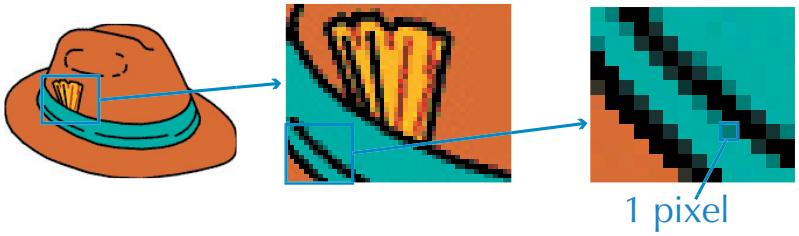
Digital Images

Digital images are widely available and affordable. Even the least expensive digital cameras and scanners can produce images of acceptable quality for use in print and on the Web. Digital cameras and scanners have settings that affect the image files produced.

Bitmap Images

Digital images that were produced by a scanner or digital camera are *bitmap images*, which are based on rows and columns of tiny dots that are square in shape. Each square is a *pixel* and is made up of one solid color. Many pixels of varying colors create an image:



The number of *dots per inch (dpi)* is called the *resolution*. The larger the number of dpi, the better the quality of the graphic. Common bitmap image formats are BMP, JPG, TIFF and GIF.

Vector Graphics

Another type of graphic that is frequently used are *vector graphics*, which are composed of lines connected by points. Vector graphics can be resized smoothly, without developing a jagged-edge look that is common in low-resolution bitmap images. Vector graphics are created using software such as Adobe Illustrator or Macromedia FreeHand.

Digital Camera File Formats

When a digital camera takes a photograph, a chip in the camera collects light and converts it to data. Settings in the digital camera determine what the camera does with the data that is collected. Common settings in digital cameras process the data into JPEG, TIFF, or RAW image files. The JPEG setting and the TIFF setting produce image files that can easily be used in most applications and on the Web, once they are transferred to a computer or printer. The TIF format has better quality than a JPG and is the better choice for printed matter such as newsletters, flyers, and brochures. The file size of a TIF is usually too large for use on the Web, and the format is not widely acceptable on Web pages, so the TIF must be converted to a JPG for use in a Web page.

The RAW setting indicates that the photograph data is not processed in the camera. The data must be transferred to a computer that has had software from the camera's manufacturer installed. The RAW file is manipulated using the software and saved in different image file formats, which is one reason why many professional photographers use the RAW setting. Manipulating a RAW file and saving the image in a different file formats can be thought of as *processing* the digital film, because it allows adjustments such as exposure and color balance to be made. RAW file names have different extensions depending on the camera, for example .mrw is a Minolta camera RAW file, .crw is a Canon camera RAW file, and .nef is a Nikon camera RAW file.

Megapixels and Resolution

The word *resolution* is used to describe the dimensions of an image in pixels and the pixels per inch of an image. Both uses are correct.

One megapixel is one million pixels. The megapixel specification for a digital camera is dependent on the number of pixels on the camera's chip that collect light and convert it to data. For example, a camera with a chip that is 1,600 pixels wide and 1,200 pixels tall has a total of 1,920,000 pixels and is considered to be a 2 megapixel camera with a resolution of 1,600 x 1,200.

A *scanner* is used to scan a photograph or drawing and create a digital image. The scanner can be operated through many applications, such as an image editing application. Common file formats of scanned images include TIF or TIFF, BMP, and JPG.

Maintaining Image Quality in JPG Files

Setting a digital camera to process the photograph data into a JPEG file is a fast, convenient way to produce image files for use in a web page. However, every time a JPG image is saved it is compressed again and loses more data, because the JPG format has lossy compression.If any editing needs to be done to the image, be sure to keep the original file unchanged and change copies of the file.

To retain excellent image quality, the camera should set to process the photograph data as TIFF, and the TIF file can later be modified in a computer as needed and saved in JPG format. This way, the image will have much better quality than if it was processed as a JPG and then modified and saved a few times.

When using a high-resolution digital camera such as a 3 or more megapixel camera, processing the photograph data as JPG is acceptable. In this case, the image is originally at a high resolution. After tranferring the high-resolution image to a computer, it can be it can be used in printed matter or saved at a lower resolution for use on a web page and still retain sufficient quality.

Image Resolution for use on the Web

Most computer monitors display at a resolution of 72 pixels per inch. An image file used in a web page should therefore have a resolution of 72 pixels per inch. Any larger number includes image data that will not be able to be displayed on a screen, and therefore just increases the file size.

Digital Camera Image Resolution

Digital cameras and scanners have settings that affect the resolution of the saved images. Scanner options are usually simply expressed in dpi. In a digital camera, these settings may be called something similar to "File Size" or "Quality" and may have settings such as Large, Medium, and Small, which affect the resolution of the image file processed by the camera. For example, selecting Large may result in 1600 x 1200 pixel images, and Small may result in 640 x 480 pixel images. The file size (in kilobytes) of the Large image will be larger than the file size of the Small image because it contains more data.

Modifying Digital Images

The actual commands and methods vary between applications, but most of the names are similar. This section lists generic terms that apply to digital images and should be used to understand how an images can be changed.

image size The image size (dimensions) in usually expressed in pixels, but may also be in inches, centimeters, or picas.

resolution The resolution is usually expressed in pixels per inch.

color Images that are RGB (red, green, blue) are best used oin the Web. Images that are CMYK (cyan, magenta, yellow, and black) are used for print. Digital images are usually RGB unless they have been converted to CMYK using an application.

Using Images in PowerPoint

Microsoft PowerPoint 2003 has a feature called Photo Album that includes options for selecting images from a scanner or digital camera connected to the computer. Use this feature by selecting Insert ➞ Photo ➞ New Photo Album.

Smaller, not Larger, to Maintain Image Quality

It is better to start off with the highest-quality image possible, and then reduce the size later. The dimensions of a bitmap image should never be changed to larger because the software extrapolates data information to fill in additional pixels, which results in poor image quality. The resolution (dpi) also cannot be increased without resulting in poor image quality.

Compromises may sometimes need to be made because the larger file sizes of high-quality images require more space in memory, and therefore fewer images can be stored. When creating images that will only be used on the Web, save time by scanning or shooting the photos at the low resolution.

contrast Adjust the contrast between the lightest areas and darkest areas in the image.

brightness Adjust how dim or bright an image appears.

crop Trim away areas of an image.

transparency Make a selected color transparent. This option may not be available depending on the image file type. For example, this feature is not available for JPGs, but can be used for GIFs. Typically the background color of a GIF will be formatted as transparent, so that it iwll blend in well with .

scale Used to size the image smaller proportionally. Never size an image larger, becuase the quality will go down.

canvas This term is sometimes used to refer to the image area. Making the canvas larger will not change the size of the image, just add space around the image.

compression A file format feature that reduces file size.

GIF A file format best used with graphics that do not contain many colors, such as clip art or logos.

interlaced A GIF file format feature in which a low-quality version of the graphic appears first and becomes clearer in four horizontal passes as the web page fully loads.

JPG A file format that supports millions of colors and is best used for photographs.

lossless compression Type of compression in which all of the original file information is retained. Used for GIF graphics.

lossy compression Type of compression in which some data in the file is removed in order to reduce the file size. Used for JPG graphics.

optimized image The best quality images with the smallest possible file size.

PNG A file format created in the mid-1990s during a controversy over copyright of the GIF format. It is only supported by the newest browsers.

progressive A JPG file format feature in which a low-quality version of the JPG graphic appears when a Web page is first loaded and then becomes clearer as the page fully loads.

proportionate size The width and height of a graphic are in the same ratio as the original graphic to prevent distortion.