FEATURE BASED IMAGE OPTIMIZATION TECHIQUE

Dr. R.Ramakishore
Assistant Professor; USIT
GGS Indraprastha University
New Delhi, India
ram_kish@yahoo.com

Yogiraj Sharma
6th Sem MTech.(ITW);USIT
GGS Indraprastha University
New Delhi,India
yogirajsharma@rediffmail.com

Abstract— The motivation behind the production of high resolution images is to increase the quality and the visual presentation of a digital image. The erstwhile analogue images captured by the silver Bromide film was having infinite resolution. However the options such as editing, transmission through the media etc features warranted the production of the digital images. Started with the few thousand pixels now, the digital images are of 16 Megapixels or more resolution and tend to bridge the gap between the analogue and digital images while maintaining the advantages offered by the digital images. However, in this effort of increasing the resolution, the size increases drastically and thus compression and optimization is required to the extent possible. The proposed feature based image optimization techniques will reduce the size of the image by incorporating feature based segmentation while maintaining the high quality in the areas of interest opted by users.

Keywords-Color segmentation, image compression,optimization, Area/region of interest

I. OVERVIEW AND INTRODUCTION

The digital images capturing resolution is increasing due to severe advancement in the CCD (Charged Couple Device) technology and digital scanners technology. Due to this reason the storage size of the captured image is increasing. Although storage is not a problem now a days , yet the transmission bandwidth over networks specially over internet is still a problem resulting in to increase in the time interval of transmission and hence the cost of transmission. This necessitates the compression and/or optimization of the images. The compression necessarily involves the removal of the redundant data from a digital image. Various compression techniques are in vogue like JPEG (Joint Photographic Expert Group), LZW compression and fractal based compression etc. These compression algorithms are successfully being used for the compression of images. Ming Yang, N.Bourbakis in [4] has given a broad view of the various compression techniques. The more and more compression of image is always welcome and researcher is finding ways to further optimize the images. Many efforts in these directions have been made. Bracamonte,M. Ansorge, F. Pellandini in [5] proposed a block based compression techniques wherein an image is divided into multiple blocks for designating each block based on its activity. [6] G.Fahmy, J. Black,, Jr. S.Panchanathan, in [6] proposed a new compression techniques based on human perception of colors. The proposed image optimization in this paper also serves the same purpose.

The proposed innovative techniques will be applicable to the images involves human faces and other exposed skin color area such as hands, neck and other skin exposed parts as Area of Interest as described by Siddartha chattopadhyay and Suchendra M. Bhandarkar in [3] Also we may obtain the color of the interest for deploying color segmentation .While implementing the skin color segmentation it has been observed that the skin color of various masses from different races and sampled to make a set of colors need to be segment the area of interest. Various segmentation techniques may also be deployed as described by R. Gonzalez and R. Woods in [1] Since the target is to optimize the size of image , some background area containing the skin color are accepted without much problem as quantum of rest of the areas are also considerable. Similar optimization techniques can be extended to other images wherein area of interest may contain some specific object of interest such as flowers color, animals color, forests green color and mountain color.

II. MODELING AREA OF INTEREST USING COLOR SEGMANTATION

The area of interest can be obtained as an input from the user to optimize the image. In an image containing the human faces and other body parts the skin color based segmentation can be deployed using the set of skin color set prepared from the samples of skin color obtained from the various races. In one image 'A' the area of interest i.e. skin color parts are identified using skin color segmentation. The location address of these skin color pixels in face and other exposed is marked.

(i) In HSV Color Space

0.5 < H < 1.4) Not Skin;

(ii) In YCbCr color space

102 < Cb < 128) Skin;

(iii) In RGB Color Space

0:836G ¡ 14 < B < 0:836G + 44) Skin

When we obtain the color input from the user for other color than the skin color the color so obtained may be used for the segmentation.

Various color segmentations are proposed at [11],[12] and [13].Given a digital image, each pixel in this image is designated as skin or non-skin using color information .Similarly a pixel can also be designated as pixel belongs to area of interest such as green or sky blue . The histogram is normalized and if the height of the bin corresponding to the H and S values of a pixel exceeds a threshold called color threshold (obtained by seeking the average of various samples), then that pixel is designated as pixel of interest of common pixel.

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III. PROPOSED WORK

It has been observed that while we look towards an image, we focus our vision on the skin color parts such as face and other exposed body parts. While we look towards an image containing multiple faces, we spontaneously switch our vision from one face to another. Similarly in images containing the flowers we focus on these and other areas such as grass or sky are grossly ignored Though by removing the redundancy in the spatial and frequency domain reduces the size considerably. Yet scope is still left to improve upon using our approach... Thus if we are able to represent an image in multiple resolution wherein these area of interest are displayed using high resolution and other unfocused area in slightly lower resolution, the image will be optimized or compressed without much compromise on the quality. In an image there can be more than 50% Sky-blue color sky area or large patches of green areas having flowers bed without any human presence and we want to optimize the image. In the areas other than areas of interest, too much resolution wastes the storage space without any value addition. The proposed paper involve Digital Image processing techniques such as skin color Segmentation or in general color segmentation based on users choice and thereafter deploying multi resolution image display. The optimization of image proposed here is a lossy compression technique in which the original image cannot be made at destination of transmission.

The process of Feature based image optimization using color segmentation is summarized as below:

A. Image Caputring Initially the image will be captured using highest possible resolution. Then two copies of image will be made Now we have two image of the same resolution say A & B. The MATLAB code shall be used for creating the same.

B. Color Based Segmentation

In one image 'A' the area of interest i.e. Color parts i.e. skin color, flower color or other color of area of interest is identified using color segmentation. The average of large sample size will provide best results The location address of these color pixels i.e. Face, flowers or other object of interest are identified and marked.

C. Coding Area of Interest

Based on the criteria that a pixel is area of interest of not a logical array having only '1' or '0' is prepared. In this 1 indiciate that the pixel belongs to object of interest. Whreas '0' indicates that the pixel does not belong to the area of interest. for entire image a logical matrix C if prepard.

D Multi Resolution Display

The image 'B' is translated into the lower resolution of acceptable range using suitable methods such as change in the data type or other methods.

E Assembly Based on the logical matrix ‘C’ assembly of Optimized Image is carried out. If for a pixel value is '1' in C, high resolution value from image 'A' is copied in newly built image "D'. In case the value is '1' , the pixel value from lower resolution image 'B' is copied into the newly built image 'D’

F Compression

The output image D will be a compressed image wherein important critical areas of the image are displayed using the high resolution and less important areas are displayed using low resolution.

It can be seen that by blending higher resolution for object of interest and lower resolution pixels for other general areas such as background, clothes and other un important areas. The size of newly made image is compared with the high resolution image and percentage reduction is calculated the available compression techniques such as JPEG and others listed by Harsha D. Zope and Prof Pallavi Y patil in [2] will again be applied to further compress the image. Thus a higher resolution captured image shall be compressed to a considerable extent while maintaining the higher resolution in the areas of interest.

IV. THE PROPOSED ALGORITHM

Step 1. Obtain the input RGB image (rgb(i,j))into current working directory. In case the image is not color image, an error message will prompt that the image is not a color image. This is required when we opt color based segmentation. In other selection methods like eigenface methods [7], [8] and 9 the gray images will work fine.

Step 2. Make two copies 'A(i,j) and 'B (i,j)' of the image. These images will be having the same resolution as that of the input image except that the names are different.

Step 3. Decide upon the value of color for segmentation. The value may be a skin color or other color based on the user input which may be obtained using color pick tool.

Step 4. Make a logical marix 'C (i, j) based on the condition that If a pixel is color of object of interest or not i.e. for an image of size M X N

```
For i=1 to M
For j=1 to N
  if color of A(i,j) == color of object of interest
    ( C(i,j)==1)
   else C(i,j,)==0
```

The output will be a logical matrix C (i,j) and it will decide whether a pixel is having a color of choice. Spatial filtering methods using 4 or 8 pixels may be deployed to fill the areas within the pixels having required color. Similarly in an image containing multiple colors of object of interest various C1 ,C2,------Cn logical matrix can be built and final C(I,j) will be

C =C1+C2+c3+…..Cn

Step 5

Convert the image B(i,j) in to lower resolution image. This can be done by changing the data type to lower values.

The size of the image B will be considerably reduces. The values of lowering the resolution may be dynamically selected using the user input. Though minimum acceptable range may also be fixed at the algorithm level itself.

Step 6.

An optimized image 'D(i,j)' is assembled using the following method:

```
for i=1 to M
  for i= 1 to N
if C(i,j)=1
   D(i,j)=A(i,j)
else D(i,j)= B(i,j)
```

The resultant image shall be equally sharp and remain unnoticeable for any loss as we mostly concentrate on the object of interest and other areas remain unnoticeable. The techniques is a lossy compression techniques whereby the original captured images cannot rebuilt at the transmitted location. Although at the location of initiation the rebuilt is possible. The rebuilt can be done using the reverse of the entire process.

V.EXPERIMENTAL RESULTS & DISCUSSION

The Fig. 1 shows an image surajkund.jpg having the size of 434 KB. Though the skin color area is too small but have complex skin color background enhancing the area of the interest . The fig 2 depicts the area of interest highlighted with red color for the sale of preparing the logical matrix .

The Fig 3 shows the binary image for the area of interest. All the pixels belong to the area of interest category have the value 1 and rest of the pixels have value 0.To be more generalized we may consider drawing a

rectangle dynamically around these area of interest pixels and consider all the pixels to have the value 1 i.e. to be retained at the higher resolution. The Fig4 show that the area of interest pixels are retained whereas other pixels are replaced with the lower resolution image pixels. The size reduction of about 25% is obtained whereas no visual change in the quality of image is noticeable. Using user interface we may obtain the predominant color of these areas of interest and the value/values may be used for processing the image for optimization. Further other value addition may also be offered similar to ICE tool (Interactive color editing) or image processing tools like roipoly can be deployed to select the region and enhance the visual impact of the image in addition to the optimization. The histograms of both the initially loaded image and finally optimized image indicate there is not much of noticeable difference.

Figure 1. Input Image Surajkund.jpg =434KB

Fig 2 Skin color marked as area of interest

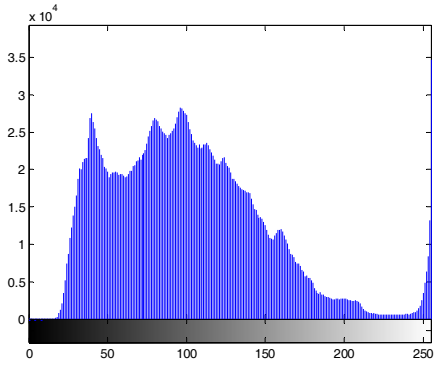

Figure 1.1 Histogram of Image 1

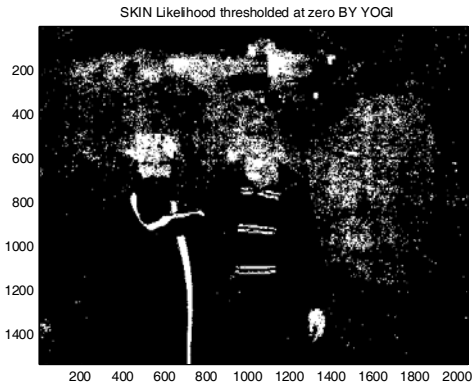

Fig. 3 Binary map for Area of interest pixels ..

Fig.4 Final image yogi.jpg=343KB

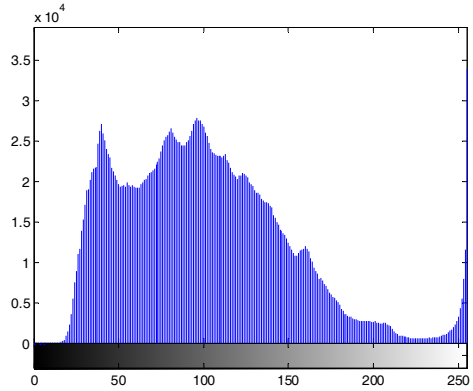

Fig.4.1 Histogram of final optimized image

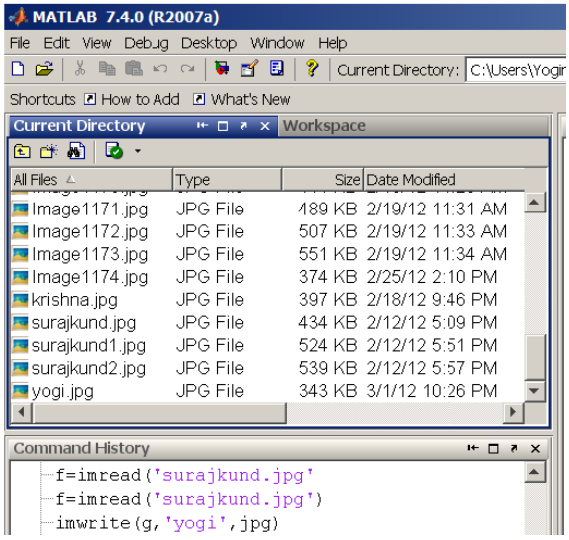

Fig.5 Showing size of newly built image 343 KB

VI.CONCLUSION AND FUTURE SCOPE

1.The size of the image so generated using the proposed algorithm will be quite less. Expected reduction of 30% in the size is not an over estimate even in images containing multiple object of interest and complex background.

2. The Quality of the areas of interest such as face and body parts are not compromised. As the focus of vision remains on the areas of interest, other background and unimportant areas goes unnoticed.

3.The face detection techniques so proposed can also be used as the first step of the face recognition techniques and video analytics.

4.The techniques can be extended to other areas wherein the areas of interest are pre-defined. The detection schema may include other pattern recognition techniques which include neural networks, SVM's and knowledge based networks.

5. The proposed techniques of multi resolution of digital image need further exploration to use the same at the point of capturing the image such as digital cameras, CCTV CCD cameras so as to reduce the storage space in the camera memory and Digital Video Recorders.

6. The Multi resolution concept using face detection in CCTV can also be used to enhance the image resolution for the human movement in the image.

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AUTHORS PROFILE

Dr. R, RamaKishore is Asssitant Professor in the USIT , GGSIPU New Delhi. He received his Ph.D in Information Technology from GGSPU and has 12 years experience.

Yogiraj Sharma is a gradaute Electrical Engineer, M.B.A and PG Diploma in Computer Application and studying in final Semester of M.Tech (IT) in GGSIPU, New Delhi