Website Images – Pixels and Quality

Introduction

Every website contains some pictures, they may be photographs of staff members, customers, site operations, diagrams or illustrative images. For performance reasons, the size (in kilobytes or megabytes) should be kept as small as possible … without sacrificing quality.

This paper looks at some of the considerations and examines the trade-off between size (and hence download speed) and quality.

1 Pixels

The more pixels a camera has, the more it costs; more pixels means better quality pictures; and this is true (more or less). A pixel is essentially the resolution of the images – the number of dots that it contains. Old black and white TV's has 425 lines, which was increased to 625 lines to provide a higher quality picture. A modern 42-inch wide screen TV with the equivalent of 425 lines would be un-watchable, a larger screen area needs more pixels (or lines).

But the number of pixels is not the sole contributor to overall image or picture quality. The camera's image sensor also plays a part. A professional SLR camera will contain a CCD sensor rather than a CMOS sensor. But for the purposes of this paper this and other factors such as the sensor size, lens quality etc will be ignored.

2 Image size and area

There are two factors that work together to define the quality of an image: the number of pixels and the physical size or area of the image. Below in Figure 1 are three copies of the same picture. This paper uses this picture of dripping water in a number of ways and examines the effects that the number of pixels (physical file size) and the image area or size have on quality.

Figure 1

The three images in Figure 1 all look the same, but in reality one has a file size of 2.7k, one is 27k and the other one is 270k. The larger the file the more pixels it contains and the higher the quality. But at this size (area 25mm x 20mm) one looks much the same as the other.

When the images are viewed such that the area (size 40mm x 30mm) is larger it becomes apparent that one image has a lower resolution (or contains a smaller number of pixels) than the other two; this image is not as clear or well defined as the others.

Figure 2

In Figure 2 the middle image contains the least number of pixels ie 2.7k. The right and left images contain 27k and 270k. ie one of the images contains 10 x more pixels than the other image (and 100 x more pixels than the middle image). It is difficult to see any differences between the left and right images although clearly the middle image is of lower quality. But in some circumstances (when displayed with a number of other images the 2.7k image, even at this size (40mm x 30mm) may be perfectly acceptable.

Increasing the area (size) of the left and right images (ie the two higher quality images) further to 70mm x 40mm (Figure 3), it is still difficult to separate the images, but the image on the right seems to be of a higher quality. But without careful examination it would be easy to assume that the two images were identical.

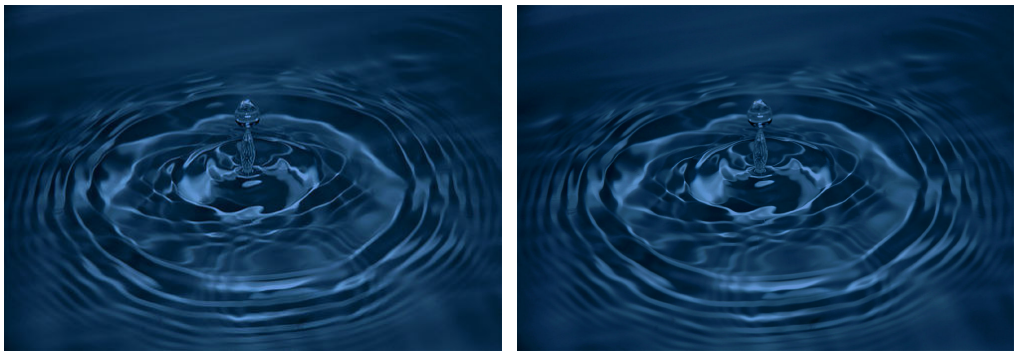

Figure 3

But the image on the left contains 27k pixels and the one on the right contains 270k pixels. But to the viewer they still appear similar (or identical) and if they are viewed in isolation it is difficult to say which is which.

With both images set at 1200mm x 900mm and Using Adobe Photoshop layers technology to switch between the two (the 27k and the 270k) images, the only perceivable difference in quality is on parts of the reflected light on the water ripples.

Increasing the area of the images (ie zooming in) in one specific point, indicated by the yellow square in the image below (Figure 4), allows the differences in quality to be seen more easily.

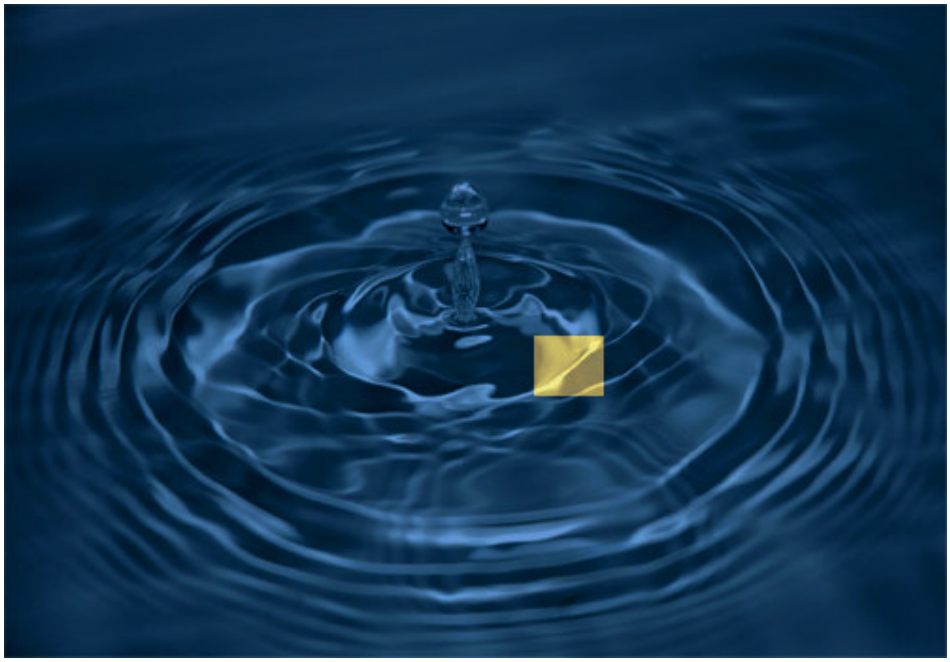

Figure 4

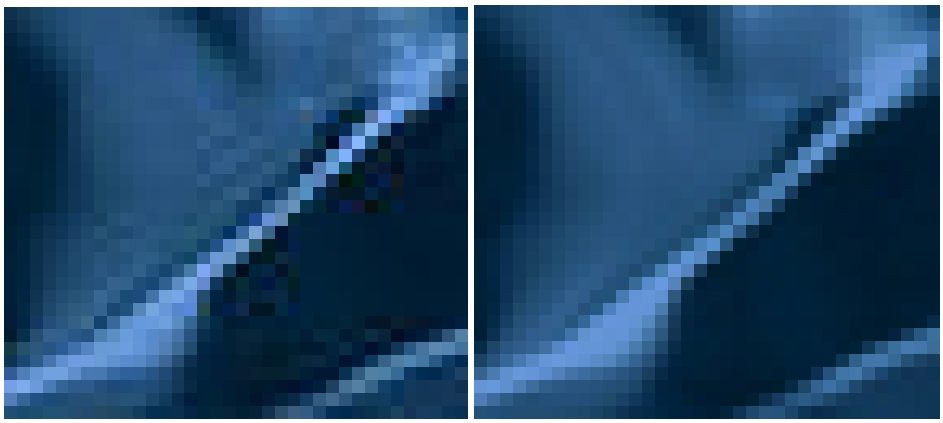

Figure 5

The image on the left (the 27k image) is grainy and has a rougher appearance. The image on the right (the 270k image) is smoother and is less rough. And as this is an image of dripping water the picture should be smooth. But to see the difference in quality between the 27k image and the 270k image (NB the high quality file is 10 x as large) it is necessary to magnify the image by several times.

Below is the same section (yellow square from Figure 4) applied to the 2.7k image.

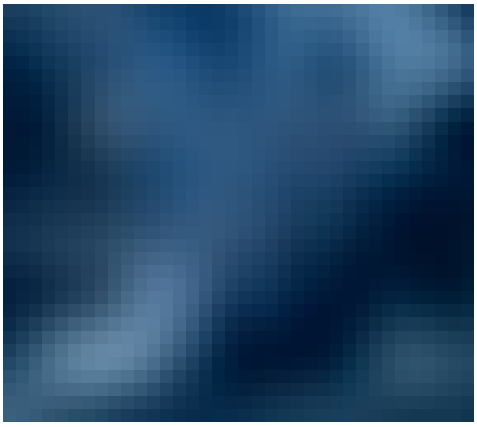

Figure 6

Any sharpness in the original image and picture has been lost, although it is still possible to see where the light areas are located. The transition from one colour or from dark to light is not smooth it is blurred.

3 Images for your website

Today PC's have massive processing power and large memories providing a speedy response when using Microsoft Word, Excel and even complex programs such as Photoshop. But the same PC may also be used to access Websites on the Internet where the key constraint is bandwidth. Website designers sometimes assume that access to the Internet is always via broadband and that there will be almost unlimited bandwidth and hence speed. In reality, even in UK, many people still access the Internet via a dial-up modem. In offices workers share bandwidth and even dedicated home users seldom receive the maximum speed quote by the service supplier.

Using the images in the example above, if the website needed an image that was 25mm x 20mm (as per Figure 1) any of the three would serve the purpose. The lowest resolution would require only 2.7k whereas the highest would need 270k (it is 100 times as large and would take 100 times as long to download).

If a larger image was required, as per Figure 2 (40mm x 30mm) or Figure 3, (70mm x 40mm) the lowest resolution is unsuitable as the quality is too low. So either the 27k or 270k image could be used. But the additional inherent quality of the 270k image is not visible (unless you zoom in) and so the 27k image should be used.

In Figure 4 the image is size 140mm x 95mm. Looking at the image in Figure 4 in isolation it is impossible to determine whether the image is 27k or 270k. Until the image area (size) is increased to 300mm x 200m there is a limited loss of quality even when using the 27k image. But if the image area is increased beyond 300mm x 200mm it is necessary to use the 270k image as the grain effect (as shown in Figure 5) starts to become visible and the quality deteriorates. In case you were wondering Figure 4 uses the 27k image.

About the author

John Hookham is a director of maintenance management consulting and marketing services company Adrelia. Tel: 020 7286 7073 Website: www.adrelia.com