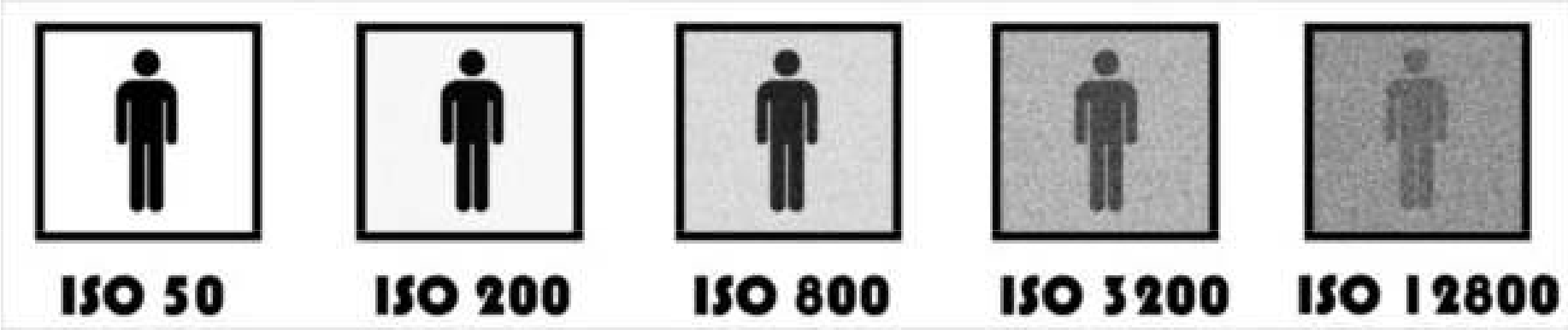
Large
ISO values

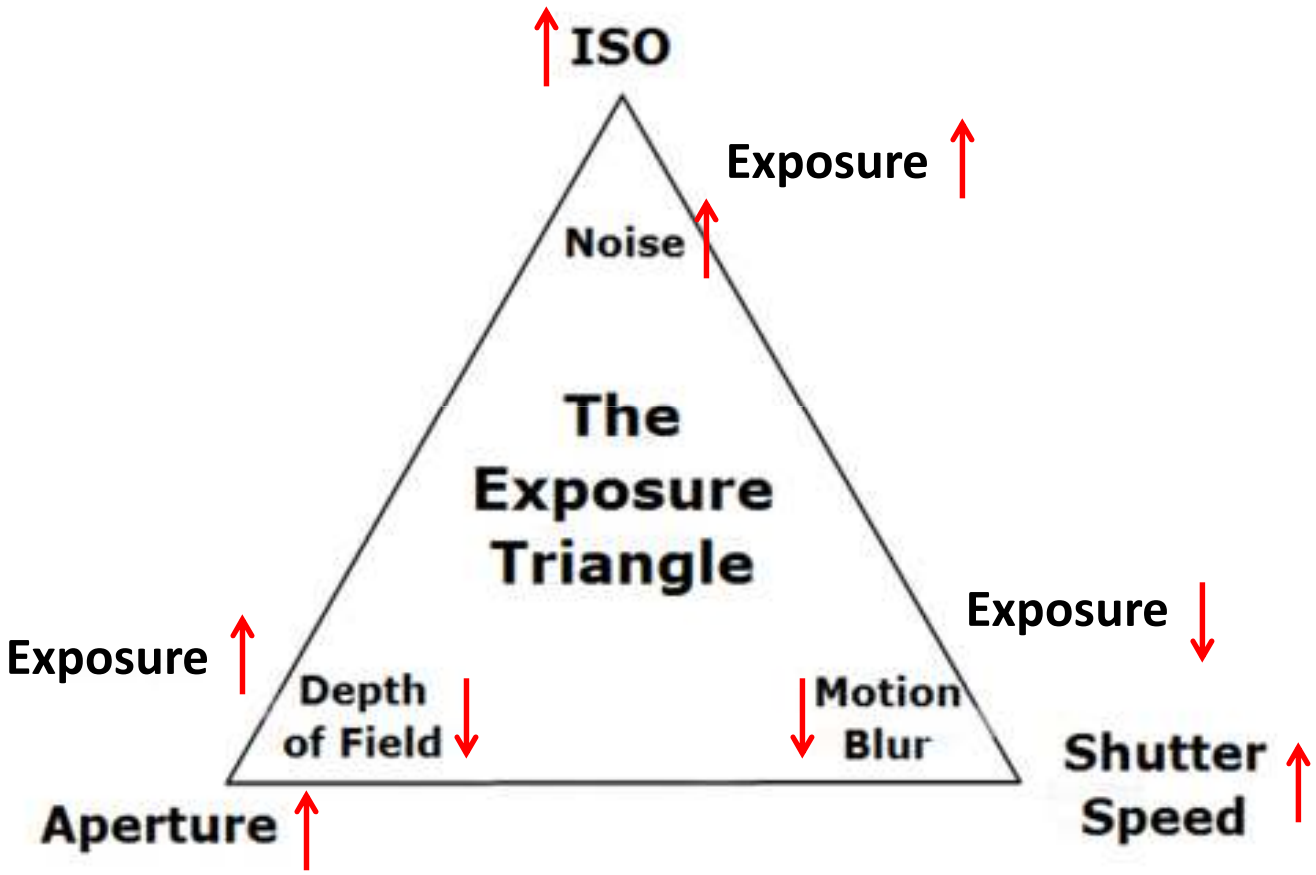
Low ISO
values

The ISO refers to how sensitive the digital sensor in your camera is to light. The lower the ISO number, the less sensitive it is to light. Setting a higher ISO number increases the sensitivity of your camera sensor to light. Most cameras have ISOs ranging from about 50 or 100 ISO right up to 16,000 ISO or higher.

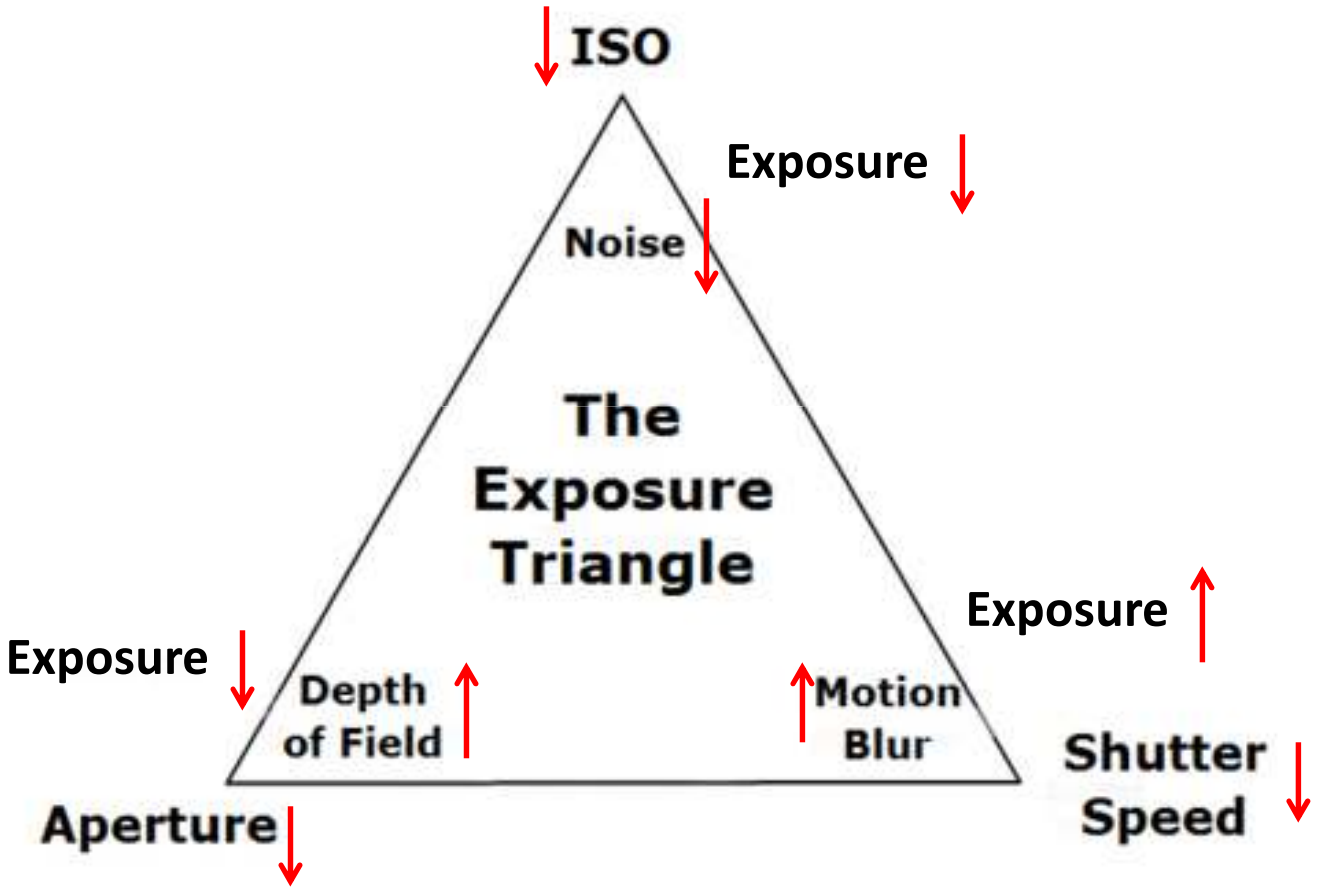


The higher the ISO used, the more digital noise will be present in the image. Digital noise results in a graininess that can have a negative effect on image quality.

Exposure Triangle



Exposure Triangle



ISO ↓

Aperture ↓

Shutter Speed ↑

ISO ↑

Aperture ↑

Shutter Speed ↓

Underexposure

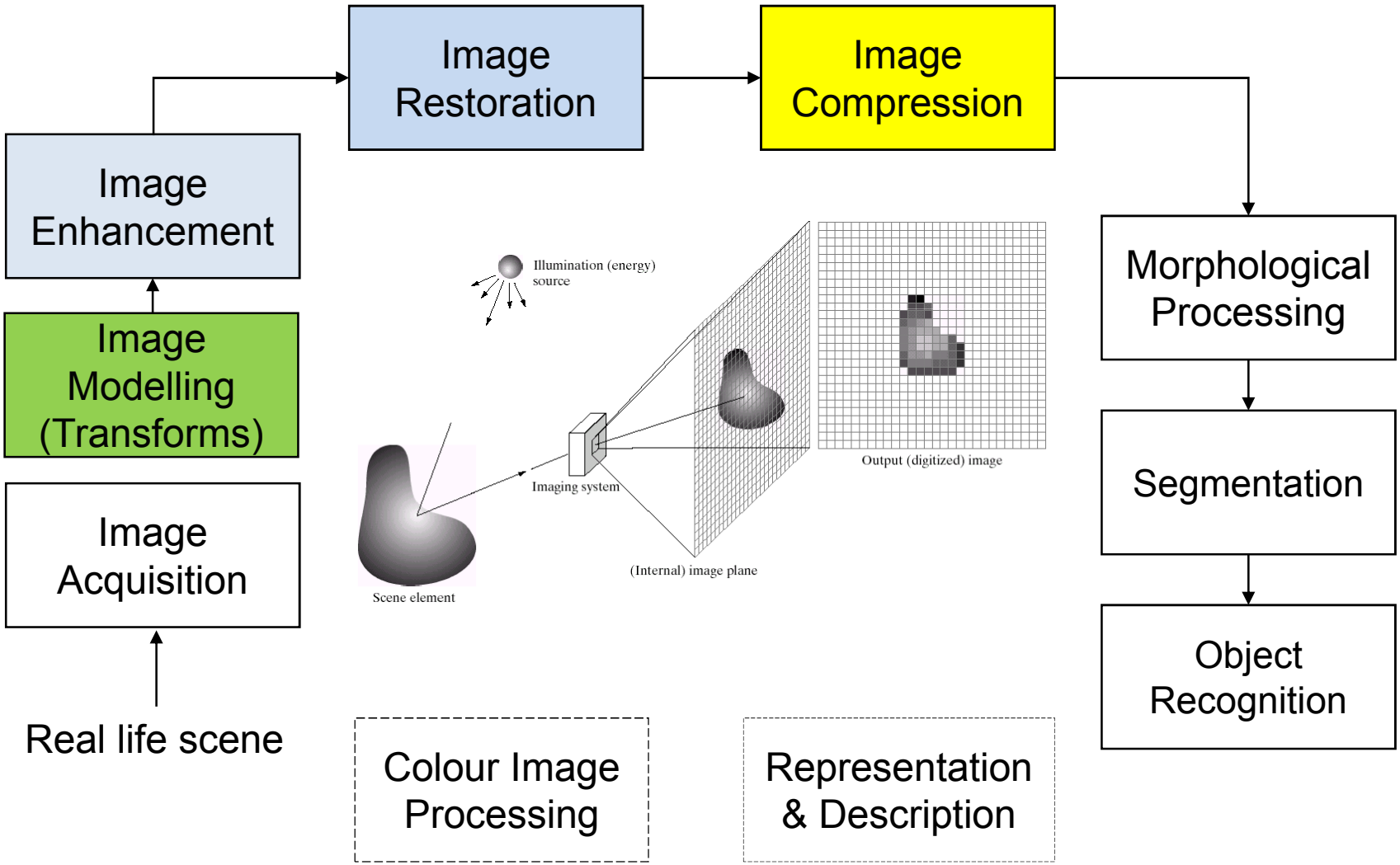
Overexposure

Image with motion

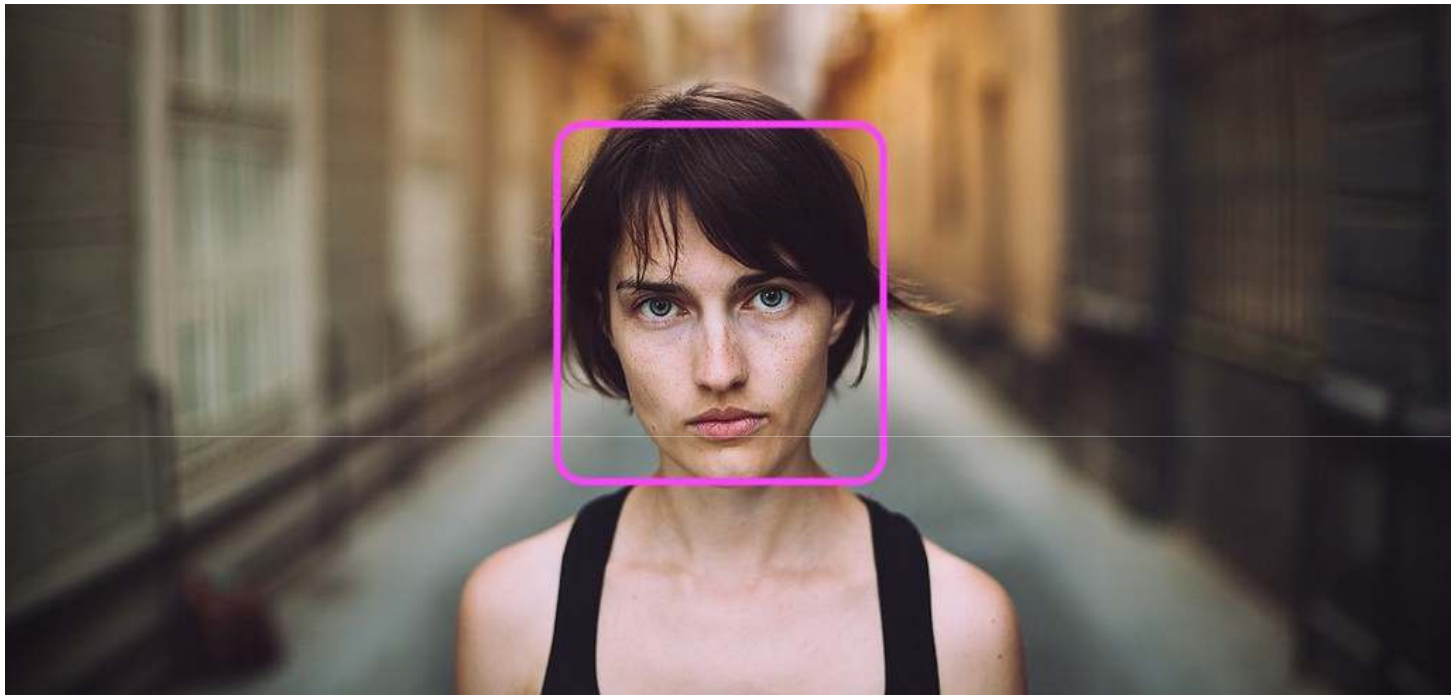
Shutter Speed ↑ → Dark Image (underexposure)

- Aperture ↑ → Depth of Field ↓
- ISO ↑ → Noise ↑

Image Acquisition



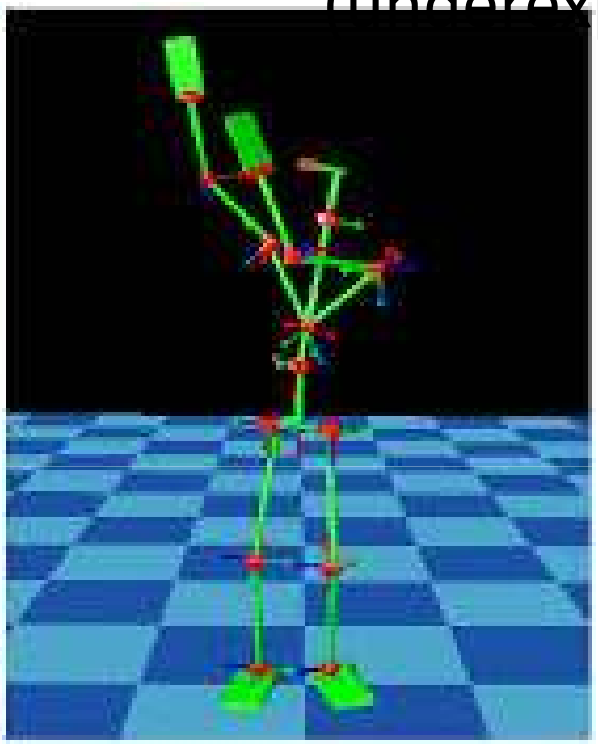
Face Detection/Identification



Depth of Field ↓ — Aperture ↑ → Bright Image (overexposure) — Shutter Speed ↑ / ISO ↓

Motion Tracking

Dark Image (underexposure)



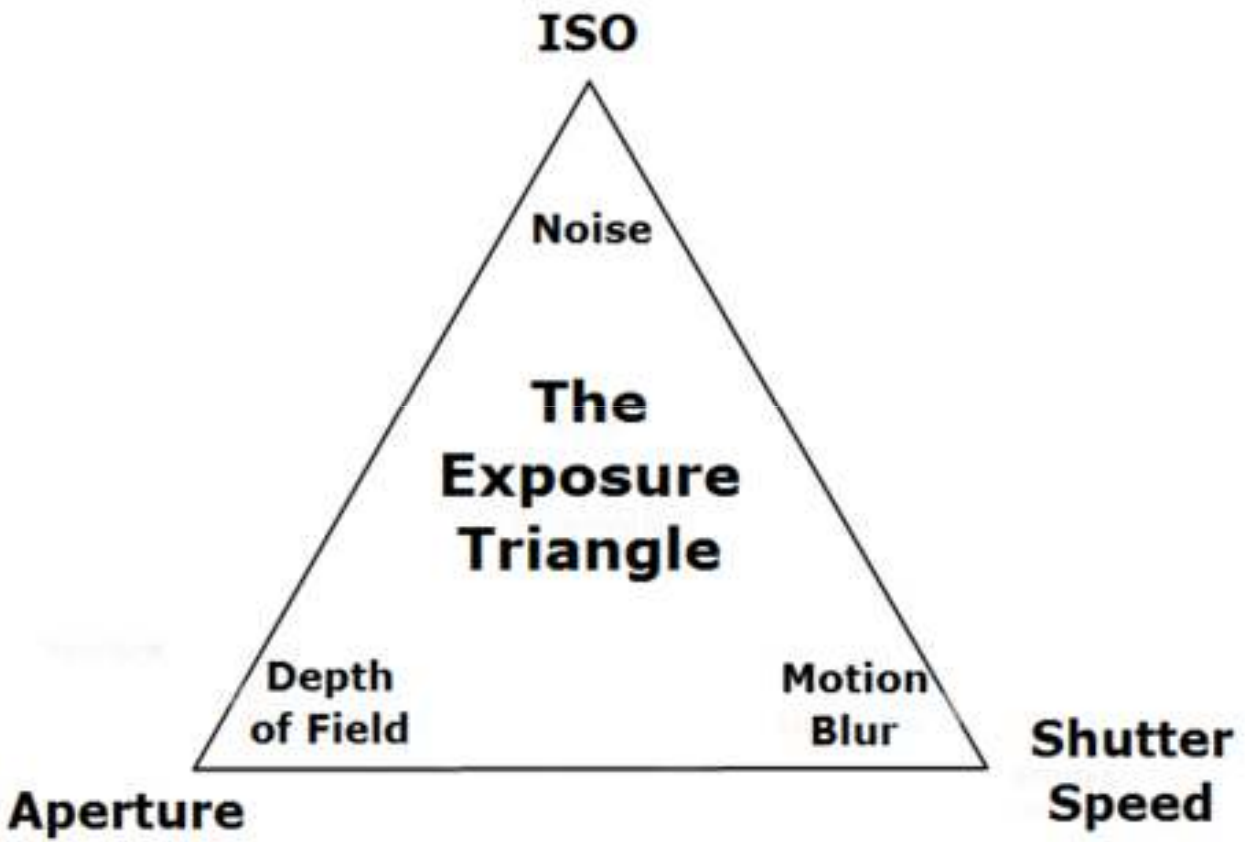
Blurring ↓

Depth of Field ↓

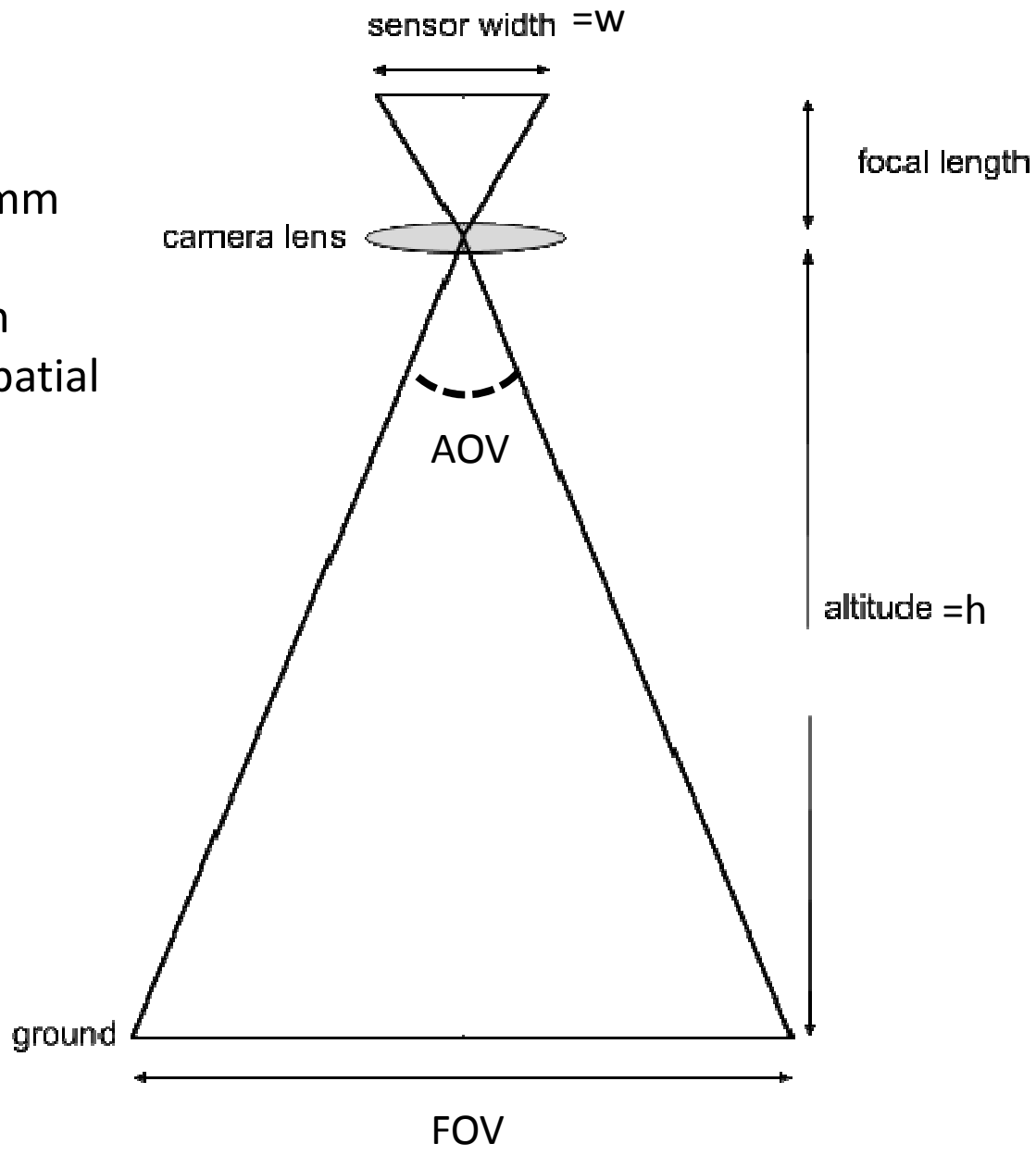
Shutter Speed ↑ → Dark Image (underexposure)

Aperture ↑ → Bright Image (overexposure)

Exposure Triangle



Sensor width=35mm
Length covered by pixel=5mm
Altitude=10m
Focal length of Lens=75mm
Determine the minimum spatial resolution for the camera.



Basics of Digital Cameras

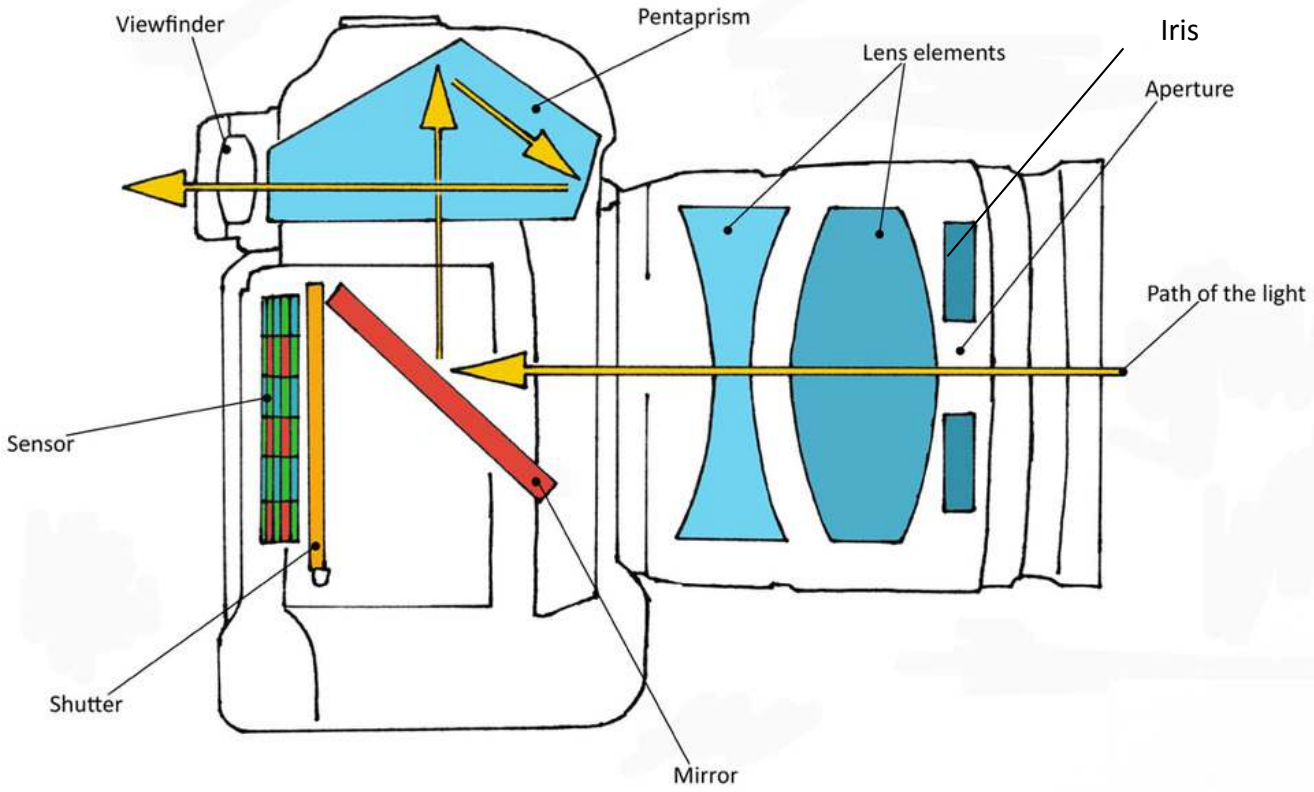
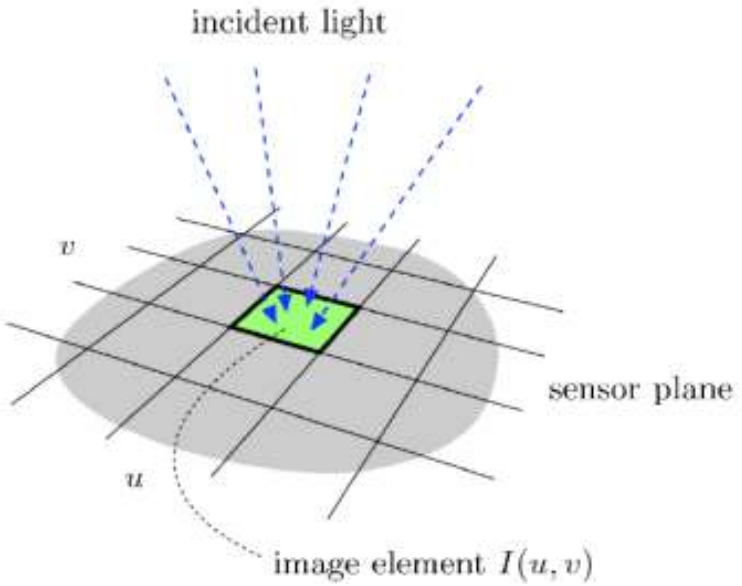


Image Sampling and Quantization

Cannot record image values for all (x,y).
Sample/record image values at discrete (x,y).
Sensors arranged in grid to sample image.



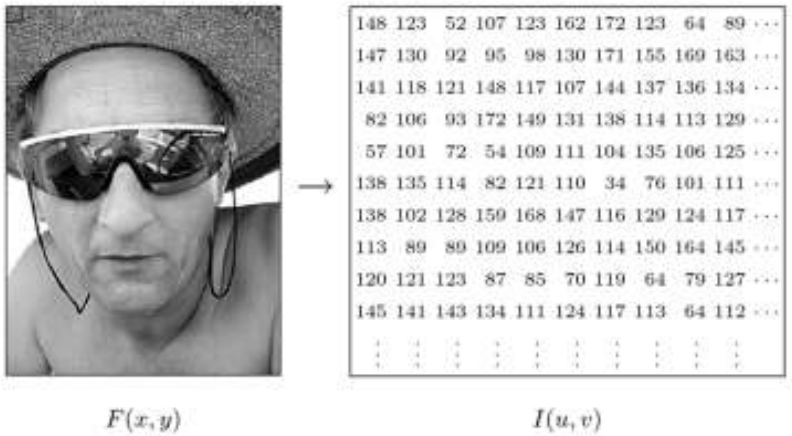
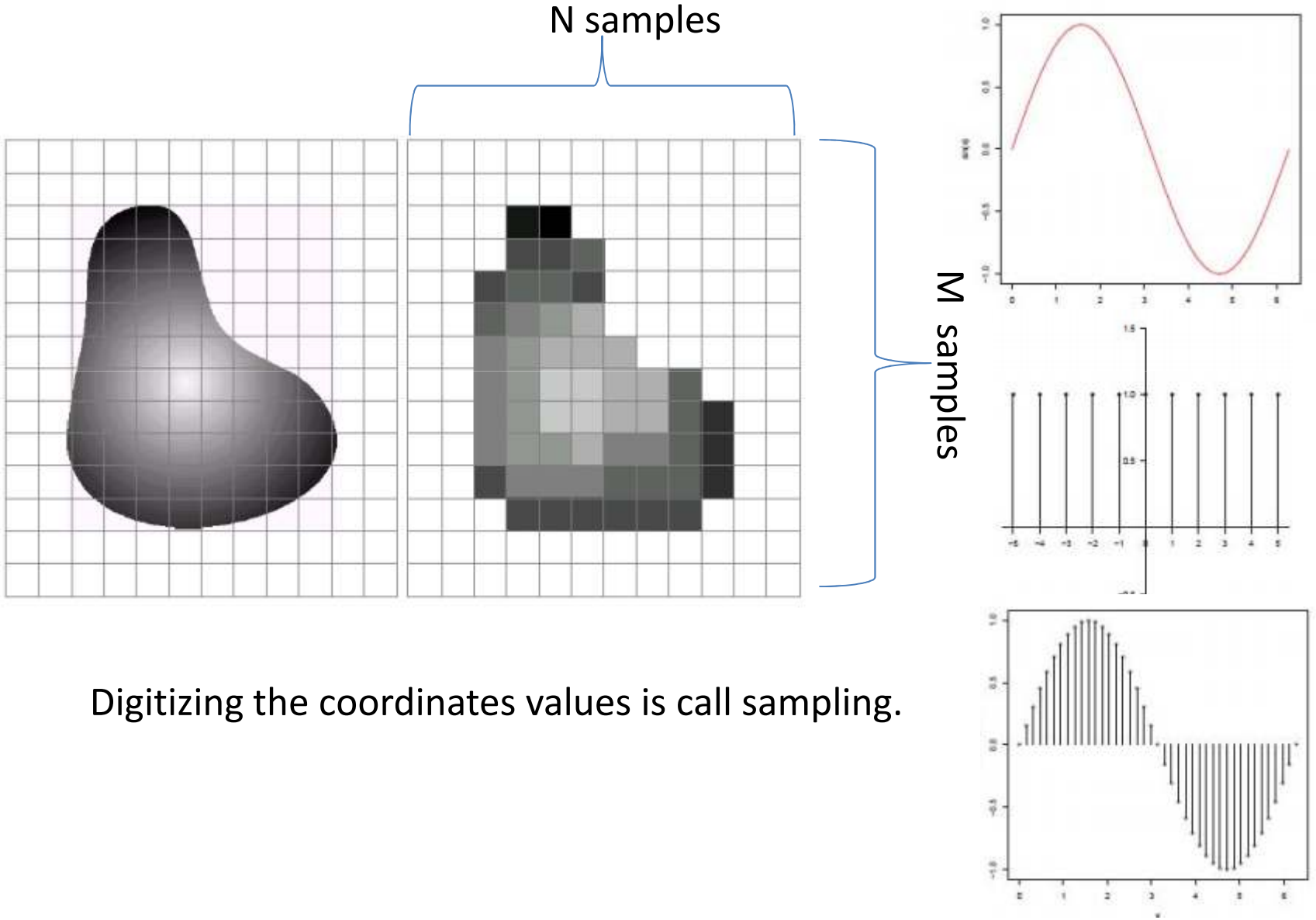
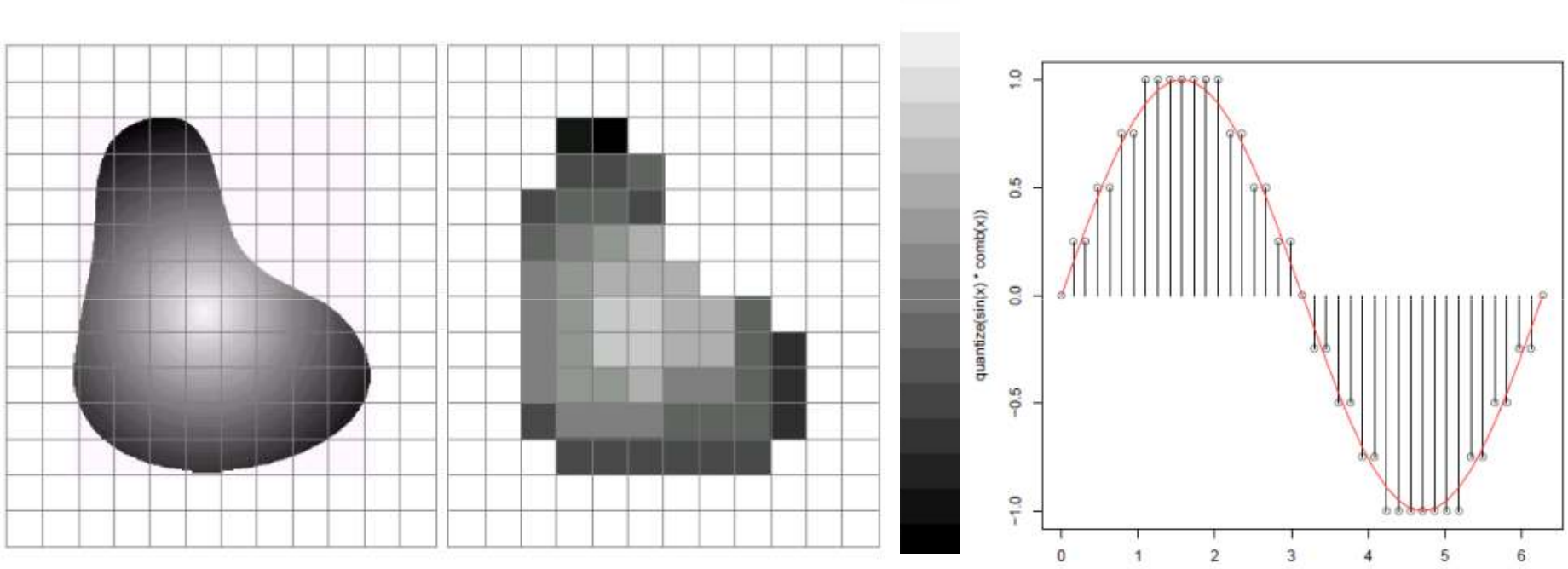


Image Sampling (Spatial)



Digitizing the coordinates values is call sampling.

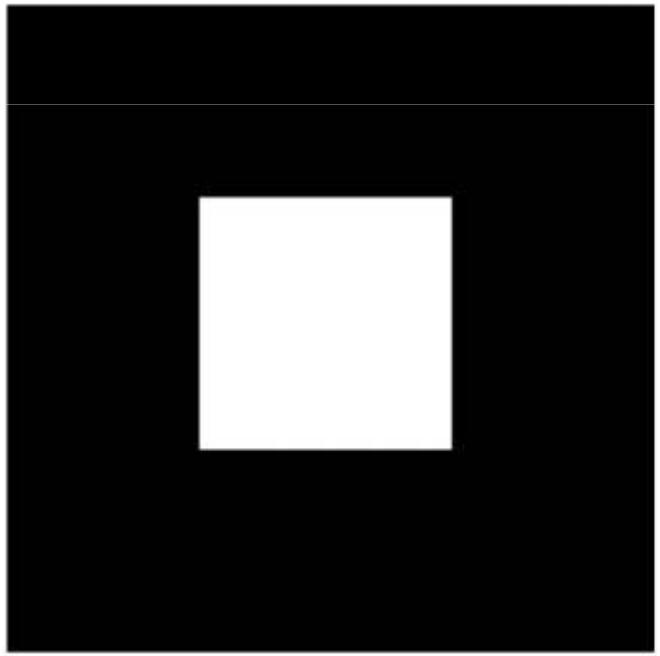
Image Quantization

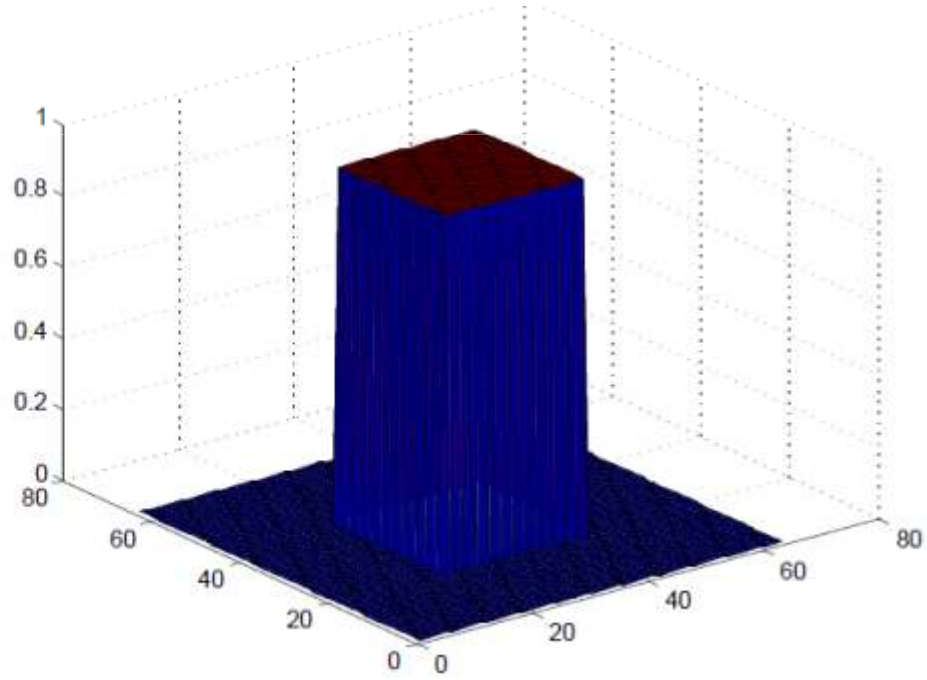


Digitalizing the amplitude values is call quantization .

Representation of Image as Discrete Function

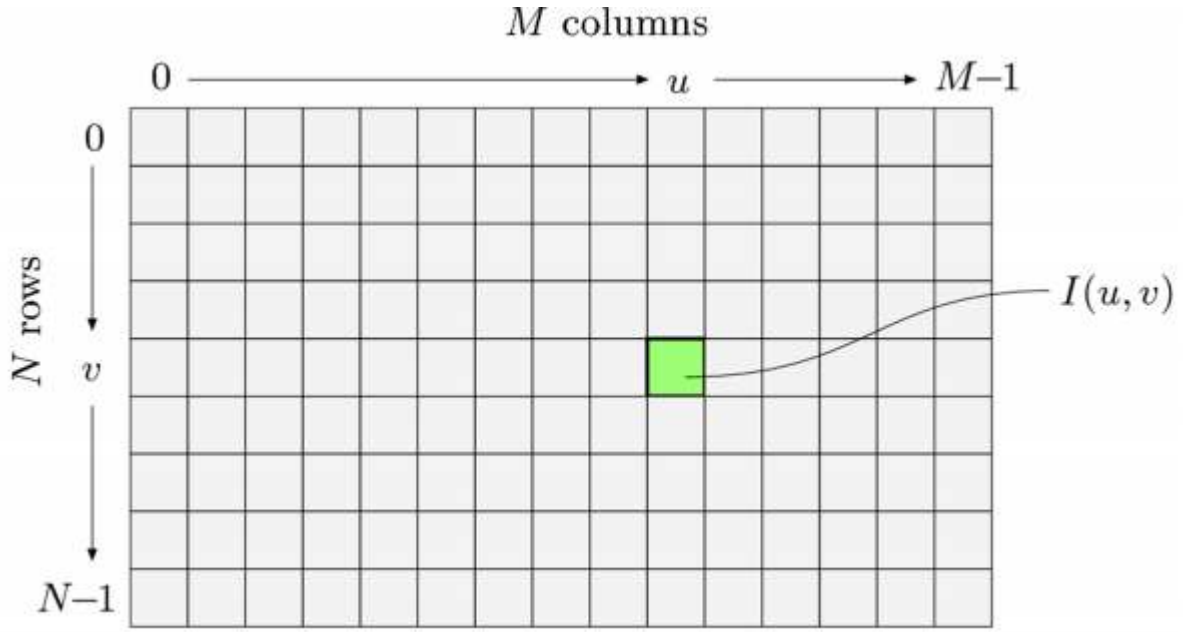
- After spatial sampling and quantization, an image is a discrete function.





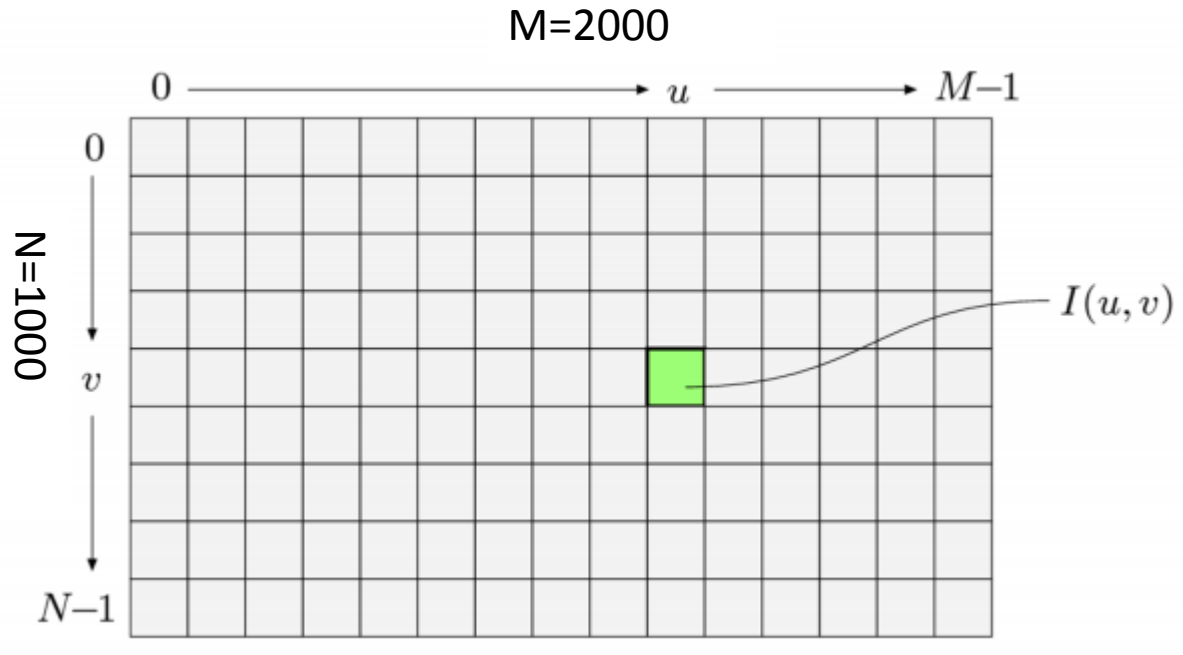
Representing Image

- Image data structure is 2D array of pixels values.
- Pixels values are gray levels in range 0-255 when using 8 bits to represent a pixel.

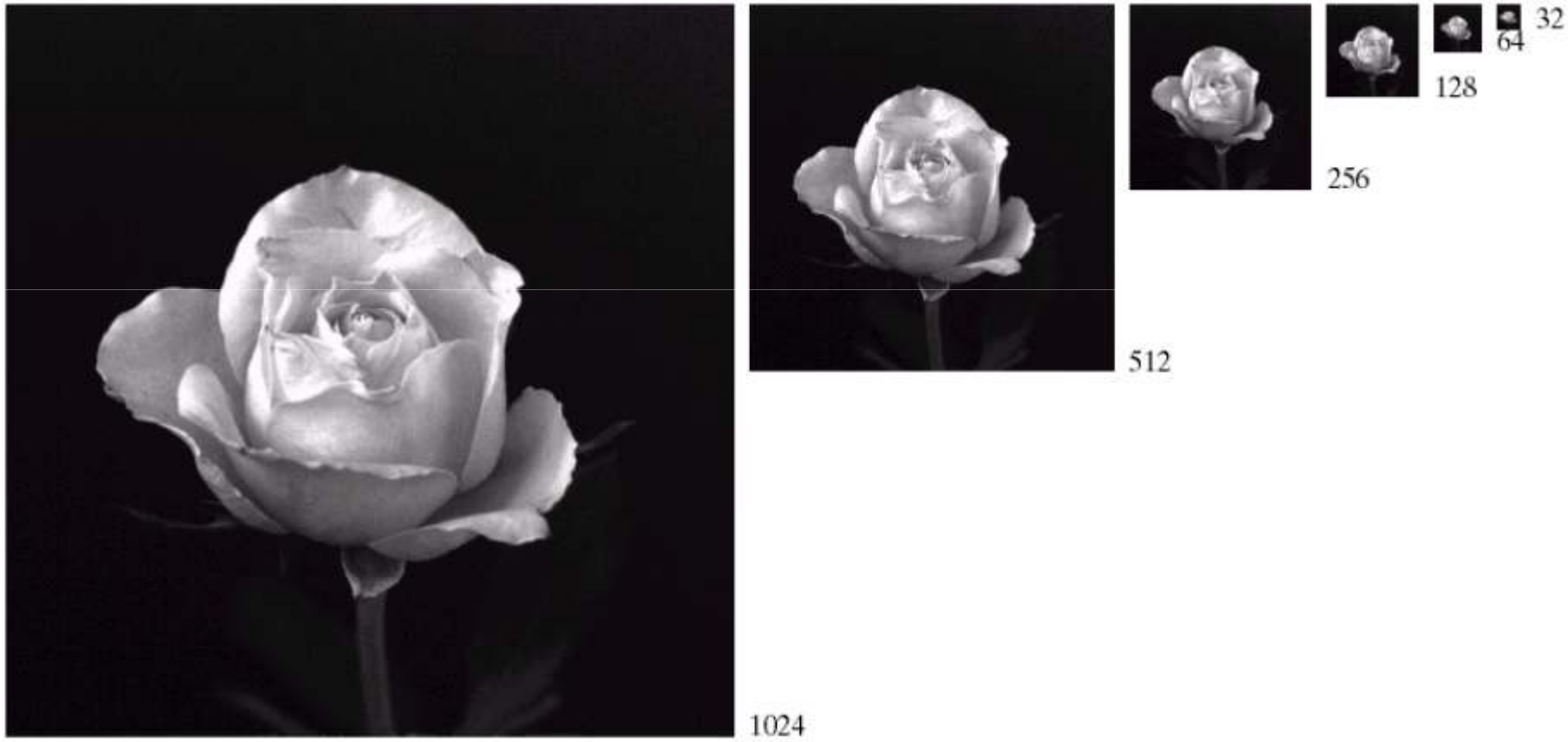


Spatial Resolution

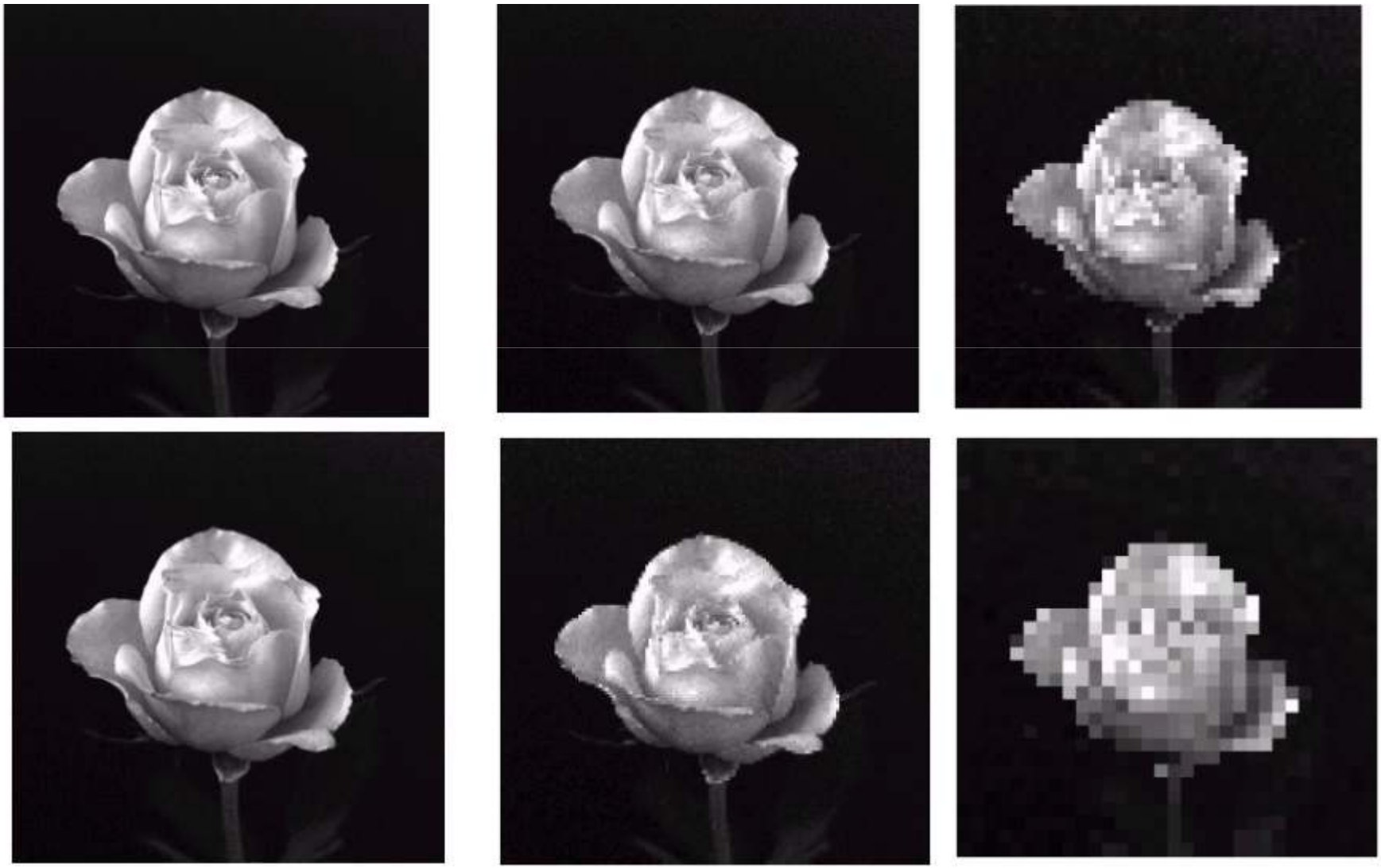
- Number of pixels that composes an image (Graphic designers talk about dots per inch (DPI)).
- Determine how coarse/fine sampling was carried out.



Spatial Resolution



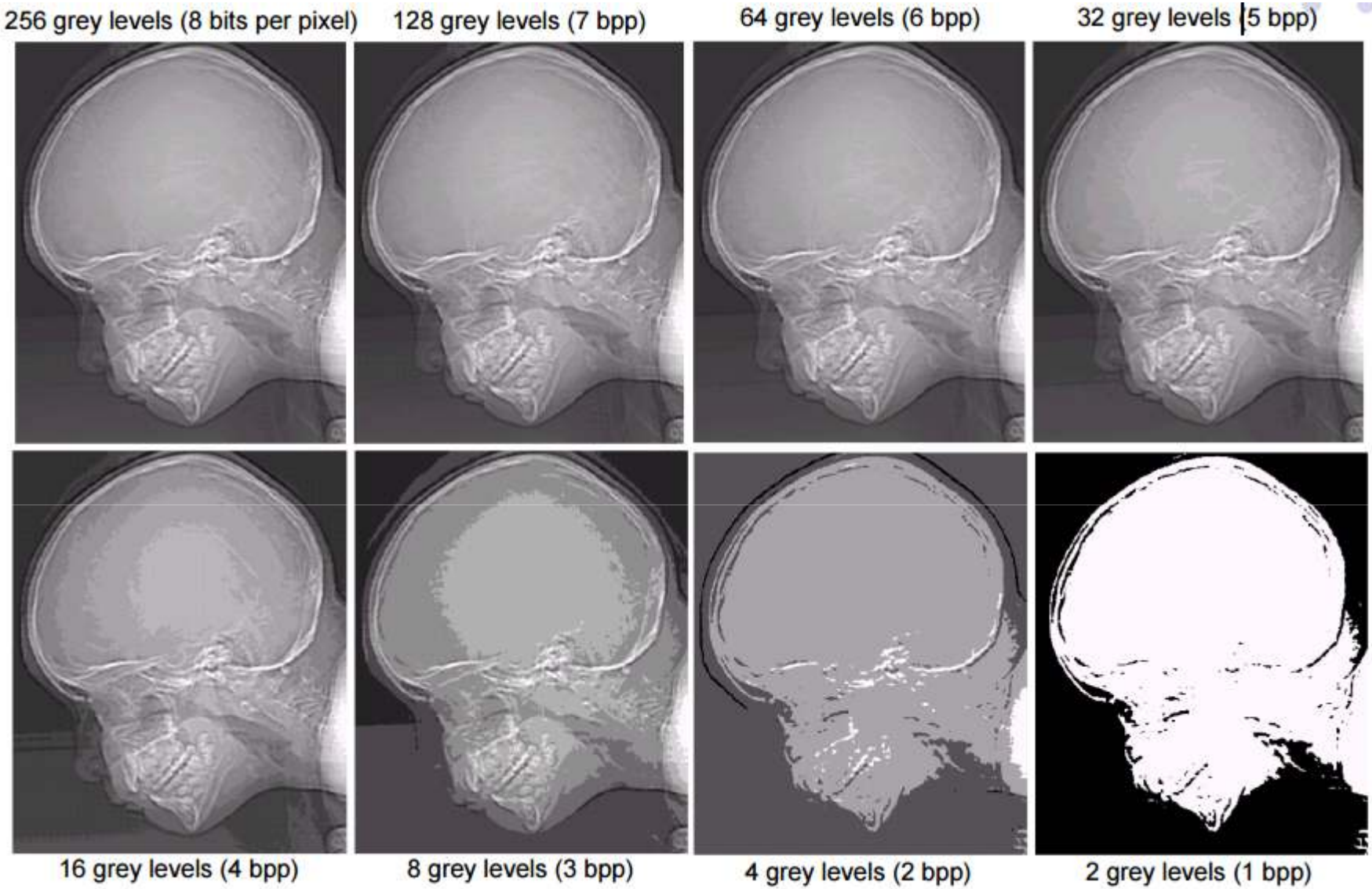
Spatial resolution



Intensity Level Resolution

- Number of intensity levels used to represent a pixels.
- Related to the number of bits used to store a pixel value.

Number of Bits	Number of Intensity Levels	Examples
1	2	0, 1
2	4	00, 01, 10, 11
4	16	0000, 0101, 1111
8	256	00110011, 01010101
16	65,536	1010101010101010



For smaller intensity levels appear ridge-like structures in areas of constant intensity (false countering) .