



How many pixels? Making a good photograph

Information from Lightsmith's Photography, <http://www.lightsmithphoto.co.uk>

How many pixels do I need for a good picture?

There is much hype concerning camera sales, mostly resulting in more and more pixels and here I address the matter. If you are buying a camera, this may help you make the decision of what one.

So, what technical factors are there in making a good photo? They are

- the quality of the camera's lens
- how steady the photographer can hold the camera to avoid camera shake
- how good the camera's autofocus is, and the photographer's ability to use it properly
- the correct exposure - too dark, too light or just right?
- the physical size of the camera sensor (mm or inches)
- the number of pixels packed into the physical area of the sensor
- the electrical noise introduced by the camera (like 'snow' on a TV or hiss on a radio)
- the software inside the camera that creates a jpg image from the electrical signals
- how the photo is being viewed - e.g. on a screen or a print, what paper and what size?
- the eye's ability to resolve imperfections, like pixels on a screen or spots of ink on paper

Let us look at each of these before looking at the pixels

the quality of the camera's lens

No lens is perfect and, generally, you get what you pay for. No recorded line is 100% sharp and often the lens cannot resolve to the pixel level of the sensor; additional pixels become pointless then as no further information is stored.

how steady the photographer can hold the camera to avoid camera shake

All hand-held cameras introduce a bit of shake from the person taking the picture. The longer the shutter is open, the more shake is evident. Moral - use shutter speeds of 1/60 sec or faster, or use a support, like a tripod or beanbag

how good the camera's autofocus is, and the ability of the photographer to use it properly

Camera autofocus is pretty good on modern cameras but not infallible. Even if it works, it may not be centred on the point of interest - this is up to the photographer to get it right.

the correct exposure - too dark, too light or just right?

Most cameras are very good but, as with focus, it is up to the photographer to ensure the points of interest are optimally exposed.

the physical size of the camera sensor (mm or inches)

Now we get to the real purpose of this page! In compact cameras the sensor is tiny, about 1/8 inch on the long side. Is amazing just how good a picture can be got from such a small recording device; the lens is critical here in being able to resolve to the physical area of the sensor. Most DSLRs have a much larger sensor, some expensive ones



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having a sensor size the same as 35mm film. (I am ignoring medium and large format cameras in this discussion). The larger the sensor, the less hard the lens has to work to focus on a particular point, so generally, DSLRs will be sharper than compacts, depending on the quality of the lens used.

the number of pixels packed into the physical area of the sensor

The more individual sensors (pixels) packed onto a given area the smaller they must be. So long as lens quality is sufficient, more pixels allows the recording of greater detail, so the better an enlarged photo will be. BUT....

the electrical noise introduced by the camera (like 'snow' on a tV or the hiss on a de-tuned radio)

... as camera pixels get smaller, so the output signal gets smaller and needs more amplification. The greater the amplification the more the noise will be. This is why high ISO ratings have poorer pictures - the tiny signal has been amplified by more prior to being digitised. (No, you can't digitise it first...). The bigger sensors on DSLRs produce more signal so they tend to have better noise characteristics, but at the expense of a much larger camera. Most people are not overly worried about noise most of the time and use the flash when it is dark - hence the popularity of compact cameras.

the software inside the camera that creates a jpg image from the electrical signals

There is not a major issue in terms of potential quality these days. More important is whether the camera is set to maximum size, maximum quality recording or some, lesser, setting. All cameras have image size and image quality settings and not all default to maximum quality or size, so check yours.

how the photo is being viewed - e.g. on a screen or a print, what paper and what size?

Is the picture being viewed on an old 12" grotty 256 colour monitor or a 38" HD TV? Is the picture printed and what size? There is a big difference in what is needed to print a 6 x 4 inch photo and a 20 x 16 inch masterpiece. What paper is it printed on? Again, there are huge differences in the image quality on normal paper and high quality photo papers. There is also a wide range of photo paper qualities – generally, the less you pay, the worse the quality. Same goes for ink, too.

the ability of the eye to resolve imperfections, like pixels on a screen or spots of ink on paper

Lastly, the eye itself can only resolve so far. For normal viewing distance on an inkjet, anything greater than 300 dots per inch (think of it as 300 pixels per inch) cannot be resolved and is thus wasted. For a screen, a resolution of about 72 pixels per inch results in a satisfying image quality.



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Megapixels to decent image size - nominal.

These are only nominal sizes but they do get you in the right ball-park, all in inches.
(There are 2.54 cm per inch if you are metric)

Mega-pixels	Width (pix)	Height (pix)	Print width at 300 dpi	Print height at 300 dpi	Screen width at 72 ppi *	Screen height at 72 ppi*
2.7	2,012	1,341	6.5	4.5	28.0	18.5
4	2,449	1,633	8.0	5.5	34.0	22.5
5	2,739	1,826	9.0	6	38.0	25.5
6	3,000	2,000	10.0	6.5	41.5	28
7	3,240	2,160	11.0	7	45.0	30
8	3,464	2,309	11.5	7.5	48.0	32
9	3,674	2,449	12.0	8	51.0	34
10	3,873	2,582	13.0	8.5	54.0	36

** In inches: If your screen is, say, 18 inches x 11.25 inches in size, and has a pixel size of 1680 x 1050, its resolution is 93.33 pixels per inch.*

In practice by interpolating, you can usually easily double the sizes of any of these - a 2.7MP camera can give a decent interpolated picture of about A4 size. So, you don't really need vast numbers of pixels....

Health Warning - Don't get Confused by DPI and PPI!

The screen resolutions of 72 dpi/ppi are a bit of a fiction; you will see 96 dpi banded about also. They are intended to reflect the number of phosphorous dots in an inch of crt or the number of lcd points in a lcd screen. A wide screen might have 1680 x 1050 pixel resolution. But then that screen might be 15", 20", 22" or something else. So, the number of pixels per inch varies as each screen is a different physical size but the same pixel size. Many people get confused by this. An 840 x 525 pixel image will take one quarter of a 1680 x 1050 screen regardless of how physically big the screen is!

Will my Picture Print OK?

Easy way - get the picture set up on your screen such that it is as near to the physical size you want to print. If it looks OK, then chances are it will print OK at the same physical size, ensuring the picture has been interpolated to be at least 300 DPI/PPI. Simplez, as a meercat might say!