**Different Image Formats – And When to Use Them**

These are all different and incompatible, though. These image formats have their own pros and cons. They were created for specific, yet different, purposes. What’s the difference, and when is each format appropriate to use?

Let us tackle the five most common image formats for the web and computer graphics: JPEG, GIF, BMP, TIFF and PNG.

**JPEG**

JPEG is short for Joint Photographic Experts Group, and is the most popular among the image formats used on the web. JPEG files are very ‘lossy’, meaning so much information is lost from the original image when you save it in JPEG file. This is because JPEG discards most of the information to keep the [image file](http://en.wikipedia.org/wiki/Image_file_formats) size small; which means some degree of quality is also lost.

Original File:

JPEG Medium Compressed File:

As shown above, image compression is not that evident at first glance. But if you take a closer look, the JPEG image is not as sharp as the original image. The colors are paler and the lines are less defined and the picture is noisier. If you zoom in there are JPEG artifacts like any other JPEG files.

JPEG compression of varying levels, from highest to lowest.

Almost every digital camera can shoot and save in the JPEG format. JPEG is very web friendly because the file is smaller, which means it takes up less room, and requires less time to transfer to a sites. Moreover it is less grainy then GIF, the old king of the internet roost. Since 1994, JPEG has been considered the standard.

Pros of JPEG:

* 24-bit color, with up to 16 million colors
* Rich colors, great for photographs that needs fine attention to color detail
* Most used and most widely accepted image format
* Compatible in most OS (Mac, PC, Linux)

Cons of JPEG:

* They tend to discard a lot of data
* After compression, JPEG tends to create artifacts
* Cannot be animated
* Does not support transparency

**GIF**

GIF, short for Graphics Interchange Format, is limited to the 8 bit palette with only 256 colors. GIF is still a popular image format on the internet because image size is relatively small compared to other image compression types.

Image by [If.ufrgs.br](http://if.ufrgs.br/)

GIF compresses images in two ways: first, by reducing the number of colors in rich color images, thus reducing the number of bits per pixel. Second, GIF replaces multiple occurring patterns (large patterns) into one. So instead of storing five kinds of blue, it stores only one blue.

Image by Cloudsper

GIF is most suitable for graphics, diagrams, cartoons and logos with relatively few colors. GIF is still the chosen format for animation effects.

Image by Westnet

Compared to JPEG, it is lossless and thus more effective with compressing images with a single color, but pales in detailed or dithered pictures. In other words, GIF is lossless for images with 256 colors and below. So for a full color image, it may lose up to 99.998% of its colors.

One edge of the GIF image format is the interlacing feature, giving the illusion of fast loading graphics. When it loads in a browser, the GIF first appears to be blurry and fuzzy, but as soon as more data is downloaded, the image becomes more defined until all the date has been downloaded.

Pros of GIF:

* Can support transparency
* Can do small animation effects
* ‘Lossless’ quality–they contain the same amount of quality as the original, except of course it now only has 256 colors
* Great for images with limited colors, or with flat regions of color

Cons of GIF:

* Only supports 256 colors
* It’s the oldest format in the web, having existed since 1989. It hasn’t been updated since, and sometimes, the file size is larger than PNG.

**BMP**

The Windows Bitmap or BMP files are image files within the Microsoft Windows operating system. In fact, it was at one point one of the few image formats. These files are large and uncompressed, but the images are rich in color, high in quality, simple and compatible in all Windows OS and programs. BMP files are also called raster or paint images.

BMP files are made of millions and millions of dots called ‘pixels’, with different colors and arrangements to come up with an image or pattern. It might an 8-bit, 16-bit or 24-bit image. Thus when you make a BMP image larger or smaller, you are making the individual pixels larger, and thus making the shapes look fuzzy and jagged.

BMP files are not great and not very popular. Being oversized, bitmap files are not what you call ‘web friendly’, nor are they compatible in all platforms and they do not scale well.



Pros of BMP:

* Works well with most Windows programs and OS, you can use it as a Windows wallpaper

Cons of BMP:

* Does not scale or compress well
* Again, very huge image files making it not web friendly
* No real advantage over other image formats

**TIFF**

TIFF was created by Aldus for ‘desktop publishing’, and by 2009 it was transferred to the control of Adobe Systems. TIFF is popular among common users, but has gained recognition in the graphic design, publishing and photography industry. It is also popular among Apple users.

Above is a screenshot of how a TIFF image looks like–TIFF is not compatible for all systems; so to be sure, I uploaded a screenshot in JPEG of a TIFF image preview instead of uploading the original TIFF image here. Notice the crisp quality and rich colors of the photo.

The TIFF image format is easy to use with software that deasl with page layout, publishing and photo manipulation via fax, scanning, word processing, etc. TIFF is very flexible, it can be lossy or lossless. TIFF is a rich format and supported by many imaging programs. It is capable of recording halftone image data with different pixel intensities, thus is the perfect format for graphic storage, processing and printing. This makes TIFF the superior raster image format.

Pros of TIFF:

* Very flexible format, it supports several types of compression like JPEG, LZW, ZIP or no compression at all.
* High quality image format, all color and data information are stored
* TIFF format can now be saved with layers

Cons of TIFF:

* Very large file size–long transfer time, huge disk space consumption, and slow loading time.

**PNG**

PNG or (Portable Network Graphics) is a recently introduced format, so not everyone familiar with it. But PNG has been approved as a standard since 1996. It is an image format specifically designed for the web. PNG is, in all aspects, the superior version of the GIF. Just like the GIF format, the PNG is saved with 256 colors maximum but it saves the color information more efficiently. It also supports an 8 bit transparency.

Image by Hello eBoy

PNG was actually created for the intent to replace the GIF as an image format that doesn’t require a patent license. PNG can support 24 bit RGB color images, grayscale images, both with and without alpha channels. RGB cannot support CMYK color spaces, and is not designed for print graphics.

Pros of PNG:

* Lossless, so it does not lose quality and detail after image compression
* In a lot ways better then GIF. To start, PNG often creates smaller file sizes than GIF
* Supports transparency better than GIF

Cons of PNG:

* Not good for large images because they tend to generate a very large file, sometimes creating larger files than JPEG.
* Unlike GIF however, it cannot be animated.
* Not all web browsers can support PNG.

**In a Nutshell**

There is no universal image format that is best for all scenarios. Every type of image format has their own advantages and disadvantages. Here is a summation of each image format, their pros and cons, as well as when and where it’s best to use them.

Print Graphics: TIFF is the best and only choice for professionals when images are intended for print. Its ability to read CMYK and YcbCr color, plus its ability to store such high pixel intensity makes it the only choice for designers, photographers and publishers.

Web Graphics: PNG, JPEG and GIF are the most web friendly image formats there is. JPEG is great for images when you need to keep the size small, such as when you need to upload it online. If you don’t mind compromising the quality of the image a bit, use JPEG. If you want to keep the size small, but still retain the image quality, use PNG. GIF is the worst choice, although file sizes are very small, and they load very fast. Plus, if you want to add animation effects, use GIF.

PC & Mac Compatibility: If you are using Mac or PC, or constantly shifting from one to another, JPEG is the best image format for PC and Mac Compatibility.

Logos & Line Art: JPEG is the worst choice, it tends to add artifacts and blur the text, line and edges. JPEG also cannot support transparency, which is often a need for logos or icons. GIF is a good choice, but it pales in comparison to TIFF and PNG. Both of the latter image formats are lossless, store as much image information, and are not limited to 256 colors, unlike GIF. They also don’t add artifacts (the downfall of JPEG) and keep the logo or line art sharp and concise.

Clip Art: GIF is the best image for clipart and drawn graphics that only use few colors and precise lines & shapes.

KANKA ÜSTTEKİ MAKALEYİ BEĞENMEZSEN AŞAĞIDAKİNİ KULLAN AMA ÜSTTEKİ DAHA GÜZEL

Digital Image File Types Explained

JPG, GIF, TIFF, PNG, BMP. What are they, and how do you choose? These and many other file types are used to encode digital images. The choices are simpler than you might think.

Part of the reason for the plethora of file types is the need for *compression*. Image files can be quite large, and larger file types mean more disk usage and slower downloads. Compression is a term used to describe ways of cutting the size of the file. Compression schemes can by *lossy* or*lossless*.

Another reason for the many file types is that images differ in the number of colors they contain. If an image has few colors, a file type can be designed to exploit this as a way of reducing file size.

Lossy vs. Lossless compression

You will often hear the terms "lossy" and "lossless" compression. A lossless compression algorithm discards no information. It looks for more efficient ways to represent an image, while making no compromises in accuracy. In contrast, lossy algorithms accept some degradation in the image in order to achieve smaller file size.

A lossless algorithm might, for example, look for a recurring pattern in the file, and replace each occurrence with a short abbreviation, thereby cutting the file size. In contrast, a lossy algorithm might store color information at a lower resolution than the image itself, since the eye is not so sensitive to changes in color of a small distance.

Number of colors

Images start with differing numbers of colors in them. The simplest images may contain only two colors, such as black and white, and will need only 1 bit to represent each pixel. Many early PC video cards would support only 16 fixed colors. Later cards would display 256 simultaneously, any of which could be chosen from a pool of 224, or 16 million colors. New cards devote 24 bits to each pixel, and are therefore capable of displaying 224, or 16 million colors without restriction. A few display even more. Since the eye has trouble distinguishing between similar colors, 24 bit or 16 million colors is often called TrueColor.

The file types

**TIFF**is, in principle, a very flexible format that can be lossless or lossy. The details of the image storage algorithm are included as part of the file. In practice, TIFF is used almost exclusively as a lossless image storage format that uses no compression at all. Most graphics programs that use TIFF do not compression. Consequently, file sizes are quite big. (Sometimes a lossless compression algorithm called LZW is used, but it is not universally supported.)

**PNG** is also a lossless storage format. However, in contrast with common TIFF usage, it looks for patterns in the image that it can use to compress file size. The compression is exactly reversible, so the image is recovered exactly.

**GIF**creates a table of up to 256 colors from a pool of 16 million. If the image has fewer than 256 colors, GIF can render the image exactly. When the image contains many colors, software that creates the GIF uses any of several algorithms to approximate the colors in the image with the limited palette of 256 colors available. Better algorithms search the image to find an optimum set of 256 colors. Sometimes GIF uses the nearest color to represent each pixel, and sometimes it uses "error diffusion" to adjust the color of nearby pixels to correct for the error in each pixel.

GIF achieves compression in two ways. First, it reduces the number of colors of color-rich images, thereby reducing the number of bits needed per pixel, as just described. Second, it replaces commonly occurring patterns (especially large areas of uniform color) with a short abbreviation: instead of storing "white, white, white, white, white," it stores "5 white."

Thus, GIF is "lossless" only for images with 256 colors or less. For a rich, true color image, GIF may "lose" 99.998% of the colors.

**JPG**is optimized for photographs and similar continuous tone images that contain many, many colors. It can achieve astounding compression ratios even while maintaining very high image quality. GIF compression is unkind to such images. JPG works by analyzing images and discarding kinds of information that the eye is least likely to notice. It stores information as 24 bit color. Important: the degree of compression of JPG is adjustable. At moderate compression levels of photographic images, it is very difficult for the eye to discern any difference from the original, even at extreme magnification. Compression factors of more than 20 are often quite acceptable. Better graphics programs, such as Paint Shop Pro and Photoshop, allow you to view the image quality and file size as a function of compression level, so that you can conveniently choose the balance between quality and file size.

**RAW** is an image output option available on some digital cameras. Though lossless, it is a factor of three of four smaller than TIFF files of the same image. The disadvantage is that there is a different RAW format for each manufacturer, and so you may have to use the manufacturer's software to view the images. (Some graphics applications can read some manufacturer's RAW formats.)

**BMP**is an uncompressed proprietary format invented by Microsoft. There is really no reason to ever use this format.

**PSD, PSP, etc.**, are proprietary formats used by graphics programs. Photoshop's files have the PSD extension, while Paint Shop Pro files use PSP. These are the preferred working formats as you edit images in the software, because only the proprietary formats retain all the editing power of the programs. These packages use layers, for example, to build complex images, and layer information may be lost in the nonproprietary formats such as TIFF and JPG. However, be sure to save your end result as a standard TIFF or JPG, or you may not be able to view it in a few years when your software has changed.

Currently, GIF and JPG are the formats used for nearly all web images. PNG is supported by most of the latest generation browsers. TIFF is not widely supported by web browsers, and should be avoided for web use. PNG does everything GIF does, and better, so expect to see PNG replace GIF in the future. PNG will *not* replace JPG, since JPG is capable of much greater compression of photographic images, even when set for quite minimal loss of quality.

File size comparisons

Below are comparisons of the same image saved in several popular file types. (Note that there is no reason to view more than one of the TIFFs or the PNG. Since all are lossless formats, their appearance is identical.)

|  |  |  |
| --- | --- | --- |
| **File type** | **Size** | **Image Example** |
| Tiff, uncompressed | 901K | [Not viewable in most browsers. Click here to try.](http://users.wfu.edu/matthews/misc/graphics/formats/uncompr.tif) |
| Tiff, LZW lossless compression (yes, its actually bigger) | 928K | [Not viewable in most browsers. Click here to try.](http://users.wfu.edu/matthews/misc/graphics/formats/lzw.tif) |
| JPG, High quality | 319K | [Click here](http://users.wfu.edu/matthews/misc/graphics/formats/HiQ.jpg). |
| JPG, medium quality | 188K | [Click here.](http://users.wfu.edu/matthews/misc/graphics/formats/MedQ.jpg) |
| JPG, my usual web quality | 105K | [Click here.](http://users.wfu.edu/matthews/misc/graphics/formats/WebQ.jpg) |
| JPG, low quality / high compression | 50K | [Click here.](http://users.wfu.edu/matthews/misc/graphics/formats/Lo.jpg) |
| JPG, absurdly high compression | 18K | [Click here.](http://users.wfu.edu/matthews/misc/graphics/formats/absurd.jpg) |
| PNG, lossless compression | 741K | [Click here](http://users.wfu.edu/matthews/misc/graphics/formats/png.png). |
| GIF, lossless compression, but only 256 colors | 286K | [Click here.](http://users.wfu.edu/matthews/misc/graphics/formats/optmedcut.gif) |

When should you use each?

TIFF

This is usually the best quality output from a digital camera. Digital cameras often offer around three JPG quality settings plus TIFF. Since JPG always means at least some loss of quality, TIFF means better quality. However, the file size is huge compared to even the best JPG setting, and the advantages may not be noticeable.

A more important use of TIFF is as the working storage format as you edit and manipulate digital images. You do not want to go through several load, edit, save cycles with JPG storage, as the degradation accumulates with each new save. One or two JPG saves at high quality may not be noticeable, but the tenth certainly will be. TIFF is lossless, so there is no degradation associated with saving a TIFF file.

Do NOT use TIFF for web images. They produce big files, and more importantly, most web browsers will not display TIFFs.

JPG

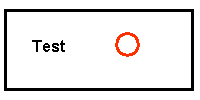
This is the format of choice for nearly all photographs on the web. You can achieve excellent quality even at rather high compression settings. I also use JPG as the ultimate format for all my digital photographs. If I edit a photo, I will use my software's proprietary format until finished, and then save the result as a JPG.

Digital cameras save in a JPG format by default. Switching to TIFF or RAW improves quality in principle, but the difference is difficult to see. Shooting in TIFF has two disadvantages compared to JPG: fewer photos per memory card, and a longer wait between photographs as the image transfers to the card. I rarely shoot in TIFF mode.

Never use JPG for line art. On images such as these with areas of uniform color with sharp edges, JPG does a poor job. These are tasks for which GIF and PNG are well suited. See [JPG vs. GIF for web images](http://users.wfu.edu/matthews/misc/jpg_vs_gif/JpgVsGif.html).

GIF

If your image has fewer than 256 colors and contains large areas of uniform color, GIF is your choice. The files will be small yet perfect. Here is an example of an image well-suited for GIF:



Do NOT use GIF for photographic images, since it can contain only 256 colors

PNG

PNG is of principal value in two applications:

1. If you have an image with large areas of exactly uniform color, but contains more than 256 colors, PNG is your choice. Its strategy is similar to that of GIF, but it supports 16 million colors, not just 256.
2. If you want to display a photograph *exactly* without loss on the web, PNG is your choice. Later generation web browsers support PNG, and PNG is the only lossless format that web browsers support.

PNG is superior to GIF. It produces smaller files and allows more colors. PNG also supports *partial transparency*. Partial transparency can be used for many useful purposes, such as fades and antialiasing of text. Unfortunately, Microsoft's Internet Explorer does not properly support PNG transparency, so for now web authors must avoid using transparency in PNG images.

Other formats

When using graphics software such as Photoshop or Paint Shop Pro, working files should be in the proprietary format of the software. Save final results in TIFF, PNG, or JPG.

Use RAW only for in-camera storage, and copy or convert to TIFF, PNG, or JPG as soon as you transfer to your PC. You do not want your image archives to be in a proprietary format. Although several graphics programs can now read the RAW format for many digital cameras, it is unwise to rely on any proprietary format for long term storage. Will you be able to read a RAW file in five years? In twenty? JPG is the format most likely to be readable in 50 years.Thus, it is appropriate to use RAW to store images in the camera and perhaps for temporary lossless storage on your PC, but be sure to create a TIFF, or better still a PNG or JPG, for archival storage.

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İTÜ Bilgisayar Mühendisliği