FACE DETECTION THROUGH TEMPLATE MATCHING AND COLOR SEGMENTATION

By

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ABSTRACT

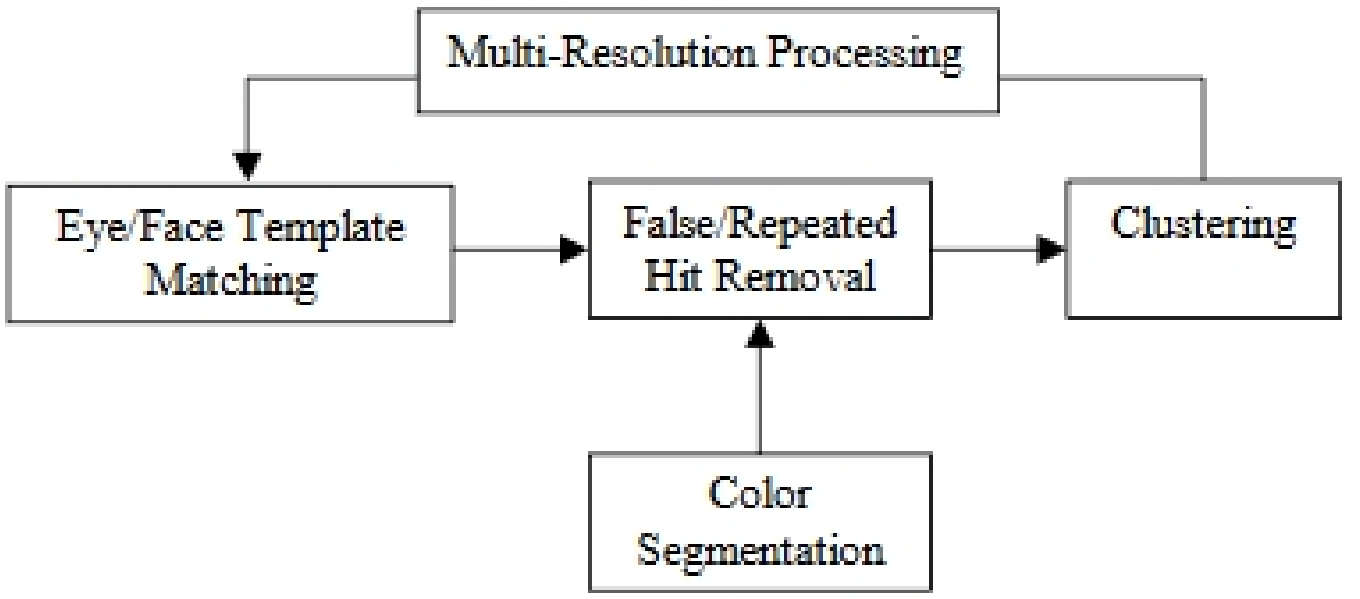
A process for face detection, which involves multi-resolution template matching, region clustering and color segmentation, works with high accuracy, and gives good statistical results with training images. Given the generality of the images and the templates used, the assumption would be that the implementation works well on other images, regardless of the scene lighting, size of faces or type of faces in the pictures.

INTRODUCTION

The increasing use of computer vision in security in place of humans led many to research the problem of face detection in images. The problem is not a trivial one as the classification of a human face proves to challenging. Despite the many variations of a human face, features can still be found, given a certain context, which will uniquely identify a face. In this project, we attempt to come up with a technique to give a high percentage of face detection based on correlation and post-processing. The first part of this paper will concentrate on the approach used in solving this problem, namely: correlation, false/repeated hits removal techniques, color segmentation and multi-resolution approach. The second section will go into the actual results of the implementation, where statistics taken after performing the algorithm on training images will be provided. A conclusion will then be given.

APPROACH

The algorithm used for face detection in this project is given below:



Template matching is performed first to find the regions of high correlation with the face and eyes templates. Subsequently, using a mask derived from color segmentation and cleaned by texture filtering and various binary operations, the false and repeated hits are removed from the template matching result. The output of this process is then passed to a clustering procedure, where points are within a certain euclidean distance from one another will be clustered into one point. The whole process will then be repeated at a different scale/resolution. The outputs from each resolution are then recombined into a single mask.

The individual processes will be explained in detail below.

COLOR SEGMENTATION

The aim of colorspace transformation is to increase the separability between skin and non-skin classes while decreasing the separability among skin tones. Hopefully it will bring robust performance under varying illumination conditions. However, there are many colorspaces to choose from and a large number of metrics to judge whether they are effective.

Some potential colorspaces that we were interested in :

- CIEXYZ
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- YCbCr
- YUV
- YIQ