the proportions of the average human face.

Face recognition

Human face recognition can be divided into two strategies: geometrical features and template matching.

a) Face recognition using geometrical features

It involves computation of a set of geometrical features such as nose width and length, mouth position and chin shape, etc. from the picture of the face we want to recognize. This set of features is then matched with the features of known individuals. A suitable metric such as Euclidean distance (finding the closest vector) can be used to find the closest match.

The advantage of using geometrical features as a basis for face recognition is that recognition is possible even at very low resolutions and with noisy images (images with many disorderly pixel intensities). Although the face cannot be viewed in detail

its overall geometrical configuration can be extracted for face recognition. The technique's main disadvantage is that automated extraction of the facial geometrical features is very hard.

Figure 3: Geometrical features (white) which could be used for face recognition

b) **Face recognition using template matching**

This is similar the template matching technique used in face detection, except here we are not trying to classify an image as a 'face' or 'non-face' but are trying to recognize a face. The basis of the template matching strategy is to extract whole facial regions (matrix of pixels) and compare these with the stored images of known individuals. Once again Euclidean distance can be used to find the closest match.

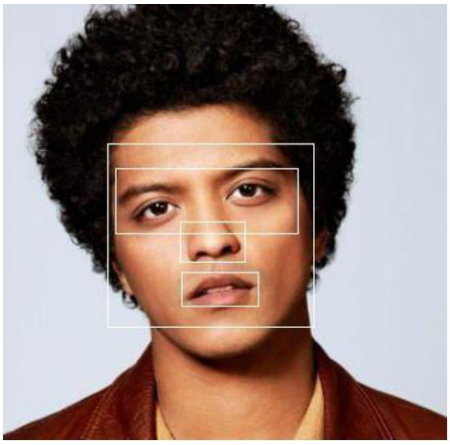


Figure 4: Whole face, eyes, nose and mouth regions which could be used in a template matching strategy.

Algorithm for face Recognition

Adding the image to the database

1. Get the image.
2. Get the FaceDetector object.
3. Apply the FaceDetector object to the image to extract the features of detectedface.
4. Add the image to the database.

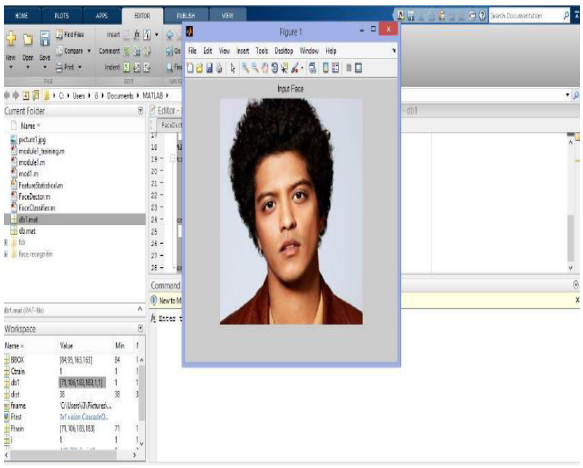
Comparing the input image with the database of images

1. Get the image.
2. Get the FaceDetector object.
3. Apply the FaceDetector object to image and extract the features.
4. Compare the image with the database.

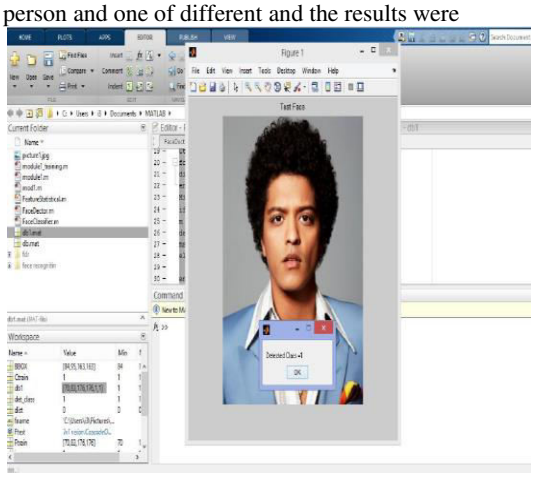
RESULTS

Two images are used for testing and the results are as follows.

1. Firstly we added the image to the database.

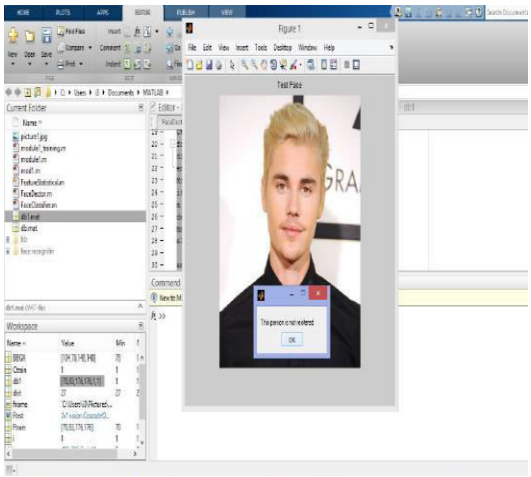


2. Then we tested for two images, one of same person and one of different and the results were



The image of same person is recognized correctly and class is detected.

3. For second test face, the results are



For this image, it shows that the person is not registered in the database.

Conclusion

The facial expression recognition system contributes a resilient face recognition model based on the mapping of behavioral characteristics with the physiological biometric characteristics. The physiological characteristics of the human face with relevance to various expressions such as happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system. Experimental analysis and study show that the hierarchical security structures are effective in geometric shape identification for physiological traits.

References

1. Digital Image Processing using MATLAB - by Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins Pearson Education Society.
2. **2.** Digital Image Processing - by Keenneth R. Castleman, Pearson Education Society.
3. **3.** Riddhi Patel, Shruti B. Yagnik (Nov 2013) : A Literature Survey on Face Recognition Techniques (IJCTT) – volume 5 number 4.
4. Raunil Singh Kiran Gupta (april 2015) : Face Detection and Recognition – A Review, SSRG-IJCSE.
5. Vision.CascadeObjectDetector system https://in.mathworks.com/help/vision/ref/vision.cascadeobjectdetector systemobject.html
6. Viola – Jones object detection framework. https://en.wikipedia.org/wiki/Viola–Jones_object_detection_framework.
7. Beymer, D. and Poggio, T. (1995) Face Recognition From One Example View, A.I. Memo No. 1536, C.B.C.L. Paper No. 121. MIT.
8. Brunelli, R. and Poggio, T. (1993), Face Recognition: Features versus Templates. IEEE Transactions on Pattern Analysis and Machine Intelligence, 15(10):1042-1052
9. https://in.mathworks.com
10. Saber, E. and Tekalp, A., (1996). Face Detection and Facial Feature Extraction Using Color, Shape and Symmetry Based Cost Functions, International Conference on Pattern Recognition.