

# Adaptive Approach for Zooming Images Using Bilinear Interpolation Technique

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## ABSTRACT

In this paper we use a proposed Bilinear interpolation algorithm for image zooming. A process in which we expand an image by a factor (greater than one) i.e. magnification factor is called image zooming. So, when we apply zooming function generally to an image, it will usually effect in aliasing; edge blurring and other artifacts. In our proposed method, the bilinear interpolation method is working to expand the original image. We are using the pixel grouping procedure to execute and to classify the pixels in the enlarged image. According to experimental resultant data, it is displayed that our proposed system provides better image quality. We can evaluate the result in terms of visual appearance and also in terms of PSNR.

**KEY WORDS:** - Resizing, Magnification Factor, Zooming of Image, Interpolation.

## 1 Introduction

When we manipulate an image by means of a processor then that is called Digital image processing of that image. The greatest common uses of Digital image processing techniques are improving picture quality and remove noise. So Image zooming is one of the very common application of Image Processing. [1] - [6]. Image zooming is basically used to provide the variation in size of image and also to improve its quality, so it is applied to multimedia application like digital database, electronic publishing and also in medical fields also. In image zooming we use an original image and after zooming resultant image is called zoomed image. Often, original image is called image of low resolution and zoomed image called image of high resolution. From the literature survey we found that there different techniques to enlarge an image and to improve its qualities.

These zooming techniques can be classified into two main categories 1) fixed image zooming and 2) adaptive image zooming scheme. [4]-[5]. There had been purposed some basic zooming techniques like pixel copy technique, nearest neighbor interpolation, bilinear interpolation technique [2], and the bi-cubic interpolation technique [3]. The most simple and easy technique is pixel copy technique used for zooming of image. In this method we simply recover unknown pixels in zoomed enlarged image by its consistent sampled pixels from original image. But one of major negative point of this image zooming technique is

its blocking effect in case of high scaling factor. And if we will use pixel copy technique for zooming purpose then resultant zoomed image is of poor quality as compared to other.

One of the other most used technique for image zooming is the bilinear interpolation technique. This technique of zooming provides smooth areas for enlarged image, but blocking effects can be found at the edge boundaries by using this method. It works well for the smooth areas zooming, but the blocking artifact can be found in the edge boundaries of the enlarged image when the bilinear interpolation technique is used. Currently, some adaptive image zooming techniques, such as the edge preserving zooming technique [4,5], the local adaptive zooming technique [6], the vector quantization zooming technique had been proposed. The goal of edge preserving zooming techniques is to remove/reduce blocking artifacts occurring in image interpolation. In other words, they can preserve more clear edge boundaries in the enlarged image than the fixed image zooming techniques. However, the image quality of the enlarged image by using the edge preserving zooming technique is not always better than that of the fixed image zooming technique.

## 2 PURPOSED METHOD

### 2.1 BILINEAR INTERPOLATION (Row and column expansion) method:

The coolest method of interpolation is Bilinear Interpolation. To do this we have to find the average value between two pixels. After that we used that average value as the pixel value between those two pixels. This can be applied and completed for the rows first suppose original image is shown in the form of matrix below in fig 2.1:-

8	4	8
4	8	4
8	2	8

Fig2.1 Original image

Now after expanding this image by row we will get image of following matrix as shown in matrix fig 2.1. Here 8 and 4 is our first two pixels in first row and its average value is,  $(8+4)/2 = 6$ , so now we have to insert this value between those two pixels 8 and 4. This step is done for every pixel in every pair of row, and next will take its result.

8	6	4	6	8
4	6	8	6	4
8	5	2	5	8

Fig 2.2 Image with Row expansion

After the expansion by row wise next step is done by column expansion in the same way. For example we are calculating average between each two pixel in the same column such as  $(6+5)/2 = 5.5$  or  $(6+6)/2=6$ , for 2st column .New image with Row and Column wise expansion is shown in fig 2.3

8	6	4	6	8
6	6	6	6	6
4	6	8	6	4
6	5.5	5	5.5	6
8	5	2	5	8

Fig 2.3 Image with Row and column Expansion

By using this method we can enlarge an original image of  $N \times N$  sized to new size image of  $(2n-1) \times (2n-1)$  and we can repeat this algorithm as desired [5].In first step the position of pixel P in the magnified image was converted into the original image, by bilinear interpolation algorithm [4], and then the Effect of the four pixel points A, B, C and

D was computed. The closer space to the point P, it will show the greater value, which specifies the greater effects. in Fig. 2.4 bilinear interpolation is shown by diagram:-

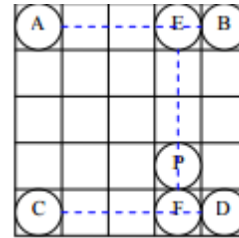


Fig. 2.4 bilinear interpolation

## 2.2 ALGORITHM USED:-

Let's assume the A, B, C and D respectively  $(i, j)$ ,  $(i, j + 1)$ ,  $(i + 1, j)$  and  $(i + 1, j + 1)$  be the coordinate, and the coordinate of P is  $(u,v)$ .

The main three steps of bilinear interpolation algorithm are:

Step 1: In first step we have to calculate the influence of A and B and denote it as E.

$$f(i,j+v) = [f(i,j+1)-f(i,j)]v + f(i,j)$$

Step 2: In second step we have to calculate the influence of C and D and denote it as F.

$$f(i+1,j+v) = [f(i+1,j+1) -f(i+1,j)]v+f(i+1,j)$$

Step 3: to calculate the influence of E and F and denote it as P.

$$f(i+u,j+v) = (1-u)(1-v)f(i,j) - (1-u)v f(i,j+1) + u(1-v)f(i+1,j) + uv f(i+1,j+1)$$

Bilinear interpolation is one of the simple techniques in image processing. It is also named as bilinear filtering. To map a screen pixel location to a corresponding point we used an algorithm. A weighted average of the attributes of the four surrounding pixels is computed and we calculate an average of four pixels a, b, c and d and then applied to the screen pixel. And a scale factor is used to enlarge image. In our purposed method we used different scale factor or magnification factor ranging from above to 1.After an image is to be scaled up,

every pixel of the original image must be moved in a definite direction based on the scale constant.

### 3. EXPERIMENTAL RESULTS

We are going to show the experimental effects and results of the images. In first figure fig 3.1 we will shows the original image by title 'babitasharma' and then after that the original is made shrunked image by using a factor 0.8.

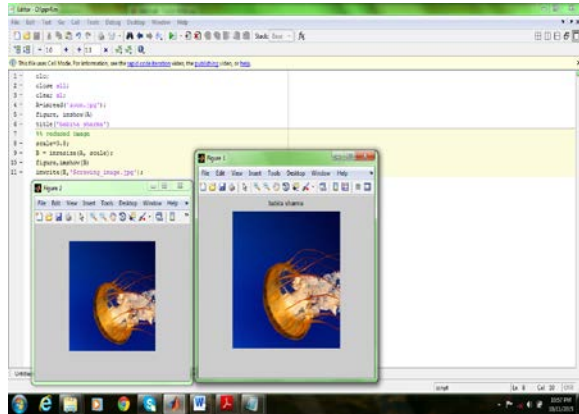


Fig.3.1 Shrinking of image by 0.8 factor

We have original image 'babitasharma' without any distortion and noise. Shrinking image is clearly seen with the suitable pixels. This image is receiving by using code and that code is made with the help of MATLAB.

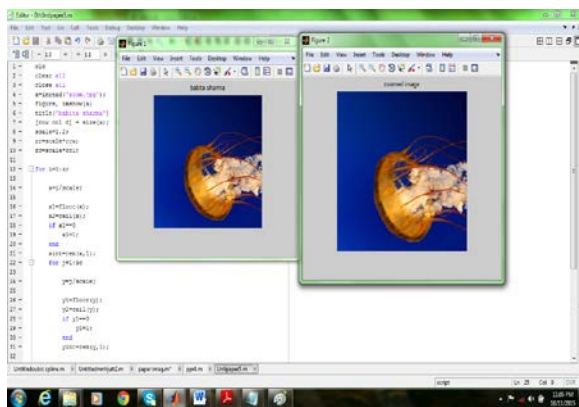


Fig.3.1 zooming of image by 1.2 factor

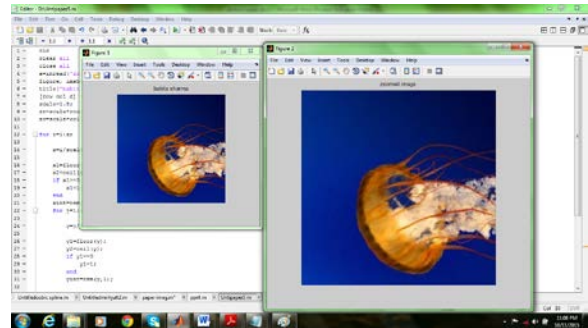


Fig.3.2 zooming of image by Scale factor is 1.8

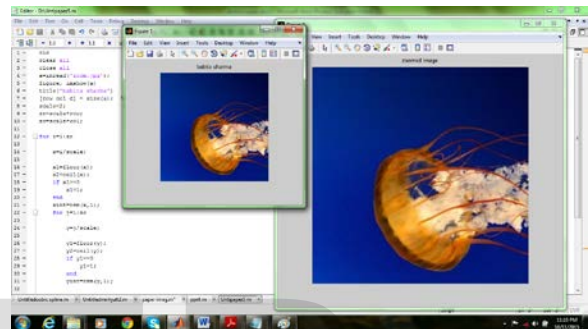


Fig.3.2 zooming of image by Scale factor is 2

These images are the new image with new pixels and without distortion and with different scale factor. Then finally the original image title 'babitasharma' is made to be Zoomed image by a scale factor 1.8, 1.2 and 2.

### 4 CONCLUSION

From experiment results it is clear that we were capable to fruitfully reproduce the results that are found by running our code in mat lab. From that results robustness of the algorithm is clear. We are capable to expand and shrink the size of each file and then kept it into the devices. Bilinear interpolation algorithm is continuous, and we found that the visual effect is better than the nearest point interpolation algorithm. We can also calculate PSNR and MSE values for result and to compare with different algorithm.

### 5. REFERENCES

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