BritePix

Resolution, Pixels, and dpi.

Have you ever wondered what does it mean that your computer monitor is configured for a display resolution of 800 x 600 pixels ? Or that your printer is capable of printing 300 dpi ? Or that your new digital camera shoots 6 megapixels images? As will be explained below, these concepts are all related.

On a piece of paper, the size of an image is measured in inches or centimetres. In a digital device, like a monitor or a camera, the size of an image is measured in pixels. Pixels are the smallest basic units that compose a digital image. In fact, the term pixel is an abbreviation from "picture element". So, a lot of small pixels put together make up an image. Obviously, the more pixels an image has, the more resolution it has, and thus, more detail that can be seen in the image with the naked eye. Pixels do not have a fixed equivalent size or measurement in inches. The size of one pixel depends on the quantity of pixels that compose an image of a fixed size.

The screen size of a computer monitor can also be measured in pixels. For instance, the average 14 inch monitor has an 11 inches wide x 8 inches high screen (approximately). When configured to display 72 ppi or pixels per inch, it creates 800 pixels wide x 600 pixels high images on screen. (11.1 x 72 = 800). Monitors can also be configured to display 96 ppi, thus creating approximately 1024 x 768 pixel images on screen.

A 6" by 4" photograph scanned at 300 ppi will generate 1800 pixels on the wide side and 1200 pixels on the high side. An image shot with a 2 megapixel camera will usually have 1600 pixels wide x 1200 pixels high, making up 1.92 million pixels in total, or approximately "2 megapixels".

In the printing industry, the term "dots per inch", or dpi has been adopted to advertise the resolution of each printing device; dpi is an analogue concept of ppi (although not exactly the same) that rates how many dots the printer can space in an inch of paper. When referring to images, or printing images, the terms dpi and ppi can be used as the same equivalent concept. 300 dpi is the standard high quality resolution for most inkjet printers.

Understanding about resolution is very important when determining printing size. A 2 megapixel image (1600 x 1200 pixels) printed at 300 dpi will result in a 5.33 inches high x 4 inches wide print (1600 / 300 = 5.33 and 1200 / 300 = 4). The same image printed at 150 dpi will create a 10.66 inches by 8 inches print. So, to print a fixed-pixel size image at larger sizes, some resolution or definition needs to be lost.

But if the same image were shot by a 5 megapixel camera, it could be printed at 300 dpi resulting in a 8.54 inches by 6.4 inches print. In other words, higher resolution images can be printed at larger sizes without losing definition or gaining a jagged appearance. Larger resolutions will also let you crop in on part of an image and blow it up, and still get a good definition printed result.

The same concept applies to scanning images. The higher the scanning resolution, the more pixels the scanned image will have. For standard size photographs, scanning at 300 dpi will allow you to print later at 300 dpi at original size. Scanning at 150 dpi or

suitable for viewing on a computer screen, posting to a website, or printing at lower quality.

For slides and negatives, which are smaller in size, larger scanning resolutions are needed. A 35 mm color negative is 1.42 inches wide x 0.95 inches high. Scanned at 1500 dpi will create a 2130 x 1425 pixels image, which printed at 300 dpi will result in a 7.1 inches x 4.75 inches print.

In digital terms, each pixel is simply a piece of information regarding the specific colour and brightness of that particular dot. For each pixel, this information is contained in three bytes representing each one these the particular shade of Red, Green, and Blue (RGB) that combined together make up the specific colour and brightness of that pixel. Each RGB component or byte is represented by 8 bits (digital zeros and ones), so it can have 256 possible values ranging from 0 to 255 ($2^8 = 256$). That means that 24 bit RGB colour image pixels are capable of displaying 16.7 million different colour combinations (256x256x256).

This is also important because pixel quantity determines computer file sizes. If each pixel is represented by 3 bytes, then a 5 megapixel image will result in approximately a 15 million bytes uncompressed file, or 15 megabytes. A 6 inches by 4 inches photograph scanned at 300 dpi will create a 2.2 megabytes uncompressed file. Other file formats such as JPEG allow for increasing levels of compression, and thus, decreasing file sizes.