Saturday, January 22, 2011
2:53 PM

Today: BoW

Lenses
- Focus, not focus, close-up

Exposure
- Aperture
- Shutter speed
- ISO

As object moves closer, lens moves away from sensor plane. Mechanical limit defines near focus distance. Extension tubes (for DSLR) allow lens to move further out and focus closer. $75 set of 3

'Close up' lenses allow close focus by changing system f . Long f lens, threads on to the outer end of main lens (threads standard, but need to match diameters). Lower quality, though. Each additional lens element can lose 10% of light, introduce aberrations.
PHD cameras often lack threads. Just hold it out in front, or mount to cardboard tube. Check focus often.
Inexpensive, $6 for set of 4

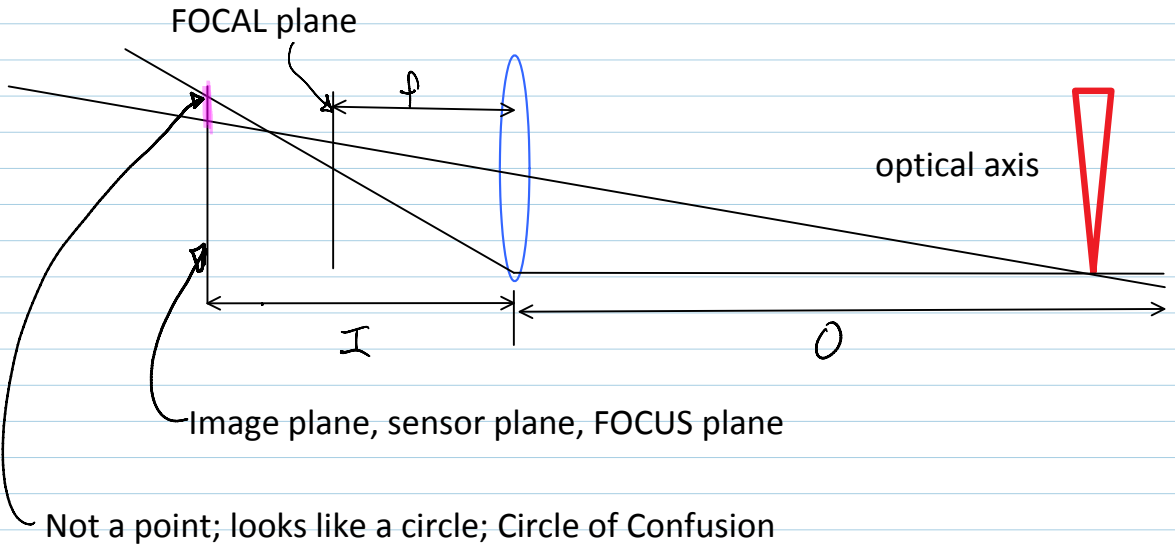
Spec'd in 'diopters' = 1/f in meters. Typically +1, +2, +4

$$\frac{1}{f_{TOTAL}} = \frac{1}{f_1} + \frac{1}{f_2}$$

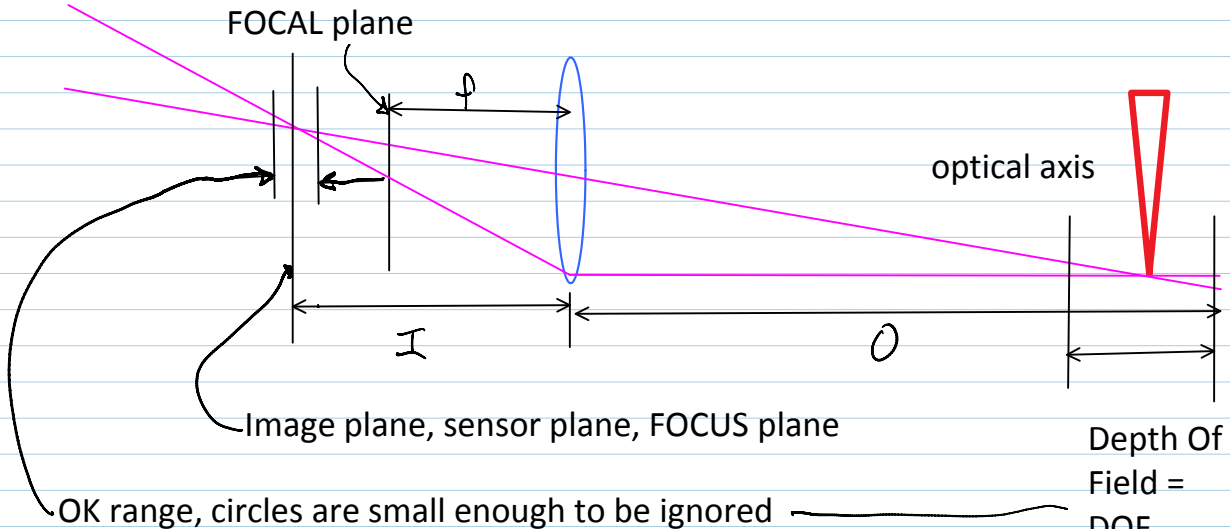
PHD cameras often have 'macro mode' =
Flower Button. Does yours?

For DLSRs, prime and zoom 'macro' lenses are available. Expect high price, hope for quality.

OUT OF FOCUS



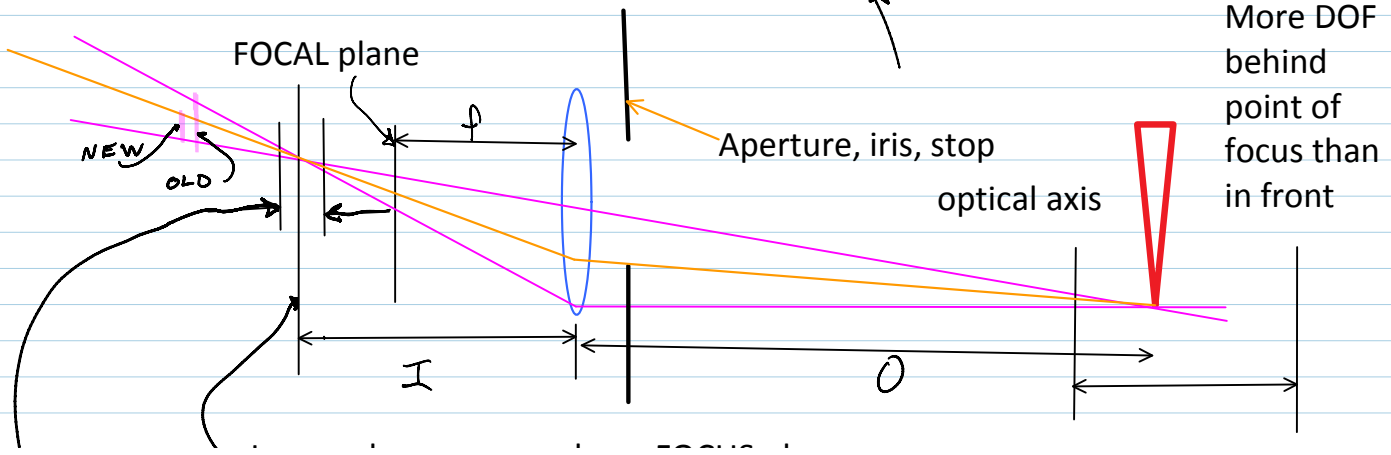
Depth of Field

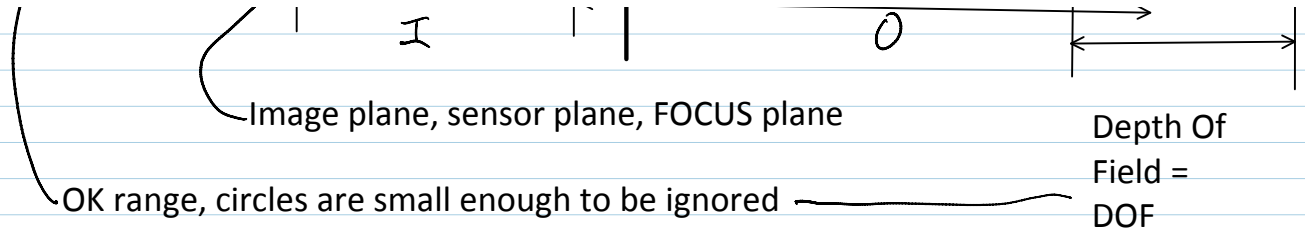


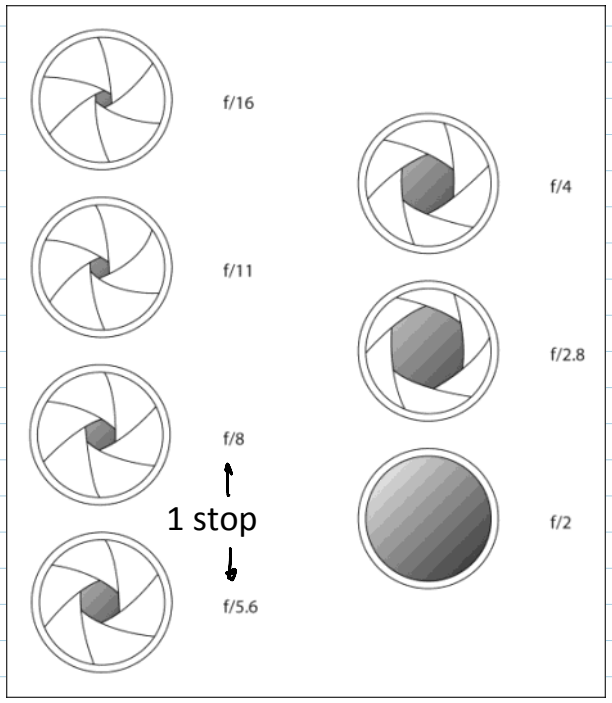
LensBaby

Improve DOF by reducing diameter: smaller hole, better depth of field

$$f/\# = \frac{f}{D}$$







Camera OBSCURA

Aperture (iris) mechanism made from overlapping pivoting leaves.

Aperture has impact on exposure too, how much light total hits the sensor.
Units: 1 stop = 1 EV Exposure Value = factor of 2 in area, light.
Camera adjustments in 1/3 stops

Stop used to be a metal plate with hole punched in it.

http://media.wiley.com/assets/1007/41/0-7645-9802-3_0213.jpg
http://synapticlight.com/iris-and-aperture/

2.8, 3.5, 4, 5.6, 8, 11, 16, 22, 32, 45, 64

Ansel Adams founded f/64 club. Tiniest hole, maximum DOF. Modern lenses often best sharpness at f/5.6 or design point.

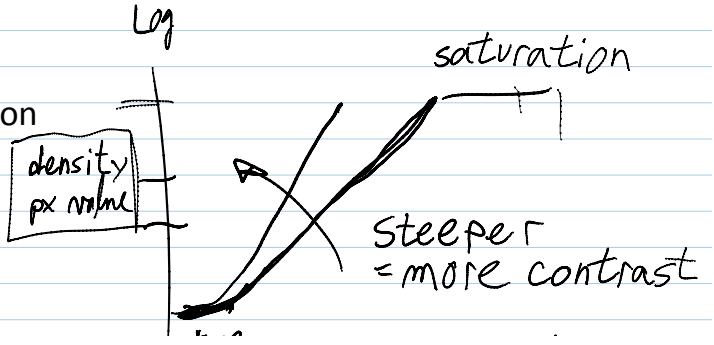
4. EXPOSURE

For a given intensity, ≈ area X time shutter is open

Equivalent exposures: f/5.6, 1/100 sec
f/8, 1/50 sec
f/11, 1/25 sec

Image 'density', average pixel values also depends on sensor gain, sensitivity: ISO (ASA historically)
1 EV, stop = factor of 2 in ISO

Same image density f/5.6, 1/100 sec, ISO 200
f/8, 1/100 sec, ISO 400



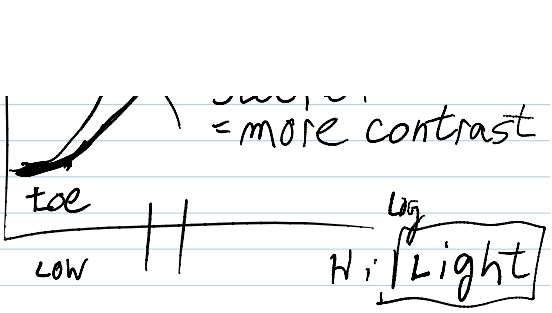
5.6

Same image density f/4, 1/100 sec, ISO 200
f/8, 1/100 sec, ISO 400
f/4, 1/200 sec, ISO 400

How to choose?

Minute paper: list pros and cons of

1) small aperture vs large aperture
2) short shutter (high shutter speed) vs long (slow)
3) high ISO vs low



film response curve

Human eye sensitivity, dark adapted ~ 800 ISO
http://clarkvision.com/imagedetail/eye-resolution.html
Human contrast range detection: 24 EV, but is dynamic.
http://www.luminous-landscape.com/columns/eye-camera.shtml
Digital dynamic range = 8 (bits, equivalent to EV) in PS for full functionality, but can do up to 32.
Camera A/D is likely 10-14 bits

4) Aperture: large f/ = better DOF, but less light, maybe less sharpness overall
5) Short shutter = freeze the flow, minimize motion blur, but less light
6) High ISO adds noise

http://upload.wikimedia.org/wikipedia/commons/3/3b/Noise_Comparison.JPG

Usually, set ISO for overall conditions, then choose
Av = aperture priority, let AE (auto exposure) choose shutter
or
Tv = shutter priority, AE chooses aperture