

FACE DETECTION

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In recent years, face recognition has attracted much attention and its research has rapidly expanded by not only engineers but also neuroscientists, since it has many potential applications in computer vision communication and automatic access control system. Especially, face detection is an important part of face recognition as the first step of automatic face recognition. However, face detection is not straightforward because it has lots of variations of image appearance, such as pose variation (front, non-front), occlusion, image orientation, illuminating condition and facial expression.

Detection of skin color in color images is a very popular and useful technique for face detection. The RGB components were converted to the YCbCr components using the following formula:

$$Y = 0.299R + 0.587G + 0.114B$$

$$Cb = -0.169R - 0.332G + 0.500B$$

$$Cr = 0.500R - 0.419G - 0.081B$$

The next step is to separate the image blobs in the color filtered binary image into individual regions. The first step is to fill up black isolated holes and to remove white isolated regions which are smaller than the minimum face area in training images. The filtered image only leaves the white regions with reasonable areas. Secondly, to separate some integrated regions into individual faces, the Roberts Cross Edge detection algorithm is used. Finally, the previous images are integrated into one binary image and relatively small black and white areas are removed.

The test images received due to eigenimage generation and selected by an appropriate square window can be passed to the image matching algorithm.

With the normalized test image, the image matching can be simply accomplished by loading a correspondent file of eigenimage from the database, then performing correlation of the test image with respect to the loaded eigenimage.

In color segmentation, a rectangular window was used for the skin color detection while the actual distribution was a cone shape. As a result, some of actual skin color was excluded and conversely some of non-skin color was included. More precise skin color detection is expected if the window shape is closer to the actual distribution, such as triangle. Despite this imperfect windowing, the overall results of skin color detection were very encouraging.