

# ***A Novel Approach for Face Detection and Colour Segmentation on MATLAB***

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## ***Abstract***

*In this paper we discussed about the ability to identify different faces than machines. So face detection plays major role in face recognition, facial expression recognition, head-pose estimation, human-computer interaction, etc. Face detection is a computer technology that determines the location and size of human face in arbitrary (digital) image. This paper presents all comprehension and critical survey of algorithms through which face detection is possible. This document gives formatting instructions for authors preparing papers for publication in the Proceedings of an International Journal.*

***Keywords: DIP, FACE DETECTION, RGB***

## **I. INTRODUCTION**

Face detection is a computer technology that determines the location and size of human face in arbitrary image. The facial features are detected and any other objects like trees, buildings and bodies etc are ignored from the digital image. It can be regarded as a 'specific' case of object-class detection,

where the task is finding the location and sizes of all objects in an image that belong to a given class. Early face-detection algorithms focused on the detection of frontal human faces, whereas this thesis attempt to solve the more general and difficult problem of multi-view face detection.

This paper takes into account variations in the image or video by factors such as face appearance, lighting, and pose. This thesis proposes a new technique for detecting faces in color images using color model HSI and YCbCr, Segmentation, Morphological operation and Template matching. To detect a face from an online surveillance system or an offline image, the main component that should be detected is the skin area. This thesis proposes a skin based segmentation algorithm for face detection in color images with detection of multiple faces and skin regions.

Skin color has proven to be a useful and robust cue for face detection, localization and tracking. In face detection, we check in given input image whether it contains human face or not, if so, then returning the location of the human face. Basically due to lots of research, wide variety of applications (like in computers, communication, image database management, law enforcement, security, smart home application and automatic control systems etc) and difficulties in face detection has become interesting topics of research for the researchers in past decade [1].

Face detection is used in many places now days especially the websites hosting images like Picasa, photo bucket and Face book. Face detection is used in biometrics, frequently as a part of a facial recognition system. It is also used in human computer interface and image database management and video surveillance. Some recent digital cameras use face detection for autofocus.

Actually Face Detection is first essential step in Face Recognition system for localizing and extracting the features of given image. Since faces have lot of variation in appearance based approach, face detection is not a simple or straightforward, it consists of a long list of these factors, such as pose variation, occlusion, image orientation, illuminating conditions, facial expression, structural components, facial size found in the image, the scene and complexity of images background and others

## II. PROBLEM FORMULATION

Face detection is a difficult problem that consists of finding one or more faces in an image or in a video sequence under different situations. This difficulty originates from the fact that the face is not a rigid body and the different conditions under which the

image or the sequence of images was acquired. The main challenges facing any face detection system typically include pose variation, the presence or absence of structural components, facial expression, occlusion, image orientation, imaging conditions, and background variations. Various algorithms, including skin color based algorithms, exist for face detection. Color is an important feature of human faces. Using skin-color as a feature to detect a face has several advantages.

Color processing is much faster than processing other facial features. Under certain lighting conditions, color is orientation invariant. However, color is not a physical phenomenon related to the spectral characteristics of electromagnetic radiation in the visible wavelengths striking the retina.

In this problem, firstly the image is segmented based on a skin color model in the HSI and YCbCr color space. There various types of color model like as RGB, CMYK, RYB, CMY etc but in this paper we use HIS and YCbCr color model because they have some advantage in comparison to other color model. Secondly we apply segmentation, in this image is

converted into binary form. Thirdly we apply a series of morphological operations, in this method we use dilation and erosion operation. Fourthly a template matching technique is applied on each resultant component. In template matching, a standard face pattern, usually frontal, is manually predefined or parameterized by a function. Given an input image, the correlation values with the standard patterns are computed for face contour, eyes, nose, and mouth independently.

The existence of the face is determined based on the correlation values. While template-matching methods rely on a predefined template or model, the “templates” in appearance-based methods is learned from examples in images. Face detection can be viewed as a pattern classification problem with two classes, “face” and “non-face.”

The “non-face” class contains images that may depict anything that is not a face, while the “face” class contains all face images. finally finds the true faces. This problem statement provides the better accuracy from the Arti Khaparde, Sowmya Reddy. Y and Swetha Ravipudi [5] face detection system.

### III.METHODOLOGY

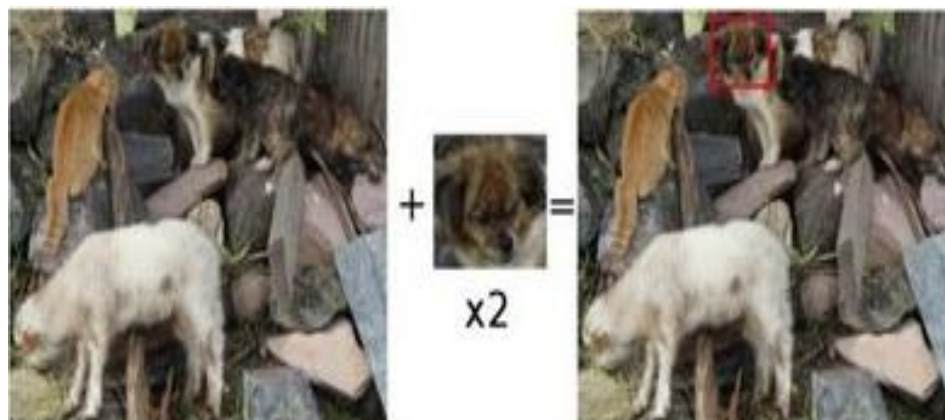
#### *Color Model*

Basically color pattern is not easily perceived and interpreted by human brain because it is a physiological phenomenon that is not fully understood by brain. The physical nature of color can be understood on the basis of practical and theoretical results. In 1966, Sir Isaac Newton discovered the color pattern when a beam of sunlight passes through a glass prism, emerging light is not white but it produces a spectrum of colors that may be divided into seven broad regions: violet, indigo, blue, green, yellow, orange, and red respectively. Characterization of light is central to the science of colors.

Now when we are working with color images, we need to describe the information

of each pixel of that color image. When human eyes perceive the color, it is seen in 3-D due to those three-color components red (R), green (G), and blue (B). We have three characteristics; Hue (H), Saturation (S), and brightness or value (V) which is used to distinguish one color from another color. Now days, a different type of color model is used which is widely classified and have broad applications areas.

Digital image processing have different type of color model and most commonly used are RGB (red, green, and blue) for color monitoring and there are more broadly classified models for color printing like color video cameras; the CMY (cyan, magenta, and yellow) and CMYK (cyan, magenta, yellow, and black) respectively.



*Figure 1 Input image*

#### IV.RESULTS

Template matching is used to perform cross-covariance with the given image and a template that is representative of the image. Template matching is basically the two-dimensional cross-correlation of a grayscale image with a grayscale template. Hence evaluating the degree of similarity between the two, there are many details involved that would have drastic influence on the overall performance of the system. **See Figure: 1**

To identify the matching area, we have to compare the template image against the source image by sliding it.

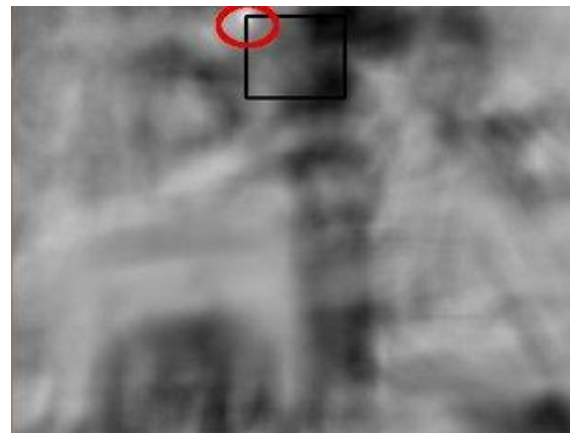


**Figure 2 Output image**

a) By sliding, we mean moving the patch one pixel at a time (up to down and left to right). At each location, a metric is calculated so it represents how “good” or

“bad” the match at that location or how similar the patch is to that particular area of the source image.

b) For each location of T over I, we store the metric in the result matrix (R). Each location (x, y) in R contains the match metric.



**Figure 3 Detected image**

The image above is the result R of sliding the patch with a metric TM\_CCORR\_NORMED. The brightest locations indicate the highest matches. As we can see, the location marked by the red circle is probably the one with the highest value, so that location (the rectangle formed by that point as a corner and width and height equal to the patch image) is considered the match.

## CONCLUSIONS

We propose a face detection method that seamlessly incorporates skin color modeling, segmentation, morphological operation and iterative template matching. Specifically, the proposed method is effective in detecting faces from typical photographs having multiple faces, single faces, faces wearing spectacles, faces of different races, faces with less light, and faces very close to each other.

The experiments show that the proposed method outperforms the peer method [1], as our algorithm achieves a higher face detection rate and lower false detection rate. Specifically, our method improves the peer method by improving the face detection rate and reducing the false detection. Our experimental results show a face detection rate of 87.25%. Though there are some cases of false positives, the overall performance of the proposed algorithm is quite satisfactory.

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