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# AN EFFICIENT ALGORITHM FOR FACE DETECTION USING COLOR SEGMENTATION & ENERGY THRESHOLDING

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***Abstract*—**
**In this paper we presented a simple and effective method to detect faces in such a situation that the images to be tested are very similar to the images in a training set, by using color-based segmentation. Color segmentation is an effective process to separate skin from its background. The color segmentation process will be followed by energy thresholding. Face detection has been a fascinating problem for image processing researchers during the last decade because of many important applications such as video face recognition at airports and security check-points, digital image archiving, etc. In this paper we attempt to detect faces in a digital image using various techniques such as skin color segmentation, morphological processing, template matching, We determined that the more complex classifiers did not work as well as expected due to the lack of large databases for training. Reasonable results were obtained with color segmentation, template matching at multiple scales, and clustering of correlation peaks.**

## 1. INTRODUCTION

In this paper we try to replicate on a computer that which human beings are able to do effortlessly every moment of their lives, detect the presence or absence of faces in their field of vision. The model will take three different color spaces into consideration namely HSV,RGB and YCbCr.

Assuming that a person framed in any random photograph is not an attendee at the gathering or get-together, it can be assumed that the face is not white, green, red, or any unnatural color of that nature. While different ethnic groups have different levels of melanin and pigmentation, the range of colors that human facial skin takes on is clearly a subspace of the total color space. With the assumption of a typical photographic scenario, it would be clearly wise to take advantage of face-color correlations to limit our face search to areas of an input image that have at least the correct color components. The color segmentation process will be followed by energy thresholding.Thresholding is the operation of converting a grayscale image into a binary image. Thresholding is a widely applied preprocessing step for image segmentation. Often the burden of segmentation is on the threshold operation, so that a properly thresholded image leads to better segmentation. There are mainly two types of thresholding techniques available: global and local. In the global thresholding technique a grayscale image is converted into a binary image based on an image intensity value called global threshold. All pixels having values greater than the global threshold values are marked as 1 and the remaining pixels are marked as 0. In local thresholding technique, typically a threshold surface is constructed that is a function on the image domain.

We propose to develop a model for face detection based on color segmentation. The color segmentation process will be followed by energy thresholding. The model tries to take advantage of face color correlation. The model will take three different color spaces into consideration namely HSV,RGB and YCbCr"

## 2. HSV COLOR SPACE

**HSL** and **HSV** are the two most common cylindrical-coordinate representations of points in an RGB color model."Hue" describes the basic pure color of the image, "saturation"gives the manner by which this pure color (hue) is diluted by white light, and "Value" provides an achromatic notion of the intensity of the color. It is the first two, H and S, that will provide us with useful discriminating information regarding skin.

Using the reference images (truth images) provided by the teaching staff shown in fig.1.we plot the H,S, and V values for face and non-face pixels and try to detect any useful trends.From those results we derive the following rule used in our face skin detection block:19< $H$ <240 -Not Skin;and otherwise we assume that it is skin. By applying a mask based on this rule to our sample image we obtain the remaining pixels .

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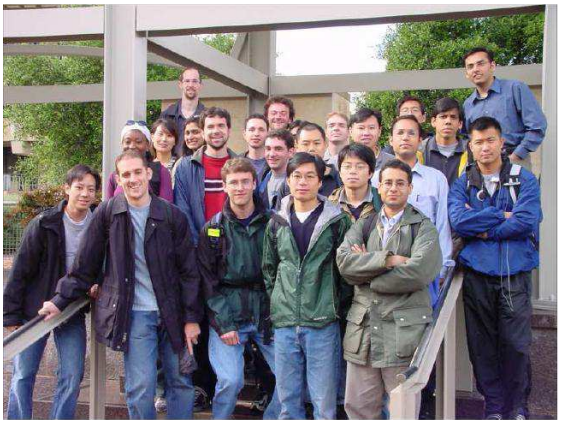

Fig,1

## 3. YCBCR COLOR SPACE

Similarly, we analyzed the YCbCr color space for any trends that we could take advantage of to remove areas that are likely to not be skin. we plot the Y,,b and Cr values for face and non-face pixels and try to detect any useful trends.After experimenting with various thresholds, we found that the best results were found by using the following rule:102 $<Cb<128$ –Skin and otherwise assume that it is NOT skin and may be removed from further consideration.

## 4. RGB COLOR SPACE

An **RGB color space** is any additive color space based on the RGB color model .A particular RGB color space is defined by the three chromatics of the red, green, and blue additive primaries, and can produce any chromaticity that is the triangle defined by those primary colors.. From studying and experimenting with various thresholds in RGB space, we found that the following rule worked well in removing some unnecessary pixels: $0{:}836G - 14 < B < 0{:}836G + 44$ –Skin and $0{:}79G - 67 < B < 0{:}78G + 42$ -Skin;with other pixels being labelled as non-face and removed.

## 5. MORPHOLOGICAL PROCESSING

At this stage we have successfully removed the vast majority of the original pixels from consideration, but we still see little specs throughout the masked image. Because we will subsequently send the image through a matched filter and the specs will be averaged outof consideration and hence could be left in and just ignored,Hence the open (erode *!*dilate)operation was performed using a 3x3 window of all 1s. After template matching the final result is shown in fig,2

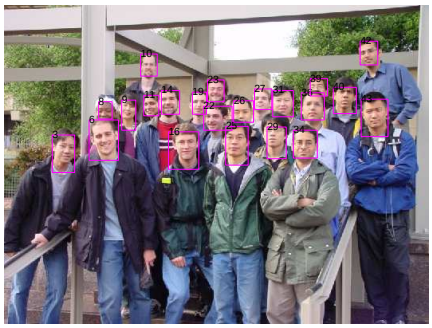

Fig.2

Finally we also use this algorithm for fruit detection and the results are shown in fig.3 and fig.4.

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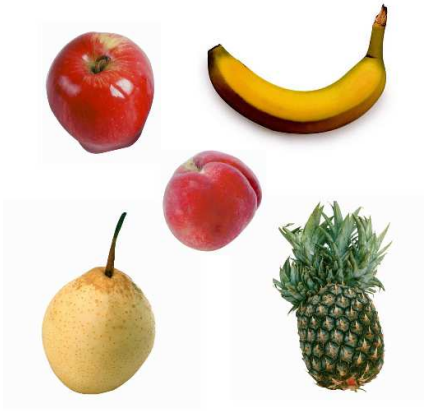

Fig.3 Test Image

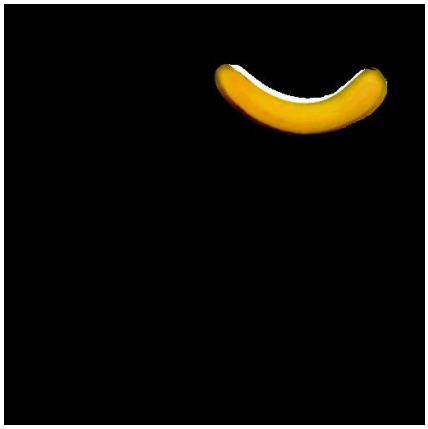

**Fig.4 Fruit detected**

## 6. CONCLUSION

The proposed work will have distinct advantage over other models in terms of simplicity and faster operation. The accuracy of this technique will be computed upon after deriving results. We will be able to compare the behavior of the model in three color spaces namely HSV,RGB and YCbCr.

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