SMAI PROJECT REPORT

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TITLE : FACE DETECTION

Introduction:

Face detection itself involves many complexities such as background, poses, illumination etc. There are many approaches for face detection such as, colour based, feature based (mouth, eyes, nose), neural network. The approach studied and applied in this thesis is the skin colour based approach. The algorithm is pretty robust as the faces of many people can be detected at once from an image consisting of a group of people. The model to detect skin colour used here is the YCbCr model. The different steps of this face detection algorithm can be explained as below.

YCbCr model:

YCbCr or Y'CbCr is a family of color space used generally in digital image processing. Y is the luminance, Y' is the luma component while Cb and Cr are the blue difference and red difference of the chroma component. YCbCr is not an actual colour space, it is just a way of encoding the RGB colour space. YCbCr values can only be obtained only if the original RGB information of the image are available.

Y = 0.299R + 0.587G + 0.114B
Cb = -0.169R - 0.332G + 0.500B
Cr = 0.500R - 0.419G - 0.081B

RGB components are subject to the lighting conditions thus the face detection may fail if the lighting condition changes. Human skin colour has a specific range of chrominance values while luminance is dependent on external variables.

IMAGE SEGMENTATION AND FILTERING:

Initially the background of the image is to be subtracted , so that it will be easy for the detection of faces. For this purpose we did background subtraction from the image using k means clustering and then converted the image to the above said YCBCR color space. Also we used sobel operator to remove noise in the images.

Now after this , the final images are now used for the detection of faces i.e., we also used morphological operators to smoothen and then recognised the face by drawing a rectangle around the white colored objects those in the YCBCR and then this image with rectangles is finally converted again into the normal first image. While going with this algorithm, noise removal is greater challenge here. So we later used opencv along with python for writing the face detection algorithm. But still we put the code implemented for the above mentioned algorithm also.

Example RGB image converted to YCBCR:

Example face detected image after running the code:
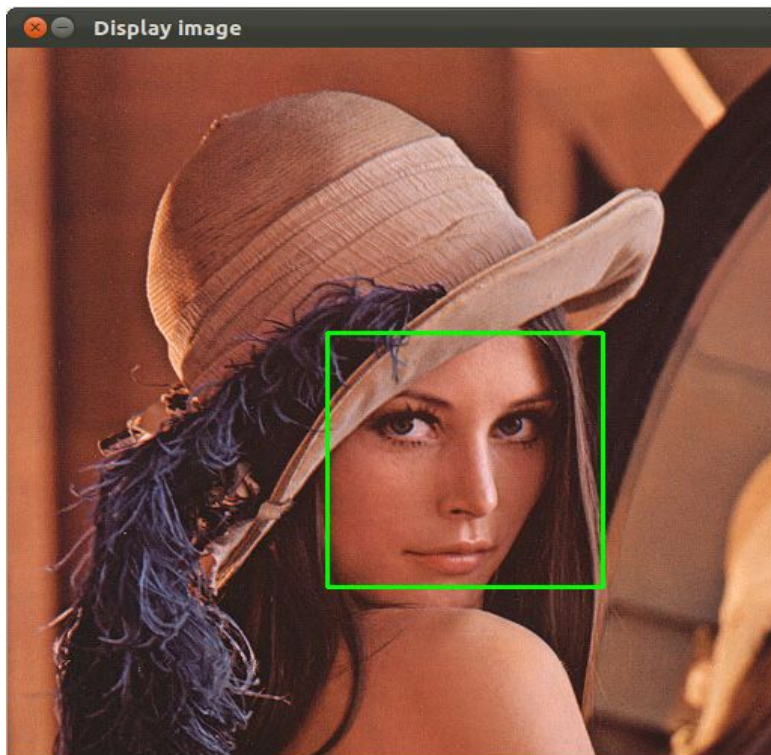
The code used for the face detection is also provided.