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A proposed method for separation of facial parts of human

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Abstract
Presently detection of facial feature is becoming very effective in the process of face recognition system, behavioral classification system. There are several numbers of techniques like skin color - based segmentation, principal component analysis, template matching based which are used to detect various facial features. In this paper a method is presented for detection various features of human face.

Keywords: Face detection, facial features detection and template matching

Introduction
The work on Face detection has done over the past three decades. It is now possible to detect facial features in real time also. Still it is required to provide an accurate measurement of important feature parts. This paper presents an approach to achieve this goal. In this approach, the proposed method along with program is given to demonstrate how distinctly facial features are identified. The key idea used to achieve accurate detections is learn the textural information of the facial feature to be detected.

Many researchers are doing work for detection of facial features due to it has a wide area of applications. Given an image, the detection of face involves separation of all the facial features in this image. It solves problems such as: face recognition, face tracking, and facial expression recognition [1]. In the recent decade, the security systems based on the information about a user's identity, like fingerprint and sound print, but now it depends on facial features. Face detection systems have been introduced by many researchers in [2-6]. Detection rate is defined as the ratio between the number of faces correctly detected by the system and the actual number of faces in the image. There are many existing techniques to detect faces, some for single image and others for images sequence (multiple images) [7-9]. Let us give a practical example to highlight the necessity of the detection of facial features.

Human face and its various facial features have been considered as a very useful tool in the process of identification, behavioral classification, expression detection etc. Furthermore, facial feature characteristics are very much effective in both biometric and forensic identification. Another most interesting thing is that among all the facial features, eye feature has more application domain. For example, in various driver alert system we specially capture the eye portion [10] of the driver's face image to determine the level of drowsiness and depending on the result we will generate an alarm signal to prevent the road accidents. Figure1a. shows the concept behind a driver's alert system. In the driver's alert system [11] we first capture the face image of the driver using a camera located inside the car. Next it is required to segment only the face region and excluded the background portion. We may use a very simple approach like skin color based model to localize a face region. After the localization of the face we need to extract the eye region [12]. For eye region the decision parameter is to find out the drowsiness of a person by looking at the pupil boundary of the eye. If the pupil is fully visible, that means the eye is open, but in case of a closed eye or partly closed eye the pupil will be invisible or partially visible. Hence after locating the eye region, we should locate the pupil to determine the drowsiness status. On the other hand, in biometric identification like person identification where we use the concept of template matching for all the individual features and when all the matching results give us a positive response, then only the person will be identified properly.

Literature Review

The research on facial parts detection of human is an active research area until recently. Face identification system, face tracking, video surveillance and security control system, and human computer interface are such applications. The separation of facial parts depends on many factors. It includes complex colour background, condition of illumination, change of position and expression, rotation of head, and distance between camera and subject. Researchers [1-5] have shown that colour is a powerful descriptor that has practical use in the extraction of the facial components.

Researchers used hardware orientated model for separation of facial features [13]. Many research studies [6- 8] use skin-tone colour since it is independent of the luminance component. Normally skin colours of different people appear to vary over a wide range. It differs less in chrominance than brightness, specially the skin colours from a compact area in the YCbCr plane [9-10]. In a method author proposed collecting facial profiles as curves, finding their norm, and then classifying other profiles by their deviations from the norm [1]. This classification is multi-modal, i.e. resulting in a vector of independent measures that could be compared with other vectors in a database [2]. Face recognition starts using appropriate classification algorithms, and post processes the results using model-based schemes and logistic feedback [3].

Proposed Method

Nowadays, “Face Recognization” and “Face Separation” are very popular topics. In a picture of group of people, or a picture of one (or some) person with a background image, sometimes we have to detect the faces from the pictures. Face Separation is an extension of Face Recognization. In Face Recognization, we detects and marks (labelling) the face and other facial parts (like eyes, nose, mouth etc.). In the Face Separation, we crop the marked portion from the picture and paste those cropped portion to another file. The proposed algorithm as well as program for separation of facials is described below:

Algorithm

1. Start
2. Select an Image as an Input
3. Specify the region you want to recognize
4. Mark the portion (You may display this into another picture)
5. Crop the portion from the picture and display it on another picture file
6. End

Program

```
%Face, Nose, Eyes, Mouth Recognization and Separation
[filename, folder] = uigetfile ({'*.jpg';'*.bmp';'*.png'}, 'File Selector');
Full File Name = fullfile (folder, filename);
img = imread (full File Name);
Figure (1);
Imshow (img);

%Face Detection
Face Detect = vision. Cascade Object Detector;
Face Detect. Merge Threshold = 7;
BB = step (Face Detect, img);
Figure (2);
Imshow (img);

For i = 1: size (BB, 1)
Rectangle ('Position', BB (i, :), 'Line Width', 3, 'Line Style', '-', 'Edge Color', 'r');
end

For i = 1: size (BB, 1)
J = imcrop (img, BB (i, :));
Figure (3);
Subplot (1, 1, i);
Imshow (J);
End

%Mouth Separation
Mouth Detect = vision. Cascade Object Detector ('Mouth');
Mouth Detect. Merge Threshold = 100;
BB = step (Mouth Detect, img);
Figure (4);
Imshow (img);

For i = 1: size (BB, 1)
Rectangle ('Position', BB (i, :), 'Line Width', 3, 'Line Style', '-', 'Edge Color', 'r');
End

For i = 1: size (BB, 1)
J = imcrop (img, BB (i, :));
Figure (5);
Subplot (6, 6, i);
Imshow (J);
End

%Eye Separation
Eye Detect = vision. Cascade Object Detector ('Eye Pair Big');
Eye Detect. Merge Threshold = 10;
BB = step (Eye Detect, img);
Figure (6);
Imshow (img);

For i = 1: size (BB, 1)
Rectangle ('Position', BB (i, :), 'Line Width', 3, 'Line Style', '-', 'Edge Color', 'r');
End

For i = 1: size (BB, 1)
J = imcrop (img, BB (i, :));
Figure (7);
Subplot (1, 1, i);
Imshow (J);
End

%Nose Separation
Nose Detect = vision. Cascade Object Detector ('Nose');
Nose Detect. Merge Threshold = 20;
BB = step (Nose Detect, img);
Figure (8);
Imshow (img);

For i = 1: size (BB, 1)
Rectangle ('Position', BB (i, :), 'Line Width', 3, 'Line Style', '-', 'Edge Color', 'r');
End
```

```
For i = 1: size (BB, 1)
J = imcrop (img, BB (i, :));
Figure (9);
Subplot (5, 5, i);
Imshow (J);
End
```

Results

The proposed algorithm is run on various faces for detecting of facial parts. The results are shown in figure 1 to figure 9.

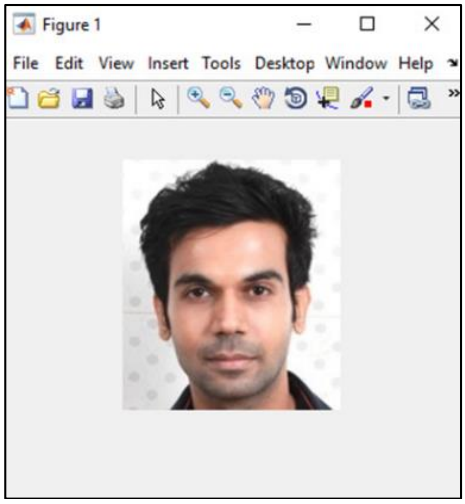

Fig 1: It is the original picture

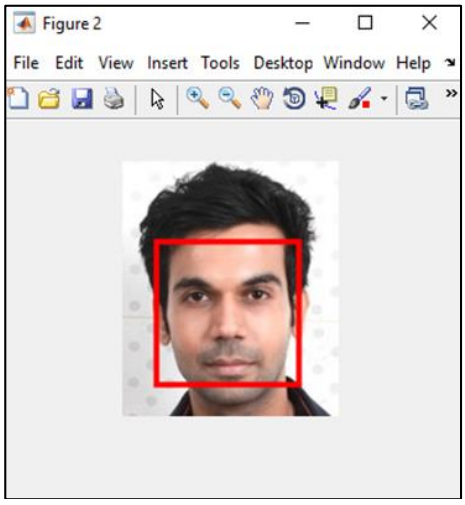

Fig 2: Face Recognized area

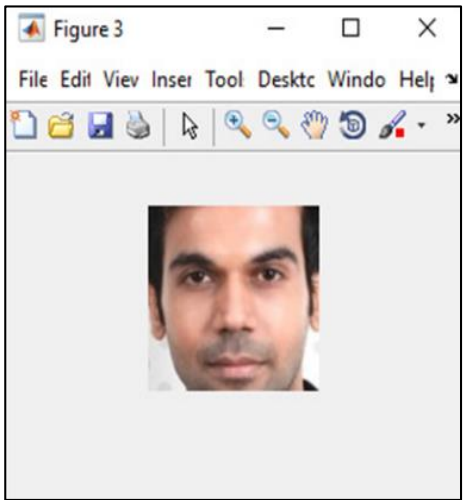

Fig 3: Separated face

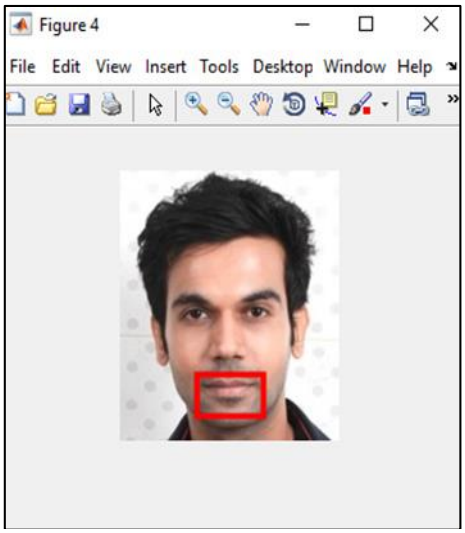

Fig 4: Mouth Recognized area

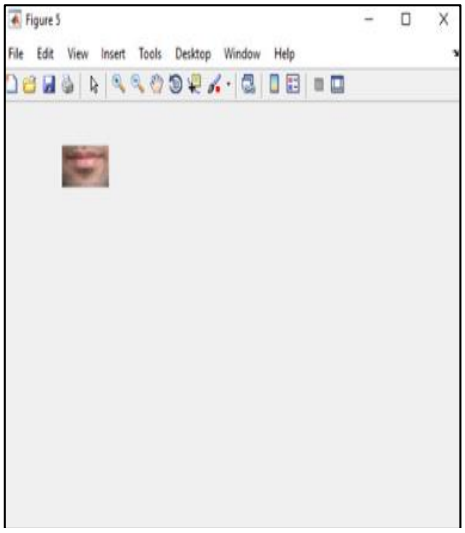

Fig 5: Separated mouth

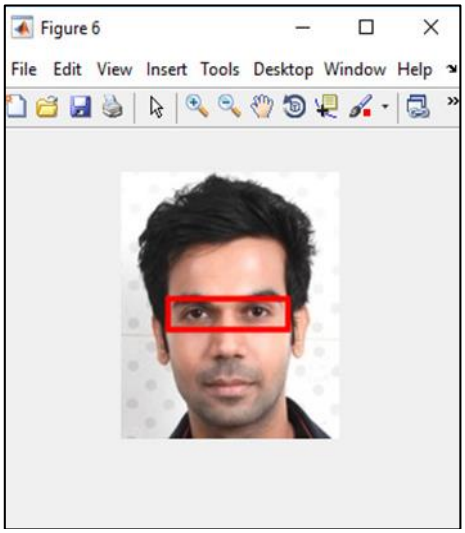

Fig 6: Eye Pair Recognized Area

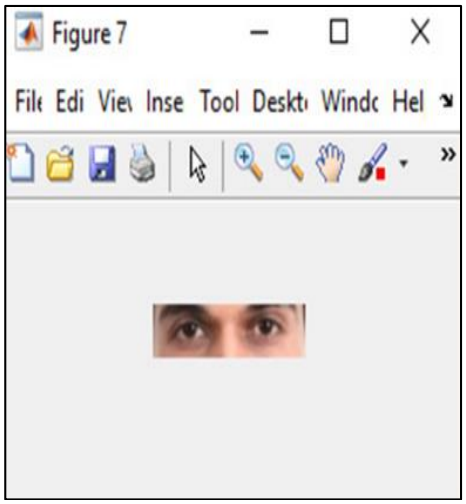

Fig 7: Separated eye pair

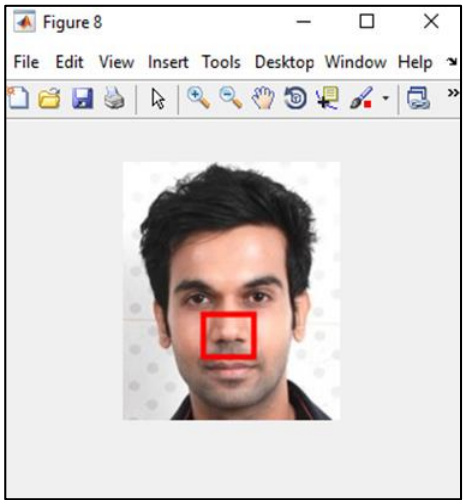

Fig 8: Nose Recognized area

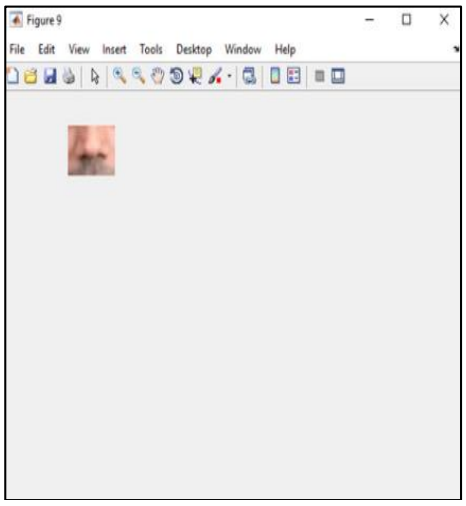

Fig 9: Separated nose

Conclusions

In this paper, facial parts are separated from human face. The results show that these features are correctly separated. In this paper algorithm as well as programs are given for understanding of the separation process.

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