

→ Computer vision

Techniques for image acquisition, extraction, characterization and interpretation of the 3D world.

↳ Luminance

Measurement of the amount of light that goes through an area emitted from a particular area and falls within a given solid angle (cd/m^2)
↓
candela

↳ Chrominance

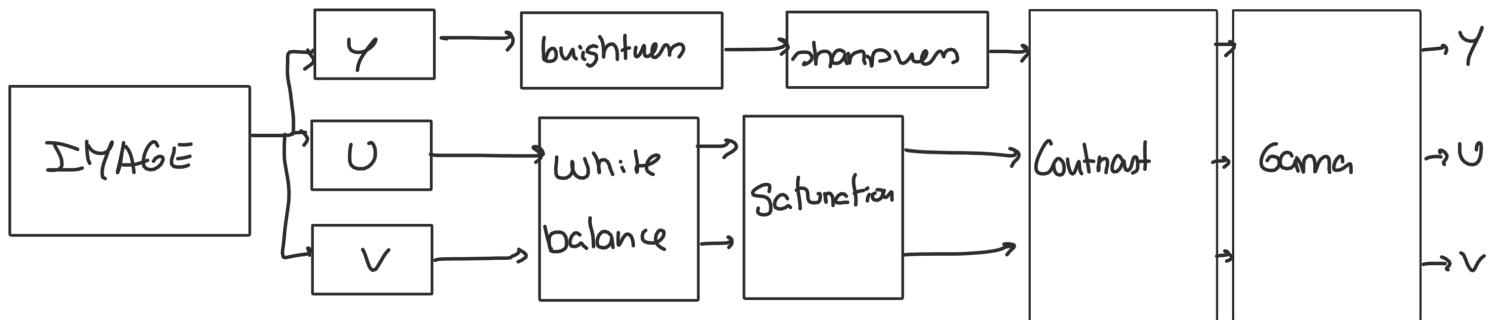
How light is distributed along the visible spectrum.
Chrominance has no info about luminance but is used with it to describe a colored image (ex: RGB).
In RGB, if $R = G = B$ then there is no info about chrominance.

↳ Image formation

Most image sensors use either CCD (charged coupled device - better dynamic range, lower dark noise) or CMOS (lower voltage, quick, lower complexity) to 'grab' light energy and convert to photons to electrons. Only **Luminance** is captured this way.

To obtain color, a set of filters must be used (most common Bayen configuration).

↳ Image processing pipeline



Brightness: measure of the average amount of light that is integrated over the image during the exposure time.

As a parameter, it's a value (constant) that can be added or subtracted from the luminance component.

Contrast: difference in luminance (or difference in color and brightness of the object and other objects in same FOV). Maximum contrast is contrast ratio.

Luminance difference

average luminance

As a parameter, is the variation of the gain control function of the luminance component of the image.

white balance: global adjustment of intensities of the colors (rgb). Important to render specific colors.

saturation: saturation of a color is determined by a combination of light intensity of a pixel and how this light is distributed across the spectrum.

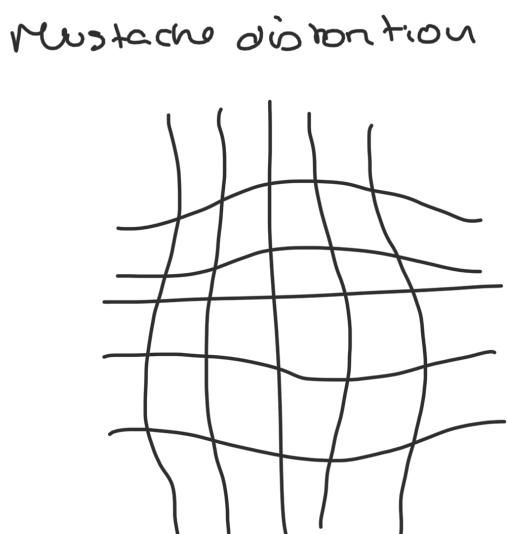
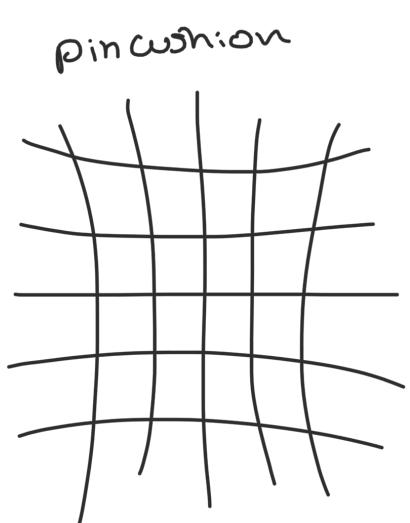
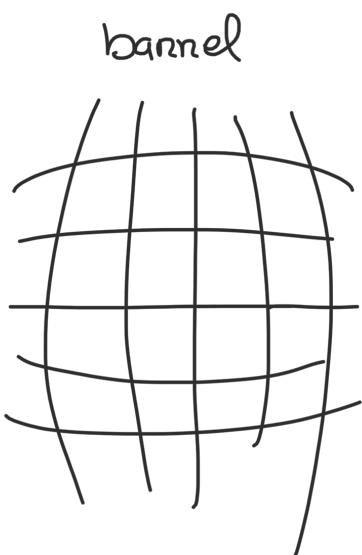
To reduce saturation, we can add white to the original colors (same as changing the gain of Y and V).

Gama: nonlinear operation used to code and decode luminance on RGB tristimulus values.

Sharpness: measure of energy frequency spatial distribution over the image. Allows the control of the cut-off frequency of a low pass spatial filter.

→ Lenses

Spherical aberration:



→ Camera parameters

Extrinsic: parameters that define location and orientation of the camera reference frame.

Intrinsic: parameters to link the pixel coordinate to the corresponding coordinates in the camera reference frame.