Re: A beginner question

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- *From*: "actuary@xxxxxxxxx" <actuary@xxxxxxxxx>

- *Date*: Mon, 11 Jun 2007 09:29:00 −0700

On Jun 11, 11:00 am, Chris L Peterson <c...@xxxxxxxxxxxxxxxxxx> wrote:

> On Mon, 11 Jun 2007 21:06:25 +1000, "Peter Webb"
>
> <webbfam...@xxxxxxxxxxxxxxxxxxxxxxxxx> wrote:
>
> > Essentially then digital ISOs are analogous to push−processing on film. To somewhat extend the analogy, its like a "digital zoom" − no extra information is actually added.
>
> I don't think the analogy is precise, but I'd agree that digital ISO is more like push processing than native film ISO. However, as I noted earlier, if the gain is applied in the sensor, before the readout stage, it's possible to see a slight improvement in S/N because the readout noise contribution isn't amplified (or isn't fully amplified).
>
> > Sure. My issue was that I had two different "scales" in use in my head, and now way to calibrate between them. I know its much the same principles for astro and terrestrial photography (of course, no depth of field issues, point sources only, some others), but I had no way "in my head" of equating the two scales. When I looked at the question concerning a magnitude 5.8 object on a terrestrial camera, I had no scale to equate this to daytime photography. Unlike, for example, photographing the moon which is directly illuminated by the Sun. I don't even know how to work out the exposure etc for photographing the Sun directly (and nor would I try!); if I did, I could pull out an inverse square law and work out what would be needed for the Sun
> > as a distant point source to be "resolved".
>
> Yeah, I don't think there's any way to really equate the calculation of exposure for terrestrial imaging with the calculation for astronomical imaging.
>
> > Presumably the camera optics are not much better than are needed to resolve to physical pixel size on the CCD array (what would be the point)? So

> presumably also the point source can easily spill over into adjacent pixels. Most digital cameras will let you reduce resolution − I wonder whether this improves sensitivity (as it does for film grain size). This is presumably whether they sum the baseline data from adjacent pixels to produce the lower resolution image. If they do, halving the total image size should provide a massive 1.5 dB gain.
>
> Of course, this can as easily be done in post−processing, I guess?

There is only one noise source that is pixel dependent, and that's readout noise. For short exposures (typically less than a few seconds with ordinary digital cameras, and up to many minutes with cooled cameras under dark skies) the readout noise is dominant, so there is a value to having less pixels involved. However, this advantage is only realized when the camera is capable of binning the pixels within the sensor, so a single readout operation is involved. If you reduce the resolution after the sensor is read, either in the camera or during post processing, there is no reduced noise.

For exposures long enough that readout noise is fairly insignificant, it makes no difference how many pixels are involved.

> Is the intent to capture in each JPEG frame the "dark background" in sufficient resolution to add multiple images and decrease noise by summing? So is the JPEG really better considered as a map of the background noise rather than the foreground point sources, and the digital artefacts don't matter as much?
>
> And if the JPEG contains the data to exactly reconstruct the original bitmap, then its hard to see how it could be much smaller than the bitmap. You have got to be chucking information away somewhere.

Well, a lossless JPEG compression (which isn't an option with any camera I've seen, although the standard supports it) could still be highly compressed with respect to a bitmap for many astronomical images, given that much of the background may be essentially zero. Naturally, if you fully encode the noise, the JPEG will have to be the same size as the bitmap.

> I assume that RAW is just that, the pixel values. Every camera I have owned in the last five years has it, wouldn't that be heaps better? (Although I have never used it, and until recently was prohibitively expensive in storage).

> That's what you'd like RAW to be, although with most cameras there's still a certain degree of processing that has occurred before the raw image is saved. But it's close enough to raw pixel values in most cases that typical image processing operations such as stacking can be performed. Besides the lack of compression artifacts, what's very important with RAW is that the original dynamic range of the sensor is largely preserved. The data will be 10−12 bits deep (60dB−72dB), compared with at best 8 bits (48dB) with JPEG encoding.
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> ———————————————————————————
>
> Chris L Peterson
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To: All

I'm still struggling to simply take a 15 second exposure on my SD 1000. I set the time delay to 10 seconds. I set the number of exposures to 2 and I set the long shutter speed to 15 seconds. I depress the shutter button and the lens retracts and the camera seems to shut off.

Help −− What am I doing wrong.

Larry

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