

Gerald's Column

by Gerald Fitton

In the last couple of months I have discussed the size to which you should crop or resize your images (pictures) for printing. This month I shall turn my attention to displaying images on a TV, on a computer screen and on the Internet.

Before I start I must acknowledge all the help given to me by the staff of T.O.M.S (Sue, Doug and Jim). They have helped me resolve many questions which have been whirling around in my mind particularly with regard to TV displays.

Image Resolution

For my experiments I produced a CD containing the same set of images in several resolutions but all in JPEG format. These resolutions ranged from that of my 6 MP digital camera, 2832 x 2128, to 160 x 120, a common size for mobile phones. In my experiment I included many common sizes such as 1280 x 960, 800 x 600, 640 x 480 and 320 x 240 as well as some unusual sizes such as 1416 x 1064 and 768 x 576.

Degree of Compression

There is always some deterioration in quality when saving an image as a JPEG. In creating my CD, I always used the same 6 MP image to produce those of a lower resolution.

One question which comes up regularly in my correspondence is about choosing the degree of compression of a JPEG when saving.

The default for most pieces of software is 75%. Whenever I see the "%" symbol I always ask myself "Of what is this a percentage?" - or, more briefly but less grammatically, "What's it a percentage of?" I don't think this 75% compression is a percentage of anything in particular! I believe it to be just a number between 1 and 99.

Larger files contain more information than smaller files so, very generally, the bigger the file size the better. The question I get asked regularly is what percentage to use and the useless answer, "The smaller the number the better!", comes into my head.

My own experiments have lead me to the conclusion that 25% is as high as I would ever want to go. Above this figure I can notice the difference in the quality of the display.

One experiment which I tried was this. I loaded a good quality JPEG and then saved it back as a JPEG file with different levels of compression. What I found was that at some value between 10% and 15% the file size was about the same as the original good quality JPEG. Also a file saved this way looked fairly close in quality to the original.

I repeated this experiment with other images and I found that for nearly all images at nearly all resolutions setting the compression at a value between 10% and 15% produces a file about the same size as the original. Consequently I have 'firmed up' on 15% as a maximum (image quality deteriorates above this) and 10% as a minimum (the file gets larger than the original) with 12% being the value I usually use.

DVD Players

I tried this CD in four different DVD players and looked at the results displayed on the TV screen. What did not surprise me was that the 6 MP images took significantly longer to appear on the TV screen than did the smaller files. What did surprise me was that, on one of the DVD players, the original (straight from the camera) 6 MP image appeared considerably smaller on the screen (a large black border all around it) than did the images having a smaller number of pixels. Using the x2 zoom did expand it to fill the screen.

My conclusion is that, for display on a TV, a high resolution format for the image doesn't improve the display and, in some cases, can make it considerably smaller than the screen size. In all cases large files take longer to display and the delay spoils the slide show.

So what is the best size for displaying on a TV?

Lost borders

On all four systems, choosing a resolution close to the resolution of the TV screen resulted in images which filled the screen. However, with some resolutions a little larger than that of a TV screen I found that some had lost material from the top, bottom and sides.

Shimmer or Dither

Losing parts of the image might be a bit annoying but there is another strange thing which happens with some images at some resolutions. The images appear to shimmer. This is particularly noticeable if the image has horizontal lines which are not exactly horizontal. I have one image which includes some telegraph lines which are not quite horizontal. These dithered in a very disturbing manner using the 800 x 600 resolution image.

Images for TV

I always thought that my TV displayed 625 lines until I took the trouble to find out! Now I have no doubt that a lot of these lines are used for something other than displaying the image on the screen. The conclusion I reached after much discussion with the staff of T.O.M.S. is that the number of lines displayed is 576.

I am not sure of the best value to choose for the number of pixels in a row but currently my choice is 768. I have arrived at this figure by assuming that the screen has an aspect ratio of 4:3; multiplying 576 by 4/3 gives 768. As T.O.M.S. have pointed out to me, such a calculation assumes that the pixels are square and there is some evidence that some DVD player software displays rectangular rather than square pixels.

On all the four DVD players I tried, the best images were those with the 768 x 576 resolution. By "best" I mean that they loaded reasonably quickly and the image displayed was steady and clear.

My recommendation to you for burning JPEGs to CD for display on a TV is that you should resize the image to 768 x 576.

On the Computer

I recall when a computer screen of 640 x 480 pixels was considered a pretty good resolution. Nowadays that is the sort of resolution which you'll find on a high end PDA (Personal Digital Assistant - a hand held computer). These days the resolutions offered by graphics cards range up to 2000 x 1500.

Popular choices for display are more usually between 1024 x 768 and 1280 x 960. My own preference, possibly because of limitations of my monitor, is 1152 x 864.

I have been told that HDTV (High Definition TV) is on its way and will be here in a few years time. When it replaces the current 625 line PAL system the screen display will be 1280 x 960 - or so I've been told!

Of course, it would be possible to display the image so that it fills the screen but it is more usual to have it occupying only part of the screen. The application in which I and many others use images most is within an email. I use part of the available screen for navigation (for example scroll bars and a list of contacts or folders) and that leaves me with about 700 to 800 pixels left across the screen for the image.

There are two fairly common sizes in which I receive images attached to emails. One is 800 x 600 and the other 640 x 480. The 640 x 480 always seems just a little on the small size and the 800 x 600 just a little too large!

Of course it is always possible to send a file (for example as an email attachment) with more pixels. Such an oversize file will be larger than it needs to be if all that you want to do is let someone look at it on their screen.

If the intention is to provide an image for the recipient to print on 15 x 10 cm photo paper, then one which has been resized to 640 x 480 pixels is rather marginal. It would be better to send a larger file for printing at this size.

PDA

These powerful hand held computers are becoming most popular. The usual screen resolution is 320 x 240 pixels but high end PDAs offer 640 x 480 at a higher price. I believe that it won't be long before this 640 x 480 will be regarded as standard and the lower resolutions will be considered a cheap option.

Mobile Phones

Mobile phones which take photos are becoming a very fashionable but the screens are much smaller in size than even the cheapest PDA. 160 x 120 is a common resolution.

Once again I believe that the trend towards ever smaller mobile phones may be reversed as image messages become more popular. It is much more interesting to receive a image which can be seen at 320 x 240 than it is to try to look at it on a 160 x 120 screen. Indeed, a PDA with a built in 3G mobile phone with a resolution of 640 x 480 can't be far away - or it might already exist. If it does then I'm sure someone will let me know.

Web sites

The resolution to use for web sites has always been a hot topic for discussion.

When most Internet users were on a dial up, pages of more than a few tens of kB (due to the inclusion of images) were frowned on. There is still a large enough proportion of Internet users who are on dial up for this rule to still apply to good website construction.

Generally it is considered very bad form to attach anything let alone an image file to an email which is being posted to a list. The protocol is to post the image to a website and then provide a link within the posting to the image or images.

The usual way of handling images on the web is to display a small thumbnail and a blanket instruction to the reader suggesting that they click on the thumbnail to view it at higher resolution. A few websites offer photographs or fine art images at 4 MP (mega pixel) or even 6 MP resolution (eg 3000 x 2000 pixels - suitable for printing at A4 size) which can be downloaded by clicking on a thumbnail. However, for most websites, clicking on a thumbnail opens a image with a resolution of 800 x 600 (just under 0.5 MP) or possibly 1280 x 960 (about 1.2 MP).

Once again, the higher the resolution the larger the file. Typically a thumbnail (in JPEG format) of, say 160 x 120, will be considerably less than 10 kB whereas a 6 MP image will be 1 MB. The size of the file does vary with the degree of compression and the complexity of the image, so these figures are necessarily approximate.

What does affect file size more than these two factors (compression and complexity) is the resolution. Roughly speaking, divide the number of pixels by 5 and you'll have the file size in bytes. As an example, a good quality 6 MP JPEG image will be $6/5=1.2$ MB in size.

For a broadband web page try to keep the size of the page, complete with images, down to 300 kB. If you make it much larger then even broadband users will complain that the page takes too long to open.

Communication

Emails addressed to me at 'abacusline.demon.co.uk' are no longer delivered. The site at <http://www.abacusline.demon.co.uk> will soon be closed forever; presently it contains only a link to my new site at <http://www.abacusline.co.uk> (the "demon" is omitted).

My website for Archive readers is at the subdomain <http://archive.abacusline.co.uk/> It is a protected subdomain. The username is "archive" and the password "amusement". You will find many examples supporting my Gerald's Column articles on that site. For example, this month I shall provide an example of the same image (with the same number of MP) saved at different compression ratios. You will be able to download them and study for yourselves the way in which the compression ratio alters the quality of the image.

For Archive correspondence, please write to me at <archive@abacusline.co.uk>. For Living with Technology, please use <lwt@abacusline.co.uk>. Finally, for technical assistance with PipeDream or Fireworkz, please write to <goldline@abacusline.co.uk>.