An Efficient Image Retargeting By Enhanced Face Saliency Technique

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Abstract—**Advancement of multimedia technology leads to the significant requirement in convenient data access using portable devices, such as mobile phone and PDA, for transmitting, sharing and exchanging information. The existing digital images, such as those taken by digital cameras, usually have high resolution and fixed aspect ratio. They should be adapted for effective viewing on a screen with small size and arbitrary aspect ratio. This adaptation is commonly referred to as image retargeting. The identification of relevant objects in an image is highly relevant in the context of image retargeting. Especially faces draw the attention of viewers. But the level of relevance may change between different faces depending on the size, the location, or whether a face is in focus or not. The paper presents method for image retargeting ,mainly considering human faces. The overall process for retargeting is divided in to three steps. The method first find the faces from the input image and then finding the focused face.After that it is retargeted to the target size.**

Keywords- Face detection, Focus detection, Saliency of faces, Image retargeting.

I. INTRODUCTION

With the recent advances in imaging technology, digital images have become an important component of media distribution. Images are frequently used in news stories, and people post their pictures on-line .

Since Mobile phones and personal digital assistants (PDAs) typically have limited resolution due to their small form factor. Images, however, are typically authored once, but need to be adapted for consumption under varied conditions. Image retargeting (IR) is the process of mapping the original image to the target zone. Mobile devices are widely used for acquiring, displaying and editing visual media such as images and videos, it's becoming more and more common that adapting the sizes of these media so that they can be shown on different devices. As all kinds of digital imaging devices have been invented and widely used, users can easily shoot as many photos as they can. However, most daily users are lack of aesthetic experience, therefore it's a difficult task to touch up and improve these photos automatically.

II. IMAGE RETARGETING PROBLEM

A digital image of size m n can be represented by a 2D discrete grid of pixels with m rows and n columns,where each

Fig. 1. An example of image retargeting: The source image containing three areas of importance, the two boys, and the ball. center(left). The source image retargeted to PDA display and cellphone display(right)

pixel has a value that encodes its color or intensity information. The image retargeting problem can be defined as . Given an image I of size mn and a new size m n, the goal is to produce a new image I of size m n that will be a good representative of the image I.

The three main objectives for retargeting are:

- The important content of I should be preserved in I.
- The important structure of I should be preserved in I.
- I should be free of visual artifacts.

This is a very challenging problem due to a number of reasons. Real-world scenes exhibit tremendous variability, and the techniques are expected to handle different kinds of imagery, such as barren landscapes and complex scenes with no clear foreground-background segmentation. Images taken outdoors have different overall characteristics from images taken indoors, and the presence of elements such as faces and text also may bring different meanings to specific image regions. Crowded and complex scenes are typical failure cases of current algorithms, due to the issues on automatically determining what is considered important in the image.

The previous works on the image retargeting mainly focused on the other images not of image containing faces and also the methods like scaling,cropping does not provide efficient method for retargeting because it produces visual distortion to the images.In this paper,first find the faces from the input image and then finding the focused face.After that it is retargeted to the target size.

The rest of this paper is organized as follows. In Sec. II and III, Presents the Image retargeting steps: Face Detection,Focus Detection and the Retargeting Method. In Sec. IV, results and discussions. Finally, Sec. V concludes this
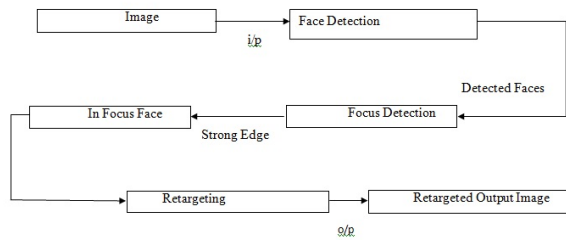
Fig. 2. Steps involved in the retargeting of an image

Fig. 3. overall Design

paper.

III. IMAGE RETARGETING METHOD

Principally,image retargeting can be defined as the problem of adapting an image to various target screens. It is a technique that adjust input images in to arbitrary sizes and simultaneously preserve the salient regions of the input images[6]. The identification of relevant objects in an image is highly relevant in the context of image retargeting(IR). Especially faces draw the attention of viewers. So an efficient retargeting considering the human faces is essential[1].

The three main steps for the retargeting of an image used here are:

1) Face Detection
2) Focus detection
3) Retargeting

The faces are detected from the input image by using a face detector and from the detected faces,focused face is found using image gradient function. This method is used to exclude all blurry faces. Each face includes characteristic edges due to nose, mouth, eyes and eyebrows, among others. A face is classified as in focus when at least one of its edges is classified as a strong edges,i.e faces with strong edges are considered as focused face. Once the focused face is detected, retargeting can be performed by considering the energy of pixels.

The overall process can be easily explained by the following fig2 & 3.

A. FACE DETECTION

In the face detection (FD) part, faces are detected from the input image by using function vision.CascadeObjectDetector[20]. It detects the location of a face in a input image. The cascade object detector uses the Viola-Jones detection algorithm and a trained classification model for detection. By default, the detector is configured to detect faces.Here I have given input image (jpg) that contain human faces is given to the system. Here face Detector = vision.CascadeObjectDetector[20]. By using the vision.CascadeObjectDetector the faces are detected.The image with detected faces is obtained after processing as output.

CascadeObjectDetector Detect objects using the Viola-Jones algorithm. DETECTOR = vision.CascadeObjectDetector creates a System object
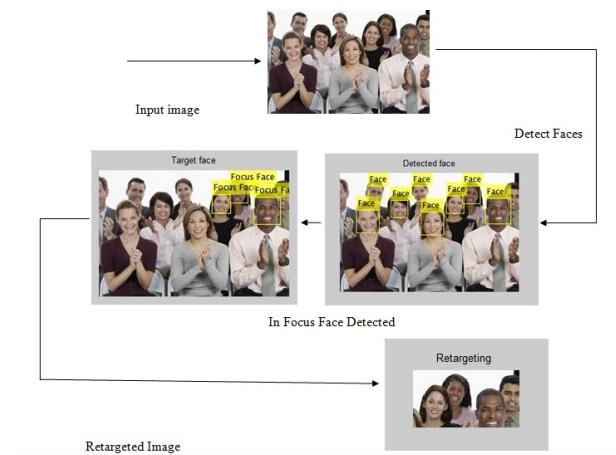
that detects objects using the Viola-Jones algorithm. The DETECTOR is capable of detecting a variety of objects, including faces and a person's upper body. The type of object to detect is controlled by the Classification Model property. By default, the DETECTOR is configured to detect faces[20].

BBOXES = step(DETECTOR,I) performs multi-scale object detection on the input image, I, and returns, BBOXES, an M-by-4 matrix defining M bounding boxes containing the detected objects. Each row in BBOXES is a four-element vector, [x y width height], that specifies the upper left corner and size of a bounding box in pixels. When no objects are detected, BBOXES is empty. It must be a gray scale or true color (RGB) image.

By using the function RGB = insertObjectAnnotation(I, SHAPE, POSITION, LABEL),inserts rectangles and corresponding labels at the location indicated by the position matrix. The POSITION must be an M-by-4 matrix, where each row, M, specifies a rectangle as a four-element vector, [x y width height]. The elements, x and y indicate the upper-left corner of the rectangle, and the width and height specify the size.

B. FOCUS DETECTION

The image containing detected faces is used as input in the focused detection part.Here the input includes all the detected faces in an image. Mainly this method is used to exclude all blurry faces. Each face includes characteristic edges due to nose, mouth, eyes and eyebrows, among others.

A face is classified as in focus when at least one of its edges is classified as a strong edge.

In the focus detection part ,the maximum information contained face from the detected faces is found. This can be done by finding weight/density/energy of pixel. For that Image gradient function is used. The imgradient(I)=[Gmag,Gdir] returns the gradient magnitude and gradient direction for the image I. The input image I can be gray scale or binary image and data type can be single,double, int8,int32,unit8,unit16,unit32,logical. The method is used by

gradient operator,(go) specified as one of the text strings 'Sobel','Prewitt,' 'Roberts'.Directional gradients along x-axis and y-axis specified as non-sparse matrices equal in size to image I, they are obtained from function imgradientxy. The output arguments Gmag returned as non-sparse matrix the same size as image I and also Gdir,non sparse matrix the same size as image I. By the gradient function,energy/edge visibility can be found out. The energy of a pixel measures how much that pixel stands out from its surroundings and give a rough idea about the importance of that pixel. The energy can be calculated from gradient image, by using an equation.

So by energy measure, the focused face is detected,i.e those faces are having high energy than the other smoothened face.

IV. IMAGE RETARGETING STEPS

A. RETARGETING METHOD

Retargeting is a continuous process after the focus detection, it is essential to check that whether there exist faces that have almost same or appropriate energy. If there are two faces two faces that have appropriate energy then those two faces must be considered. If two faces are in different position then the area in which the two faces exist is considered. So the area in which the two faces which has appropriate energy is selected. Then add 10 percent to the selected area. Then after that for creating a rectangular box for that selected area, again add 40 percent to the selected area by adding pixels left,right,up and down of the area. So this selected area is considered as focused area.

The next step is to check that there exist any energy in the background.For checking that, the total energy of the image is need to be found. Then checking that 80 percent of the total energy of the image is available in the focused area. If it is not available in the focused area then energy is still existing in the background.So in that case,again adding extra 10 percent to the focused area then check that the condition is satisfied or not.If not satisfied then again add extra 10 percent to the focused area. This process continues until the condition is satisfied. Once it is satisfied then stop adding and by cropping that area the final retargeted image is obtained. The output obtained is retargeted image.

B. Improved Face Detection Method

Face detection is an important part in this project and efficient image retargeting requires a system that detects all the faces in the input image. In the method described above, I used face detector, by default it automatically detect the faces in an input image. But during the detection process in some cases the detector is not able to detect all the faces in the input image. If the face detection is not properly done, it will seriously effect the focus detection part and also the retargeting. So a better method for face detection is needed to be considered.

This improved face detection method is based on the neural networks. The method provides two template i.e, template1 and template 2, the two template are two faces
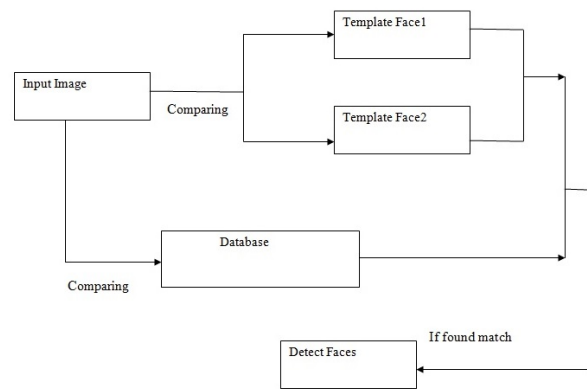

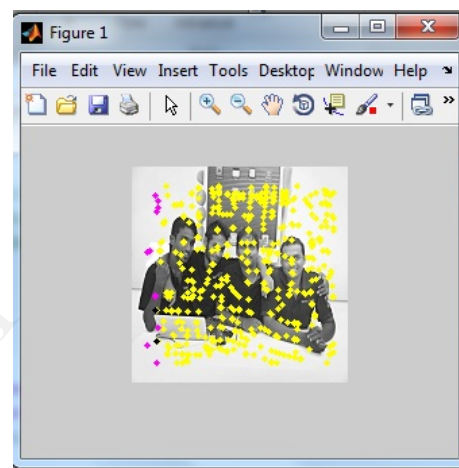Fig. 4.   Architecture of Improved Face Detection

Fig. 5.   Yellow dots shows the comparing input with template faces

which is of size 18x27 width and height and binary image. The first step of the detection part is that system matches the area of the two templates with the input image. This is done by convolution and correlation method.The template1 and template 2, the two template are two faces which is of size 18x27 width and height and binary image.The first step of the detection part is that system compares the input image with two templates. (fig 5). This is done by convolution and correlation method. The input given is a png image with size 150x150. So the first step is about comparing with the template faces. Then in the next step comparing with the faces in the database(fig6). If it found match, then it consider as face, if not found match then no face will be detected(fig7). In such cases training is done to the system, and again checking to found match. The output of the detection gives image with detected faces.
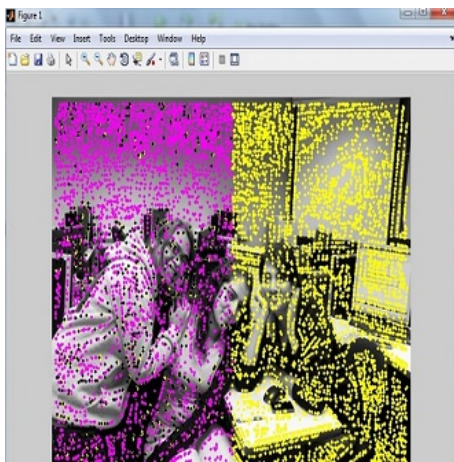
Fig. 6.   pink dots shows the comparing input with database contain faces
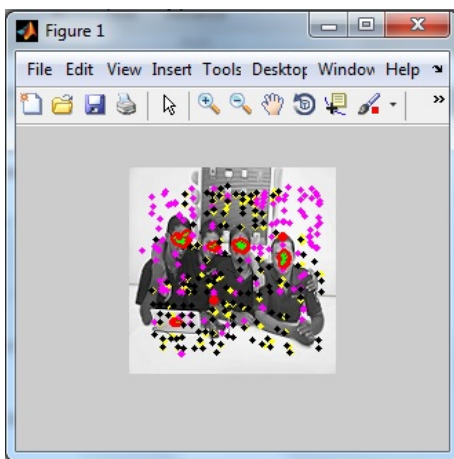

Fig. 8.   Result

Fig. 7.   By finding match, face is detected

VII. FOCUS FACE DETECTION AND RETARGETING RESULTS

In this method the focused face is found from the detected faces. A focus detection algorithm is used to exclude all blurry faces. The approach to the edge detection problem is to analyze luminance variations in an image. We use the gradient magnitude to identify edge pixels. So in the focus detection part find the maximum information contained face from the detected faces. The result of the focus detection and the retargeted image is shown in fig 8. Also some of the examples of the retargeted image is shown in fig 13 fig 14 and fig 15.

VIII. IMPROVED FACE DETECTION RESULTS

Face detection in the above method was not able to detect faces to some inputs. Since face detection is one of the important part, an enhanced or better approach is used which can detect all the faces of the input image in which other failed (fig 9 & fig 11). So by comparing the two method this method seems to be better for the face detection. This is shown in fig 10 & fig 12.

V. RESULTS AND DISCUSSIONS

This chapter discuss about the output obtained after performing the retargeting of an image described in the previous chapter. To the best of my knowledge ,a standard face image data set is currently available for benchmarking. Existing image retargeting were not done much on image containing faces. Also the automatic face detector was available was used for detection of faces from input images.

IX. CONCLUSION

In this paper, a method for finding the faces that are in focus is presented, since this paper mainly concentrate on images that contain faces. This information is especially useful in the context of image retargeting, where detections of unimportant faces in the background may lead to visual distortions of really important faces. Faces are first detected with the use of face detector which is configured to detect faces automatically. As faces that contain maximum energy are assumed to be in focus, and used the gradient magnitude to classify the faces to be in or out of focus. A retargeting method is finally used to retarget the image that contain focused face. Also another improved face detection method is used for better detection of faces.
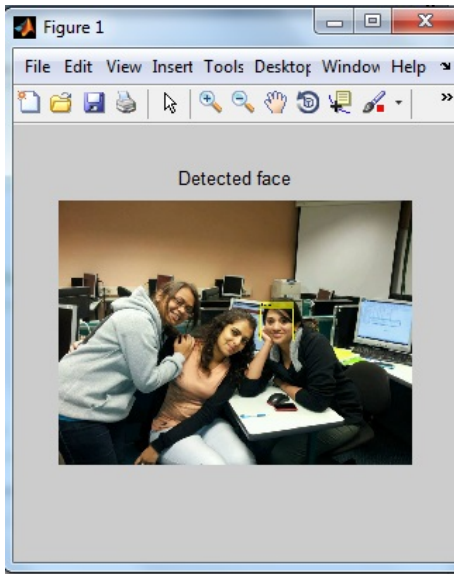
VI. FACE DETECTION RESULTS

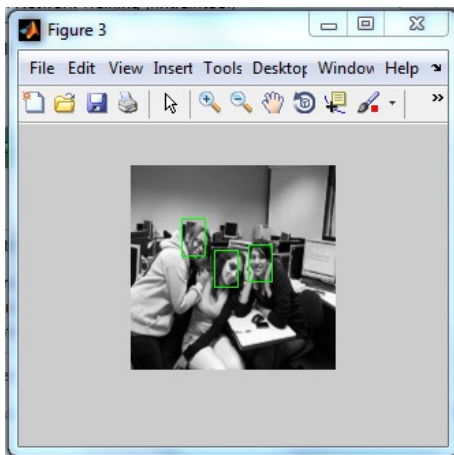The vision.CascadeObjectDetector was used to detect the location of a face in a input image. The cascade object detector uses the Viola-Jones detection algorithm and a trained classification model for detection. By default, the detector is configured to detect faces. So the automatically detected faces is then used to find the focused face. The result of the face detection part is shown below in fig 8.

Fig. 9.   Output of the Face Detection Result1
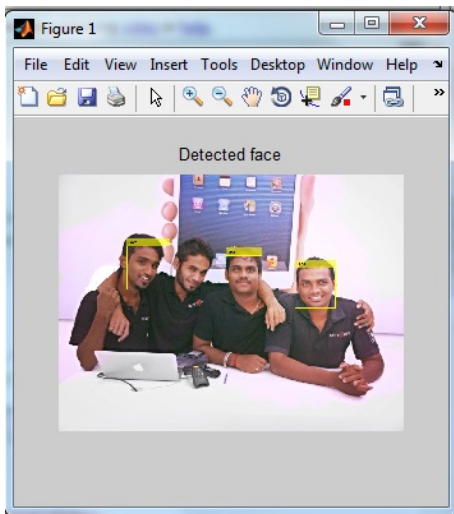

Fig. 12.   Output of Improved Face Detection Result2

Fig. 10.   Output of Improved Face Detection Result1

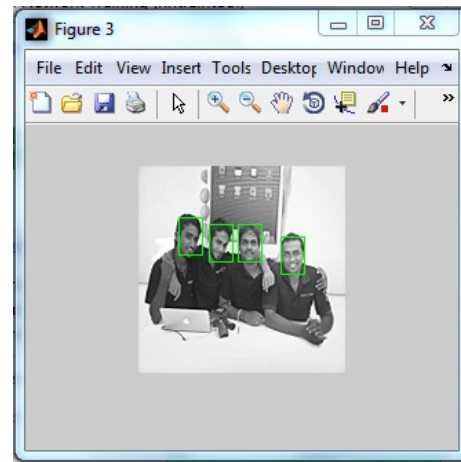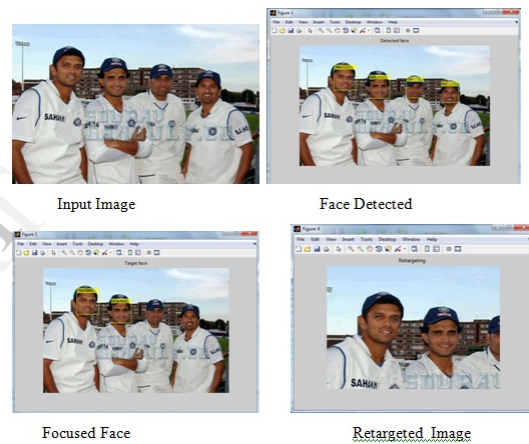Fig. 13.   Some Examples of the Image Retargeting Method

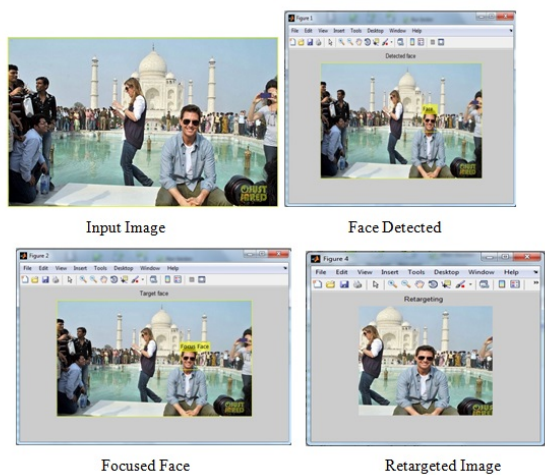
Fig. 11.   Output of the Face Detection Result2

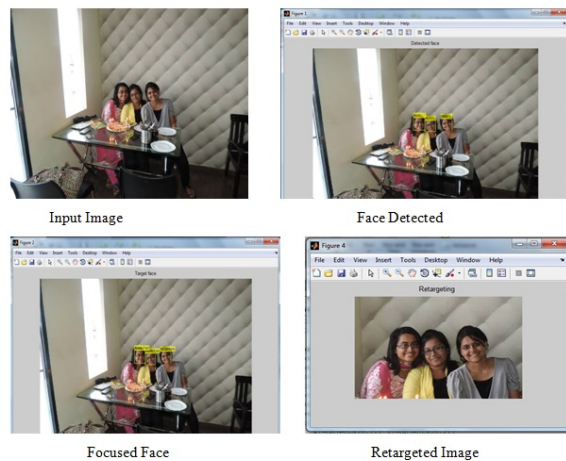Fig. 14.   Some Examples of the Image Retargeting Method

Fig. 15.   Some Examples of the Image Retargeting Method

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