Noise in images

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Types of noise

- Thermal agitation of electrons in sensor
  - increase with themperature and exposure
- Imperfection of pixels (Pattern Noise)

Kind of pattern Noise

- Fixed pattern noise (FPN): pixel difference when not exposed to light (additive in nature)
- Photo-response non-uniformity (PRNU): depends on illumination (multiplicative in nature)

Fixed Pattern Noise

- Crystal defects in creation of pixels
- Impurities
- The size of detector/potential well
- Contamination during fabrication
- Non-uniform oxide/gate thickness
- In CMOS: additional variability for each transistor

Advantages: doesn't vary with the time, so can be estimated and corrected !

Photo-response non-uniformity

- The depth of the detector/potential well
- Larger active areas – more incident photons
- Non-uniform oxide layer: results in non-uniform potential wells
- Deeper potential well: more photons absorbed (wavelength dependent)

Advantages: PRNU can be estimated and removed from each image

PRNU give the fingerprint

Denoizing methods

- Delete noise thanks to fingerprint
- More exposure and more light
- Get better quantizer