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Research Paper

"Face Detection Using Skin Color Segmentation In Images"

Engineering

KEYWORDS : face detection; fuzzy classifier; HSV color model; Takagi-Sugeno model.

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ABSTRACT

Face detection is one of the challenging problems in image processing. Face detection is determining the location and size of the human face in the digital still color image. propose a new approach using Takagi-Sugeno (T-S) fuzzy model and Hue Saturation and Value (HSV) color model. Algorithms used in this paper are Fuzzy classifier in conjunction with HSV color model to quickly locate faces in the image. The algorithm is characterized by its simplicity and inexpensive computational requirements. The method shows that our system has comparable performance in terms of detection rates and false positive rates

I. INTRODUCTION

Face detection is an active area of research spanning disciplines such as image processing, pattern recognition, computer vision and artificial intelligence. Face detection and recognition are preliminary steps to wide variety of applications such as personal identification and video surveillance and the detection efficiency of the applied algorithm highly influences the performance of these systems. The goal of the face detection algorithm is to identify the location of the face in the image. Face detection is an important part of face recognition because it is the first step to any automatic face recognition system [2]. Face detection comes naturally to human beings but the same cannot be said for machines as faces are subjected to lots of variations of image appearance, such as pose variation (front, non-front), occlusion, image orientation, illumination and facial expression.

Many methods have been proposed to resolve each variation. For example, template-matching methods [3] are used for face localization and detection by computing the correlation of an input image to a standard face pattern. The feature invariant approaches [4] are used for feature detection of eyes, mouth, ears, nose, etc. and appearance-based methods are used for face detection with edge detection and neural networks. There is a discriminated in face detection in two classes are "images containing faces" and "images not containing faces". It is easy to get a representative sample of images which contain faces, but much harder to get a representative sample of those which do not.

II. ABOUT FUZZY LOGIC

The areas of applications are very wide process control, management and decision making, operation research, economics and for our algorithm, the most important, pattern recognition and classification.

Dealing with simple 'black' and 'white' answers is no longer satisfactory enough; degree of membership (suggested by Prof. Zadeh in 1965) became a new way of solving problems by treating data as imprecise or in a fuzzy form, thereby allowing the fuzzy system to handle certain degree of randomness without compromising on the efficiency of the system. In this paper, T-S [5] fuzzy model is used to construct the structure comprising of fuzzy rules and membership functions and is referred to as the fuzzy classifier.

III. SKIN COLOR SEGMENTATION

Color is an important feature of human faces. Using skin color as a feature for tracking a face has several advantages. Color processing is much faster than processing other facial features.

In this paper HSV color model is used to detect faces in an image. In the HSV color model, H stands for hue component, which describes the shade of the color, S stands for saturation component, which describes how pure the hue (color) is while V stands for value component, which describes the brightness. In this system only the values of hue and saturation considered while detecting skin pixels by removal of v component which take care of varying lighting conditions.

IV. PROCEDURE

The proposed algorithm can be broadly divided into two layers: the fuzzy layer and the skin layer. For training the fuzzy classifier, 18 × 27 pixel images, both face and non-face were taken as samples. All the pixel values of the images were read in row format to form 486 columns. The output of face images were taken as 1 and for non-face images were taken to be -1. Fig 1 shows the flow chart depicting the proposed algorithm. Fig 2 shows the original image.

The input to the first layer was the image matrix in which the face was to be detected. The image was first resized to a size of 150×150, fuzzified and then sent to the trained fuzzy Classifier. In the classifier, classifier scanned each 18 × 27 area and classified the region as a face or a non face. This scanning resulted in a large number of false positives in the fuzzy layer as evident from Fig 3.

Fig 1-Flow chart depicting the proposed algorithm.

Fig 2-Original image.

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Fig 3-Faces classified by the fuzzy layer

Fig 4-The non skin pixels detected by HSV model are darkened.

Fig 5-Face detected shown by the box.

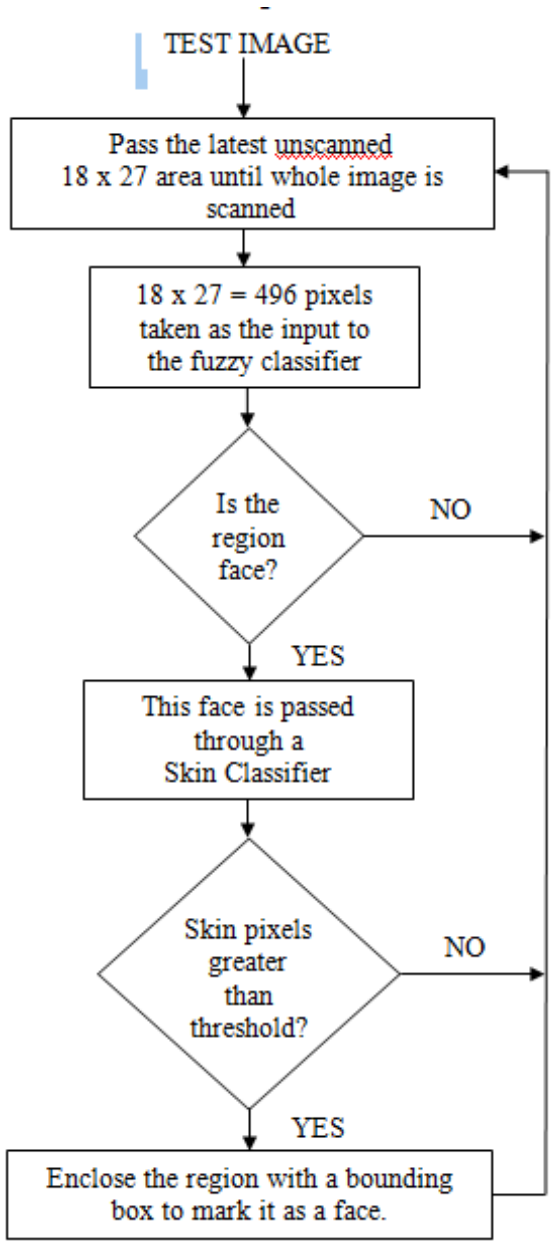
An inexpensive method with respect to computational resources was required to reduce the number of false positives of the system and this was achieved by passing the regions classified as human faces to the skin layer where the number of skin pixels were detected using the HSV color model. If the count of skin pixels in the area was found to be more than a threshold, the area was marked as human face. Otherwise, the region was discarded as false positive of the first layer.

Fig 4 shows the detected skin region of the input image matrix by the skin layer and Fig 5 shows the final detected face by cascading the fuzzy and skin classifier.

V. CONCLUSION

The performance of the system is found to be quite satisfactory on natural images taken under uncontrolled conditions. The algorithm takes approximately 2 seconds to scan a 150 X 150 size and is quite fast, and thus suitable for real-time applications.

It was found that the proposed system was able to handle subjects with spectacles, different skin colors and expressions much more effectively as compared to the conventional methods like template based methods and contour processing.



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