It covers: image sensors, perspective projection, CCD array sizes and pixels, the Bayer array-color sensing, illumination model, sampling and quantization, Matlab demo, image coordinate systems, useful Matlab commands, pixel neighbors and distances and slow motion video of a camera shutter.

Follows section 2.3-2.4 of the textbook (Gonzalez and woods, 3rd ed).
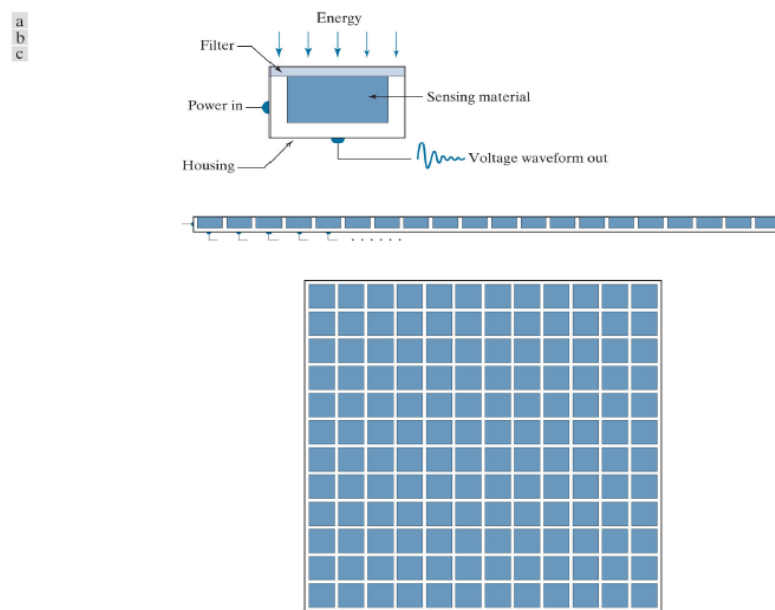
Image sensors:

Figure 3.1: (a): single sensing element. (b): line sensor. (c): array sensor
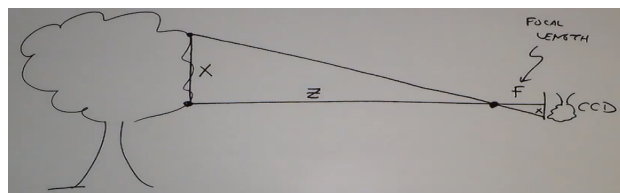
Usually, sensors are arranged in an array.

Figure 3.2: Graphical representation of the eye looking at a palm tree. Point C is the focal center of the tree.

(X, Y, Z) in word coordinates (3D), camera pinhole at $(0,0,0)$, projection of (X, Y, Z) onto image plane is (x, y) were

$$x = F\frac{X}{Z}, \quad y = F\frac{Y}{Z} \tag{3.1}$$

Pixel color responses are usually arranged in a Bayer pattern.

demosaicing

illumination model

References

[GW18]   Gonzalez and Woods, Digital Image Processing, *Pearson*, 2018.