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Facial Area Detection in Passport Images

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***Abstract*— Skin area detection is most essential part considered for maintaining facial features at the time of compressing the image. In certain cases compression leads to loss of features. To maintain features in image lossless image can not provide ultimate solution to minimize storage device requirements. In such cases partly lossless and partly lossy compression is best solution. For this reason this paper elaborates simplistic idea for skin area detection in passport images. Results obtained by implementing the algorithm in MATLAB show best performance in skin area detection.**

***Index Terms*—Skin area detection, morphological operations, color estimation.**

I. INTRODUCTION

Compressing human facial image efficiently has been explored for years. Geometric pre-analysis of the image is utilized. It uses the feature detection to locate those semantic landmarks. A principal component analysis (PCA) is applied in [7] to train a transform that could optimize the image's compact energy. A previous work in [8] proposes transform training and then processes those small tiles. Independent component analysis (ICA) for the representation of image tiles is used. Treating the group of images as a 3-D tensor, [9] and [10] decompose images into three-way rank-one approximation. In [10], a given face is deformed into a canonical form, in which the same facial features are mapped to the same spatial locations.

AK-SVD dictionaries are trained for predefining patches of image in dictionary based vector quantization. The encoding is based on sparse coding of each image patch using the relevant trained dictionary. The spatial content and the frequency distribution of each image are combined to produce a quantization scheme, which indicates spatial and frequency difference for each image being processed. The discrete wavelet transforms (DWT), can be applied to objects with arbitrary shape. Although the work in [9] requires predefined codebook in decoding operation, even it achieves high compression efficiency. A new codebook is required if the image resolution changes.

Classified energy and pattern blocks (CEPB) are constructed using the training blocks and located at both the transmitter and receiver side. Matching processing is used to determine the index of CEPB which matches the input CEPB best. The scheme demands special lookup table on both side. JPEG2000 is widely used in the medical field and digital photography. It achieves better compression quality than older methods of compression. JPEG2000 coding is used to compress facial image. It adopts the freeman chain code and its arithmetic code to describe the background boundary. The facial area is then up-shifted a bit plane. As per standard requirements the bit stream obtained does not meet the needs. This implies restrictions on the operations applicability. Energy measures can be considered for determining different image regions. However accuracy is most important concern in the applicability and as this is less, applicability is reduced.

Efficient general purpose algorithms are applicable today after immense exploration of various processing. For the class of images where lossless compression is to be done is mostly ignored part and hence this triggers the more demand for the research. There is need for region based compressing and mostly efficient compression techniques which can outperform the need and can solve the need with proper solution.

At the time of storing or transmitting the images various compression techniques are used to save requirement of transmission bandwidths or saving requirement of storage spaces. The limit of memory space in IC cards requires formal photographs to code in low bit rate and high-fidelity quality. Traditional image compression techniques do not utilize the specialty of card photographs completely. That is, the object is a human head and the background is in unicolor. So its compression efficiency is low, and cannot meet the demands of small memory capacity.

II. PROPOSED METHODOLOGY

The facial feature extracting procedure which involves three stages. In first stage facial feature detection is done by edge operator thresholding and morphological operations. The second stage is to enhance facial features by using local maxima and minima. By using these facial features in third stage we detect background region to discard the background part from the image. This image is ready for compression in Second phase.

III. UNITS

1. Extraction of body object:

To detect the body part from input passport image with white background, skin color detection is implemented in MATLAB.

First of all input RGB image is converted into HSV color space. Then Cb and Cr is calculated using formula given as,

$$Cb=128+(-37.797R-74.203G+112.0B)$$
$$Cr=128+(112.0R-93.786G-18.214B)$$

Values inside bracket indicate color preferences used.

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For skin color these values are modified for proper skin colored pixel detection.

2. Morphological operations:

Erosion:

Erosion is used for image mathematical morphology. Firstly image is converted into binary image. To erode away the extra pixels in binary boundaries is the main task obtained in this process. Due to erosion the area in foreground part is shrinking in size. There are some regions where the holes present inside this area are to be washed out. This two tasks are completed by erosion process.

Each of the pixel in foreground part is considered as target element in erosion process one by one. The structuring element is superimposed on each foreground input pixel on top of input image. Depending on match of foreground and background pixel the input pixel is set as part of the area. Input pixel is set to foreground if structuring element does not show any match else it is set to background.

In case of 3x3 pixels structuring element, if one of the input foreground pixel is oddly located in foreground area then this pixel is moved in outward direction and located at the boundary due to which actual area of foreground gets shrink in size.

Eroding the foreground is similar to dilating procedure in background region.

Dilation:

As erosion dilation is also important mathematical morphology. Dilation can be applied to binary as well as gray scale images. Mostly it is used in binary mode image. To change the background part dilation is done.

Dilation is exact dual of erosion. As dilation is done in background, erosion is done in foreground.

Opening and closing:

Along with above mentioned, opening and closing are also important morphological operations. They are both derived from the fundamental operations of erosion and dilation. Firstly image is converted into binary for opening and closing operations. The pixels present at the edge of the boundary regions of foreground part of the image, are removed compared to erosion operation is less destructive. It indicates the ;lost pixels are less in count compared to erosion. The structuring element is required at the time of operation. It eliminates the pixel if structuring elements are not showing exact ,match otherwise pixel is preserved.

IV. Experimental Results

We have successfully detected the facial area by processing passport images with white background.

Figure1: Output of Morphological operations input image 1

Figure2: Output of skin area detection input image 1

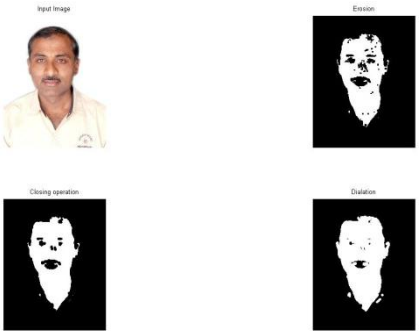

Figure3: Output of Morphological operations input image 1

Figure 1 and 2 shows the output results obtained for morphological processing and skin area detection outputs for input image 1

Figure4: Output of skin area detection input image 2

V. CONCLUSION

We have successfully detected facial region in input images with white background as used in passport image system. For input image with specific passport size image, execution speed is considerably good for detection.

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