

Optimizing graphic files

Introduction

As soon as I started using web-authoring tools, I realized that I should be careful to use graphics on the web. Well-designed graphics usually make the web site more attractive. However, graphic files can cause a matter due to a large file size. Here is a dilemma. I like to see a fancy graphic on the web. But I do not want to waste my precious time to download it.

For web designers, optimizing graphic files is an important skill to deal with. For general users who develop their own web site, like me, it is still an important issue. I reviewed articles on this topic written by professional web designers and by software product company.

In this paper, I will describe the differences between graphic file formats first since optimizing graphic files is different depending on the file formats. Then, I will show the ten ways to reduce file size regardless of the program. In the next section, I will compare the ways to optimize graphics in the two programs, Adobe Photoshop 5.5 (ImageReady 2) and Macromedia Fireworks 3. In the last part, I will summarize what we should keep in mind while creating web graphics.

What exactly does “optimizing graphic files,” mean? It means that we should reduce the graphic file size to make the downloading times reasonable while preserving the image quality. The simple way to make the downloading time shorter is to spare with graphics. But if a graphic enhances the content of your site, we should optimize the graphic files.

Graphic file formats

Graphic file formats are broadly categorized into bit-mapped formats and vector formats. Bit-mapped graphics refer to image that are composed of a pattern of dots while vector graphics use geometrical formulas to represent images. Vector graphics have some

advantages compared to bitmapped graphics. One of them is that it requires a smaller file size than bit-mapped graphics do.

There are a large number of graphics file formats, however, the following three formats are most widely used and are becoming more popular. They are GIF, JPEG, and PNG. The following chart shows the features of three file formats briefly.

Format	Compression Ratios	Compression Features
GIF	4:1 – 10:1	<ul style="list-style-type: none"> • Lossless for images • Works best for flat color, sharp-edged art • Horizontal bands of color compress better than vertical bands
JPEG	5:1 – 10:1 20:1 – 40:1 50:1 – 100:1	<ul style="list-style-type: none"> • High quality – has little or no loss in image quality with continuous-tone originals • Moderate quality – usually the best choice for the web • Poor quality – suitable for thumbnails and previews
PNG	One third smaller than GIFs	<ul style="list-style-type: none"> • PNGs behave similar to GIFs and work best with flat-color, sharp-edged art • PNGs compress both horizontally and vertically, so solid blocks of color generally compress best

The GIF format is the bit-mapped file format. This format is used for images with solid color or flat color image, type, and cartoons. Using transparency is one of the advantages of GIF format. However, the color is restricted to 8-bit color (256 colors).

The JPEG file format is designed to compress photographs or images with continuous-tone color. It reduces image file size by losing some data from the file in the compression process. However, it depends on the quality settings. I will take a closer look at this later in the paper.

PNG, Portable Network Graphic, became a new standard for web graphics. It was designed to replace GIFs on the web. Technical reasons for PNG's popularity include the compactness of PNG images, the number of colors available using PNG, and the ability

to manipulate the transparency of more than one color in more than one way. However, it has a limitation due to the lack of browser compatibility.

There are some guidelines for selecting the best graphic format for an image file.

1. Images created with vector-based drawing programs and typographic images are usually good candidates for GIF format.
2. Images that have been scanned or created in a bitmap drawing or painting program will typically work well as a JPEG.
3. If an image is a combination of solid color and continuous tones, experiment with both and find the best result.

Ten ways to reduce graphic file size in general

How to reduce graphic file size depends on the program and its file formats. I chose ten ways to reduce graphic file size in general by reviewing the articles written by web designers.

1. File Format

GIF has been a lossless file format. That is, it loses no pixel data in the compression process. However, lossy file formats such as JPEG, the compression eliminate some pixel data in order to make a file size smaller. Generally, when we choose between lossy and lossless, we are making some trade-off between file size and image quality. It means that lossy gives smaller file size and lower quality, and vice versa.

Recently, Adobe ImageReady 2.0 (and Photoshop 5.5's Save for the Web dialog box) include the new GIF lossy slider. "lossy" GIF? This new feature allows us squeeze out a smaller GIF file with a sometimes negligible loss in quality. Depending on the file, we have seen lossy settings as low as 5-10 percent reduces the file size by 5-40 percent without serious degradation in the file quality.

2. Color depth (Bit depth)

The more colors our graphic uses, the more file space the color information will take up. GIFs can use as many as 256 colors, known as 8-bit color or as little as two colors (black

and white), known as 1-bit color. If we make an image only 256 colors (8-bit color) instead of 24-bit color image, we can reduce the file size to 1/3.

3. Color palettes

We can choose the color palette when we create the image. However, 256 color system palettes are different between platforms. The 216 colors that are common to both Mac and Windows palettes are web-safe colors. Using web-safe colors gives us two benefits. One is that we can reduce the file size, the other is that we can display the image exactly the same on both platforms. Either web or adaptive palette is usually selected for GIFs.

4. Resolution

The computer screen typically displays data at 72 dpi, so it is not necessary to work at a high resolution. Therefore, it is safe to stick to the lower resolution so that we will get the same quality for smaller file size.

5. Cropping

Cropping can greatly enhance the image's effectiveness. It also reduces the file size. It is good to use cropping as much as possible. We can often see the well-cropped images on the web.

6. Non-Dithering

When we reduce GIF's color depth, we can see gradients turn into bands of color. We can use "dithering" to smooth the transitions. However, dithering makes a graphic's file size bigger. Therefore, if a non-dithered image is acceptable, it is better not to use dithering to keep the file size small. In order to avoid dithering, it is recommended to create images that use the colors specified in the browser's default color palette.

7. Transparency

Using transparency is taking advantage of GIFs and reduces the file size a bit.

Transparent GIFs are great for banners, non-rectangular buttons, separator bars, and accent images. The transparent color is usually the background color. There is usually some ghosting around the edges of the foreground figure in transparent GIFs. To minimize this effect, a background color matches the dominant color of your page's background.

The JPEG format does not support transparency. Instead, a matte color matches the web page background color on which the JPEG will appear.

8. Smoothing

When we set the quality to “low”, while saving as a JPEG, we may see some coarseness in the image. Smoothing blurs the edges and creates a more even transition between areas of high contrast. Smoothing removes small amount of data from the image, and can reduce the file size. A higher smoothing setting applies more smoothing and further reduces file size. However, too much smoothing can cause blurring and loss of detail.

9. Aliased

Anti-aliased graphics can add size to the graphics. In addition, their appearance will vary more from system to system than aliased graphics will.

10. Progressive

Interlaced GIFs and Progressive JPEGs are used to keep the user’s interest and to give the user an idea about what the wait is for. Progressive JPEGs often have smaller file sizes than their non-progressive counterparts. In contrast, interlaced GIFs always larger than their non-interlaced counterparts.

Optimizing graphics in Photoshop and Fireworks

In the previous section, I mentioned ten ways to reduce graphic file size in general. My next question is how each program does a very good job of image optimizing. I cannot describe and compare all the programs in this paper. I will show how to optimize graphics in Photoshop 5.5 (ImageReady) and Fireworks 3 in terms of file formats such as GIF and JPEG.

Some say that Adobe ImageReady and Macromedia Fireworks are extremely powerful for optimizing images. It is known that these two programs create smaller files at the same bit depth than the other programs. In both programs, GIF is a little trickier to optimize images, while JPEG is fairly straightforward to do.

Generally, JPEG seems pretty simple to optimize because we just choose a quality of images in the quality settings dialog box. But in the compression process, the file loses some data so that sharp edges can appear rough or jagged.

Fireworks supports the following file types: PNG, GIF, JPEG, BMP, TIFF, xRes, LRG, ASCII, RTF, Adobe Photoshop 3,4,5, Adobe Illustrator 7, Macromedia FreeHand 7,8, CorelDRAW 7, and Targa.

As you may have noted, Fireworks has a visible handy tool to compare optimized graphics. Let's take a close look at how to optimize graphics in Fireworks. First, let's see how to optimize an image as a JPEG. As mentioned before, JPEG always uses 24-bit color depth, and it does not handle 8-bit color (indexed images). We have to convert these images into RGB before compressing them as JPEGs. There is more than one way to optimize JPEG files in Fireworks.

For the first way to optimize graphics is as follows: First, select Export Wizard from the file menu and then compare the results by changing the setting. Another way to optimize files is to select optimize from the window menu, then choose JPEG and change settings to get the best result.

Optimizing GIF files occurs in the same manner as is used with JPEG files. The difference is that GIFs require selecting bit-depth, color palette, and dithering instead of just a quality setting.

Optimizing Graphic files in Photoshop is not much different from the process in Fireworks. It is good to use Save for web under the file menu to optimize graphics as a JPEG or a GIF. In the case of JPEG, choose JPEG quality from low to maximum. JPEG Medium is usually selected. Then, we can compare the result of different settings by using the 2-Up and 4-Up tabs. If we want to save the graphic as a GIF, we also click "Save for web" dialog box under the file menu. Then, choose GIF as a file format, and then click the optimize tab in the dialog box. We can select color palette, color depth, loss quality, dithering and transparency. Turning dithering off can create a smaller compressed file size.

Conclusion

First, I compared the three file formats in terms of the compression features. The JPEG file format seems flexible with regards to changing the file size by selecting the quality settings. Next, I described ten ways to reduce graphic file size widely used among web designers. But, it can be difficult handling the balance of file size and image quality. Some readers may not agree with the ten ways described in this paper. It really depends on the specific image. Some of the ten ways are very important when we have a large graphic image such as 20K or larger.

Last but not least, we should keep in mind that testing graphics on different platforms is as much important as optimizing graphics since unexpected change in graphics can happen on different platforms. It is safer to test the graphics on different platforms before uploading them to the web. It is also recommended to view the graphics under both Netscape Navigator and Internet Explorer.

References

Jeffrey Veen, *What happened to PNG?*

(<http://hotwired.lycos.com/webmonkey/99/09/>)

Lori Davis, *Optimizing* (<http://loriweb.pair.com/optimize.html>)

Mary Burger and Randy Varnell, *Optimizing an image as a JPEG*

(http://macromedia.com/support/fireworks/optimize/optimize_jpeg/optimize_jpeg.html)

Tim Ziegler, *Optimizing your images*

(<http://hotwired.lycos.com/webmonkey/99/15/>)

Optimizing web graphics

(<http://www.webreference.com/dev/graphics>)

Optimizing the graphic file

(<http://www.projectcool.com/developer/gzone/optimizing/>)

Adobe Magazine

(<http://www.adobe.com/products/adobemag/archive/pdfs/0001qaps.pdf>)

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