

Research on Shrinking and Zooming of Digital Image by Interpolation Method for Different Purposes

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ABSTRACT: Zooming technology is an essential part of Personal Digital Assistants (PDAs) for today's information concerted world, which caused many problems for small screen interfaces. This paper introduces zooming applications such as a normal zoom, a focus zoom, and a search zoom which are based on geometric and semantic zooming methods^{[1][2]}. Digital images are the most common and convenient means of conveying or transmitting information. They share information about positions, sizes and relationships between objects. Digital image zooming is very important process in image processing. Basically zooming done by two steps: - the creation of new pixels locations and to assignment of gray level to those new locations. Digital image zooming with respect to their higher storage size and within Multi Media is a important subject in image processing. Zoom in a digital image means replacing the number of display pixels per image pixel only in appearance. Digital image shrinking is done in same manner as zoom in. In this paper we are using interpolation methods which have many advantages as we discussed.

KEYWORDS: Shrinking, Interpolation, Bilinear, PDA.

I. INTRODUCTION

The file zooming applications use dynamic zoom-in and zoom-out functions for visualizing large amounts of information. The focus zooming applications are built on a magnifying glass lens that is a 2D visualization for large rectangular presentations; they allow a user to quickly focus on a part of the PDA screen. Here we consider various interpolation schemes, particularly focusing on interpolation methods because of their inherent abilities to preserve sharp edges and detail. Proposed algorithm is an adaptive re sampling algorithm for zooming up images. The algorithm is based on analysing the local structure of the image and applying a near optimal and least time-consuming re sampling function will preserve edge locations and their contrast. This is done by segmenting the image dynamically into homogeneous areas, as it is scanned or received zooming algorithm which focuses on preserving edges.

DIGITAL IMAGE

A digital image is binary representation of a two dimensional image. A digital image has set of finite digital values which are also known as picture elements or pixels. An image may be defined as a two dimensional function $f(x, y)$ where x and y are spatial co-ordinates. The amplitude of 'f' at any pair of co-ordinate (x,y) is called the intensity 'or' grey level of the image at that point. Digital images are binary representations of images that are stored on a computer. The display elements are called pixels, and they are arranged in a grid format with each pixel containing information about its colour or intensity.

TYPES OF DIGITAL IMAGE

A. **PICT:** Stands for 'Picture' and is used for storing 8-bit, 16-bit or 24-bit colour or gray scale images. PICT files work well for the on screen presentation of graphics.

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B. **TIFF**: Stands for Tagged Image File Format that is used to exchange files between applications and computer platforms. It's supported by virtually all paint, image editing, and page-layout applications.

C. **GIF**: Stands for 'Graphic Interchange Format', which is used for simple web images. Because GIF files are limited to 256 colours, it is suggested that you not use this format for photographs or other images with high colour ranges.

D. **JPEG**: Stands for Joint Photographic Experts Group. JPEG is actually a standard method of compressing graphics by removing nonessential information. A JPEG file can be created from most file formats and is frequently used for web-based images because small file size is essential.

E. **PNG**: Stands for Portable Network Graphics format, an open source substitute for GIFs. PNGs provide a higher lossless compression rate than GIFs, and help to reduce cross-platform differences in image display quality, among other technical advantages.

For the purposes of sharing files, adding images to Power Point presentations and posting them to websites, the formats you are most likely to use are JPG and GIF. These files are almost universally readable by image editors, work well on websites, and offer small file sizes with reasonable quality levels.

IMAGE ZOOMING

Image zooming is an important process in image processing. Basically zooming require two steps :- the creation of new pixels locations and the assignment of gray level to those new locations. Suppose that we have an image of size 500*500 pixels and we want to enlarge it 1.5 times to 750*750 pixels. The spacing in the grid will be less than one pixel because we are fitting it over a small image. In order to perform gray level assignment for any point in the overlay, we look for the closest pixels in the original image and assign its gray level to the new pixels in the grid. This method gray level assignment is called nearest neighbour interpolation.

IMAGE SHRINKING

Image shrinking is done in similar manner as described for zooming. The equivalent process of pixel replication is row and column deletion. For example, we want to shrink an image by one- half; we delete every row and column. How to present information effectively on small devices? This is a main challenge for small-screen interface developers because viewing on a small screen is becoming more difficult in our daily lives. We must find effective ways to organize, show, and search data or results on a small screen. One of the methods is to build Zoom able Users, and all need tools to enable them to control the zooming purposes.

Paper is organized as follows. Section II describes efficient use of digital image. Experimental results are shown in the section III. Finally, Section IV presents conclusion.

II. RELATED WORK

For the purpose of digital image zooming and shrinking we used an efficient method which gives us better results in both kinds of operations. The method that we are using is known as interpolation method. It is a process to recover image from distorted to its original image. The restoration of degraded images can be applied in many application areas that are needed to repair images. Image interpolation is one part of image restoration.

Interpolation is an imaging method to increase or decrease the number of pixels in a digital image. It is applied in diverse areas ranging from computer graphics, rendering, editing, medical image reconstruction, to online image viewing. Interpolation is done by approximating the required function using simpler functions such as, polynomials. It is a link between the discrete world and the continuous one. This allows input values to be evaluated at arbitrary positions in the input, not just those defined at the sample points. The goal of image interpolation is to produce acceptable images at different resolutions from a single LR image. The actual resolution of an image is defined as the number of pixels, but the effective resolution is a much harder quantity to define as it depends on subjective human

judgment and perception. The image quality highly depends on the used interpolation technique. Image interpolation works in two directions, and tries to achieve a best approximation of a pixel's color and intensity based on the values at surrounding pixels.

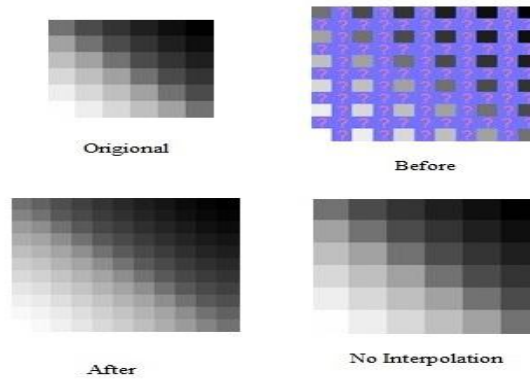
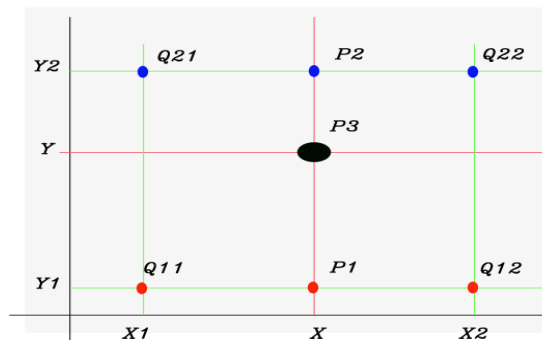


Fig. 1: Comparison of the results

ALGORITHM USED

Suppose that we want to find the value of the unknown function f at the point $P = (x, y)$. It is considered that we know the value of f at the four points

1. $Q_{11} = (x_1, y_1)$, $Q_{12} = (x_2, y_1)$, $Q_{21} = (x_1, y_2)$, and $Q_{22} = (x_2, y_2)$.
- 2.



3. We first do linear interpolation in the x-direction. This yields

$$f(R_1) \approx \frac{x_2 - x}{x_2 - x_1} f(Q_{11}) + \frac{x - x_1}{x_2 - x_1} f(Q_{21})$$

where, $R_1 = (x, y_1)$

4. $f(R_2) \approx \frac{x_2 - x}{x_2 - x_1} f(Q_{12}) + \frac{x - x_1}{x_2 - x_1} f(Q_{22})$

where $R_2 = (x, y_2)$.

5. We proceed by interpolating in the y-direction.

$$f(P) \approx \frac{y_2 - y}{y_2 - y_1} f(R_1) + \frac{y - y_1}{y_2 - y_1} f(R_2).$$

BILINEAR INTERPOLATION

In bilinear interpolation algorithm[4], the position of pixel P in the magnified image was converted into the original image, then the Influence of the four pixel points A, B, C and D was calculate. The nearer distance to the point P, the value is greater, which indicates the greater effects. The diagram of bilinear interpolation is shown in Fig. 2

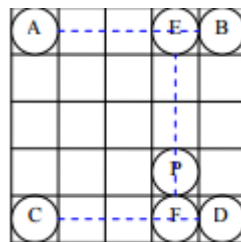


Fig. 2: Bilinear interpolation diagram

Suppose the coordinate of A, B, C and D are (i, j) , $(i, j + 1)$, $(i + 1, j)$ and $(i + 1, j + 1)$. The coordinate of P is (u, v) .

The bilinear interpolation algorithm consists of three steps:

Step 1: 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: 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.

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

Bilinear interpolation algorithm is broadly applied in digital image processing [3]. Bilinear interpolation is one of the basic techniques in image processing. It is also known as bilinear filtering. An algorithm is used to map a screen pixel location to a corresponding point. A weighted average of the attributes of the four surrounding pixels is computed and applied to the screen pixel. This is repeated for each pixel forming the object being textured. When an image is to be scaled up, each pixel of the original image needs to be moved in a certain direction based on the scale constant.. While, we want scaling up an image by a non-integral scale factor, there are pixels that are not assigned appropriate pixel values.

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III. EXPERIMENTAL RESULTS

These are the experimental results of the images. First figure shows the original image and after that the original is made shrunk image and finally the original image is made to be Zoomed image.

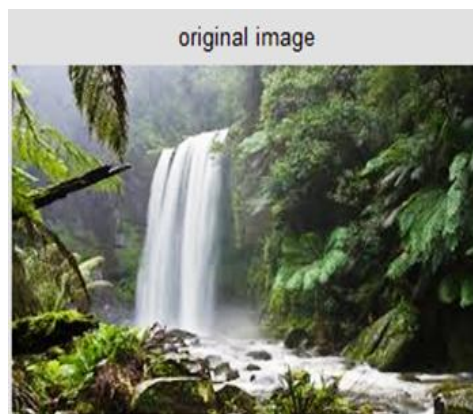


Fig.3: Original image.

We have original image without any distortion and noise. This image is clearly viewed with the appropriate pixels. This image is getting by using code and that code is made with the help of MATLAB. This image is the new image with new pixels and without distortion.

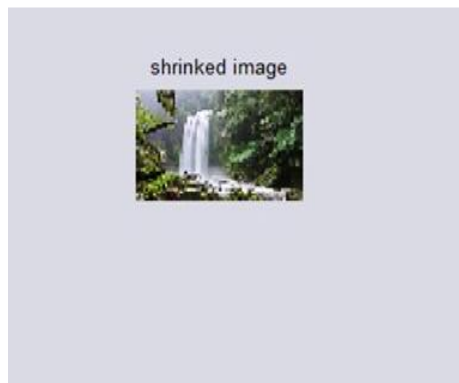


Fig.4: Shrinking of image.

This image is shrunk image of the original image. It shows the pixels are reduces as the original image. Figure 4 shows the shrinking image.

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Fig.5: Zoomed Image.

This image is zoomed image of the original image. It shows that pixels of the original image are expanding to make the zoom image. Figure5 shows the zooming image.

IV. CONCLUSION

We were able to successfully replicate the results found by running our code. This further shows the robustness of the algorithm. The file zooming applications were dynamically implemented zoom-in and zoom –out functions; we are able to enlarge and reduce the size of each file and saved it into the devices. Bilinear interpolation algorithm is continuous, so the visual effect is better than the nearest point interpolation algorithm.

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