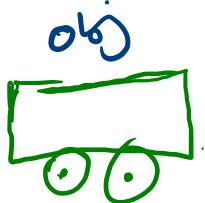
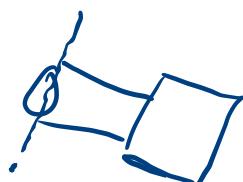


Image Enhancement

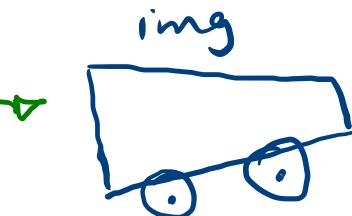
problems

Captured Image → {

- noisy
- poor contrast
- wrong shape



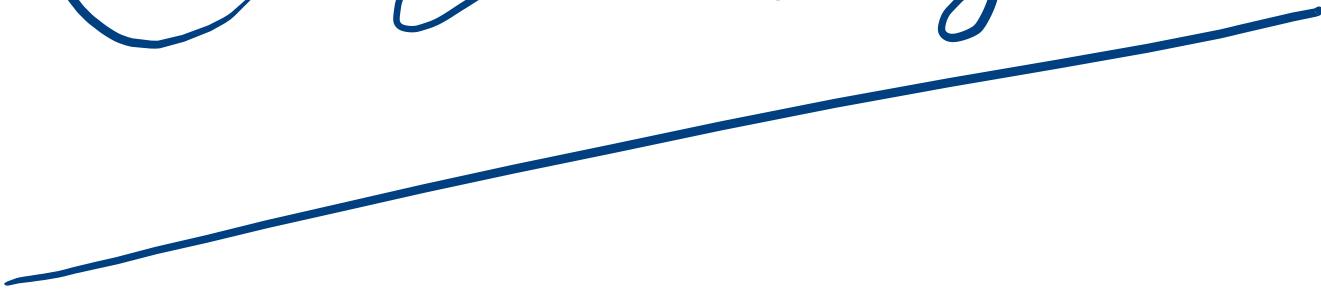
and size



default
enhancements

- Denoising.
- Contrast enhancement
- Resampling.

Contract



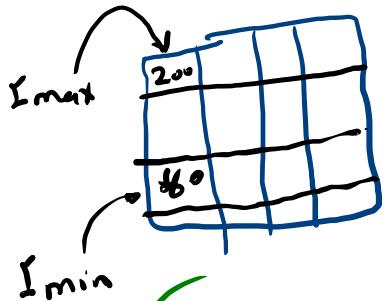
رسالة → Contrast → General (today)

صيغة (255 - intensity)
كتاب المنهج

رسالة → رسائل

رسالة → رسائل

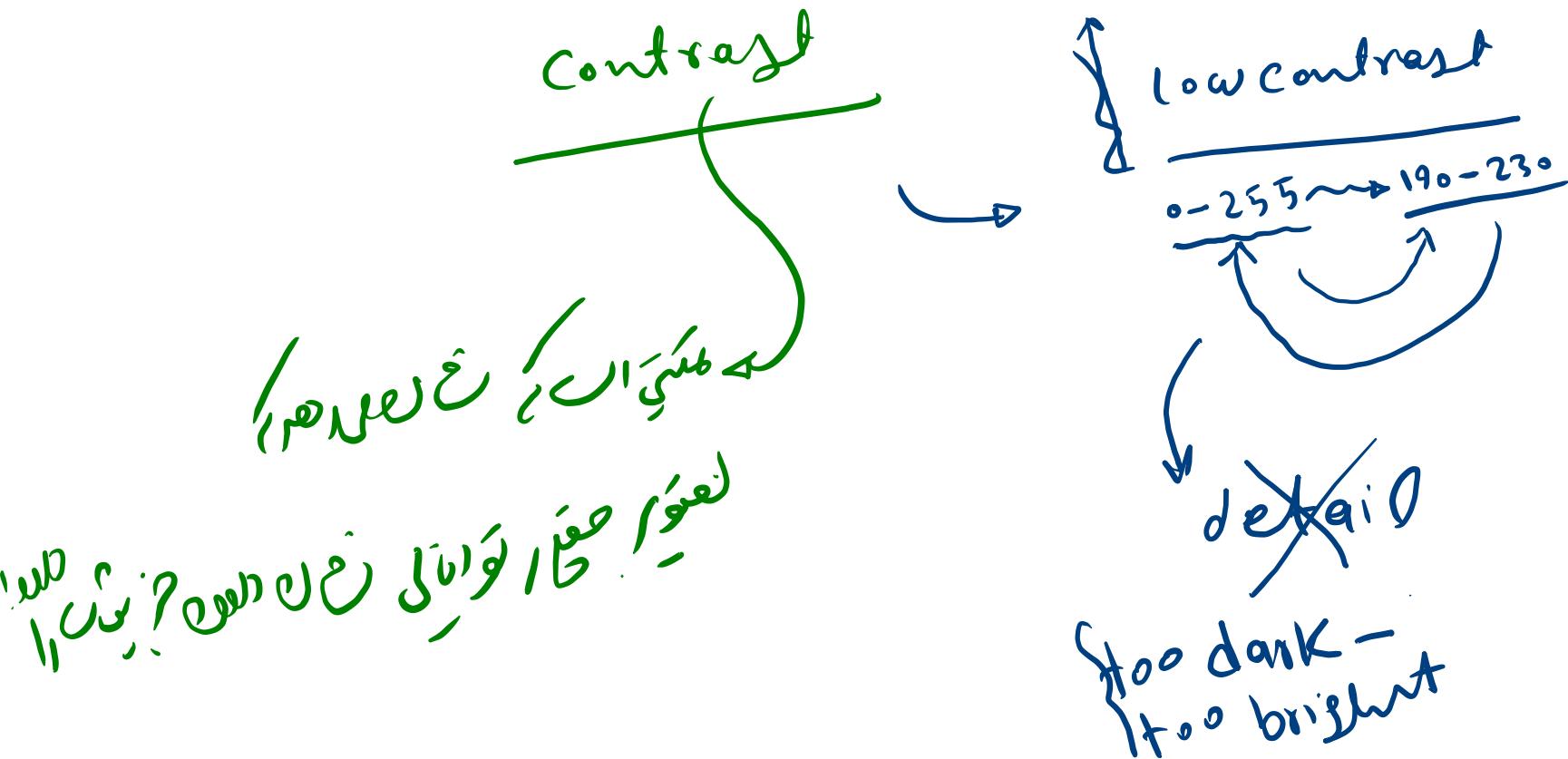
کنڑاٹ: قدرت میں نہ سرخ (پوچھیں)



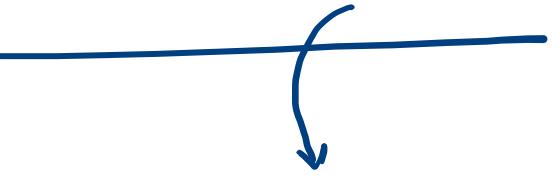
$$\text{Contrast} = I_{\max} - I_{\min}$$

better

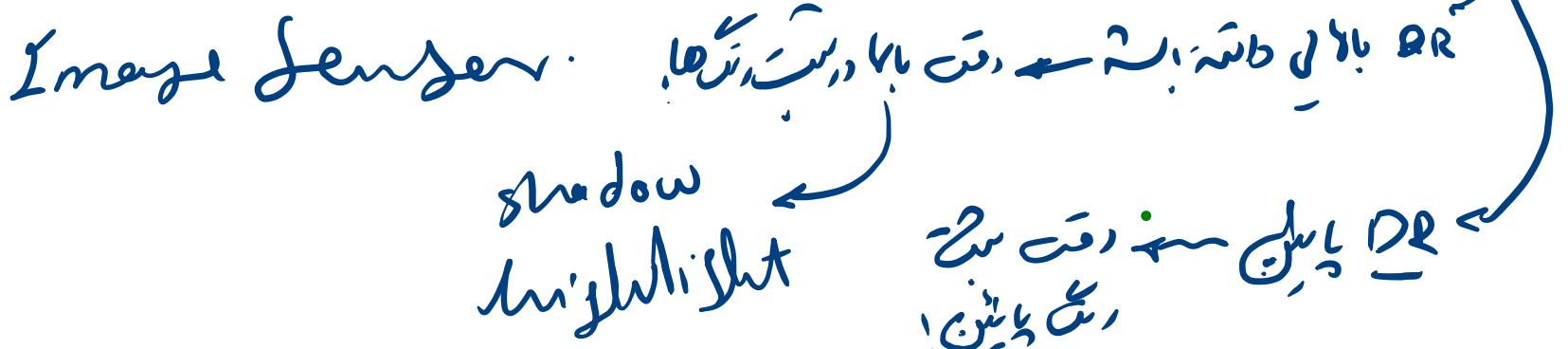
$$\text{Contrast} = \frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$$
$$\text{Contrast} = \frac{200 - 80}{200 + 80} = \frac{120}{280} = 0,4$$



Dynamic range.(DR)



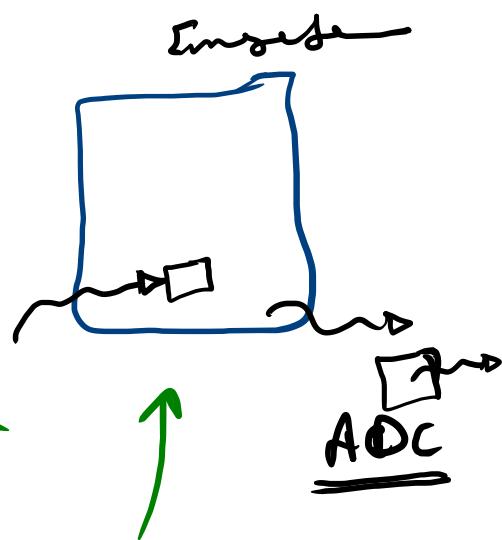
عفروت گریزه را



$$DR = 20 \log \frac{V_{max}}{V_{min}} \text{ ev}$$

البيانات المدخلية
البيانات المخرجية

أمثلة



~~target~~ tunneling

p-type ← Semiconductor

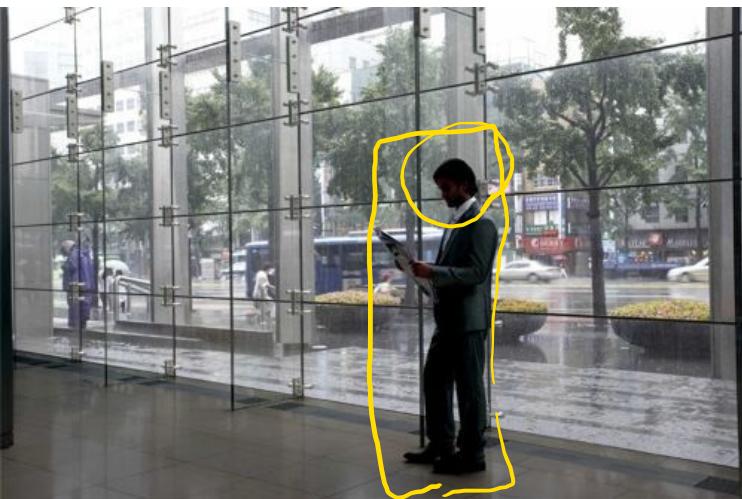
HDR

0 - 255
on

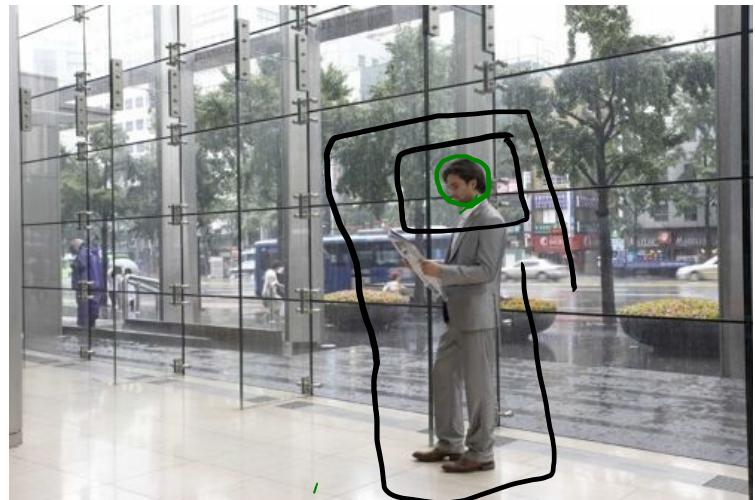
65535

High Dynamic Range.

wide Dynamic Range.



low DR



HDR

HDR



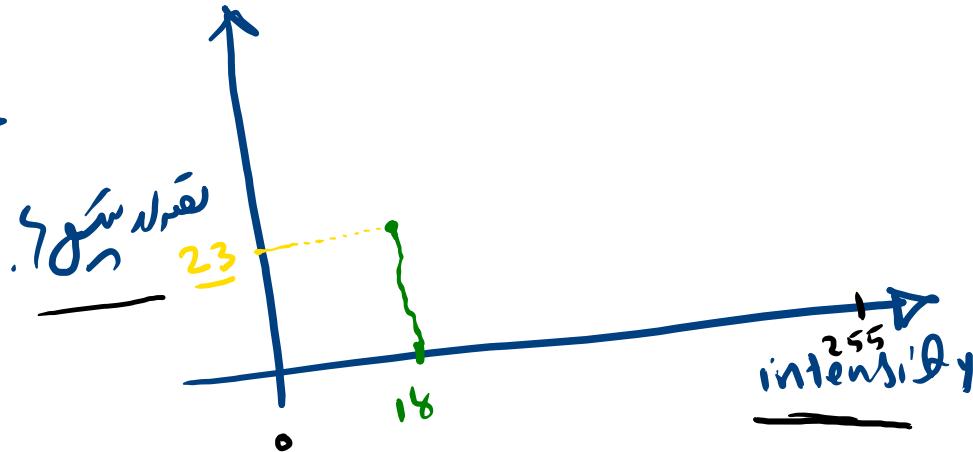
Sensor +
post processor

[multiple
Aperture.]

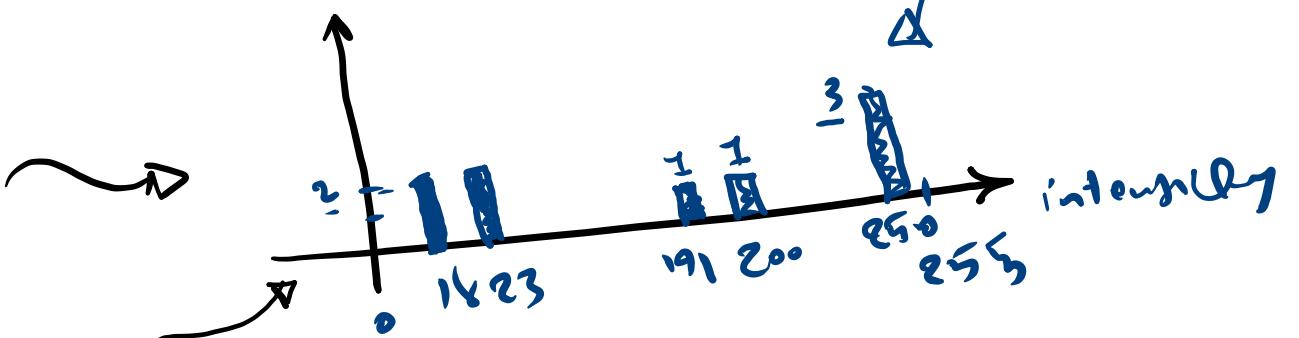
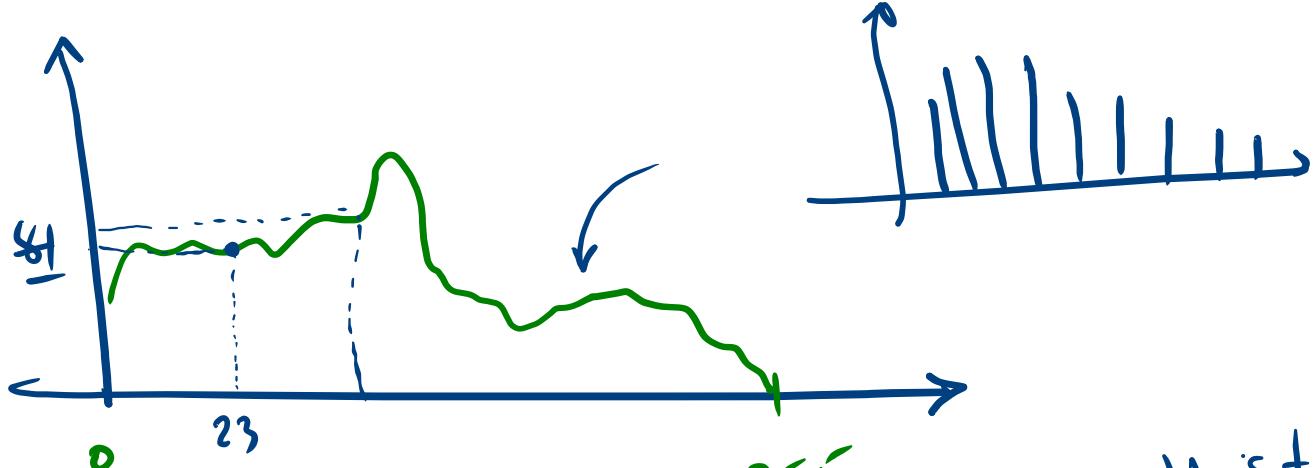
Sony ~ IS → HDR

Histogram :

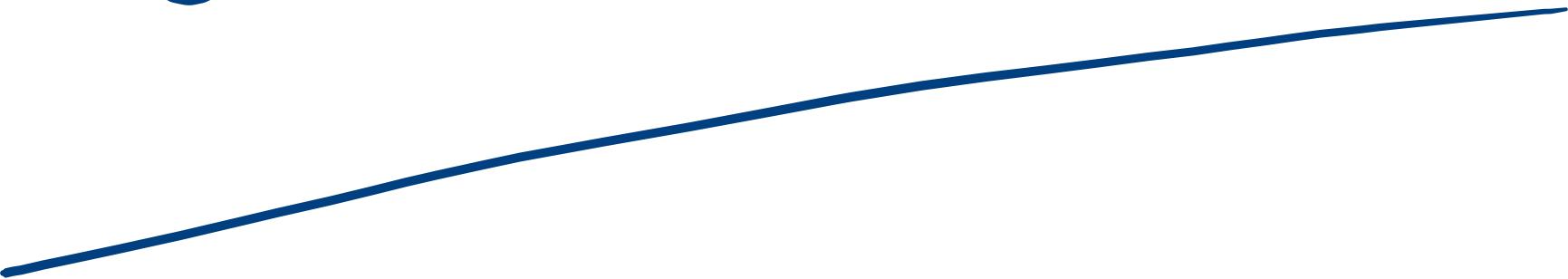
8-bit \rightarrow 256

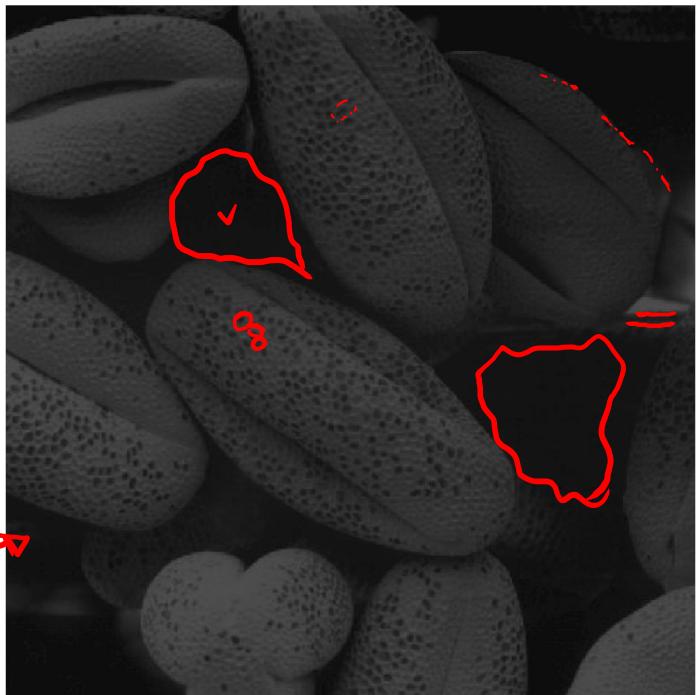


وَلُعْرَلَه سُكُونٍ 23 مَسْكُونٌ بِالنَّارِ!

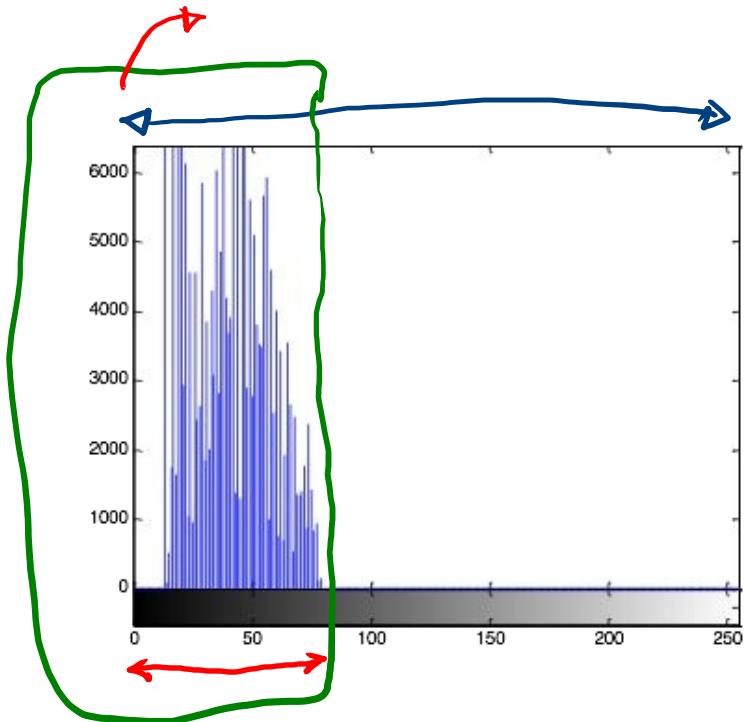


Contrast enhancement

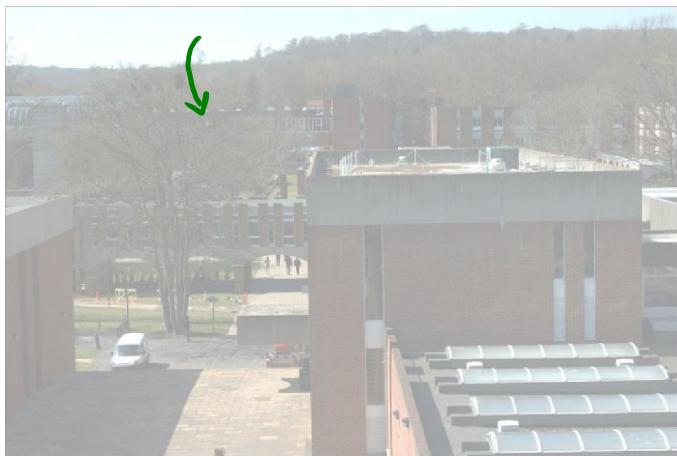




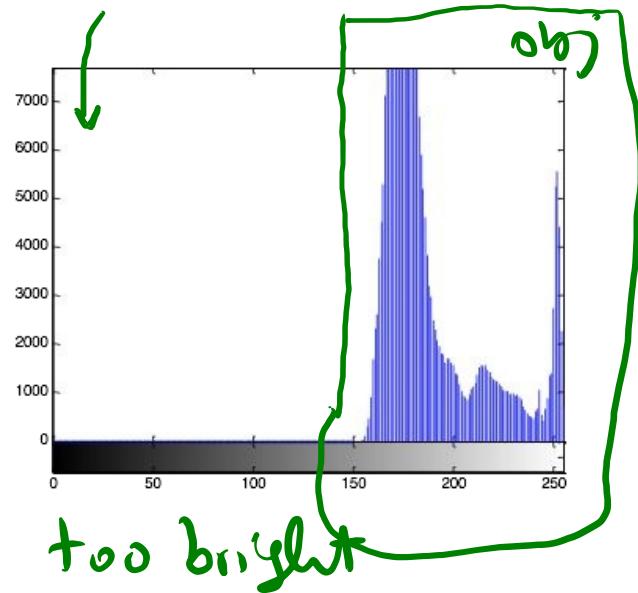
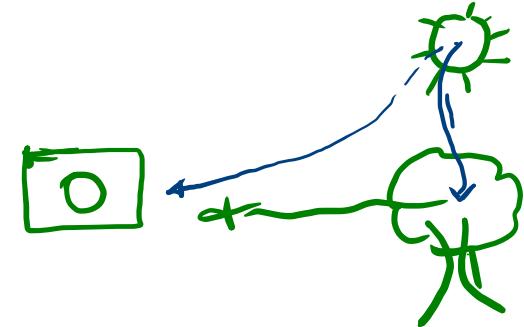
low contrast
poor contrast

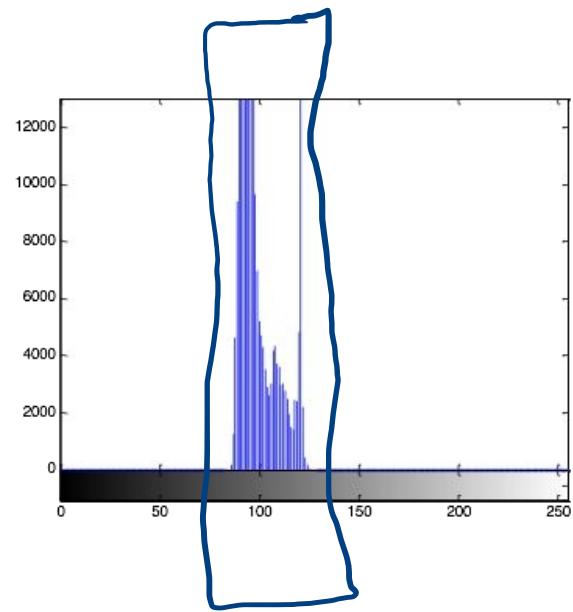


too dark



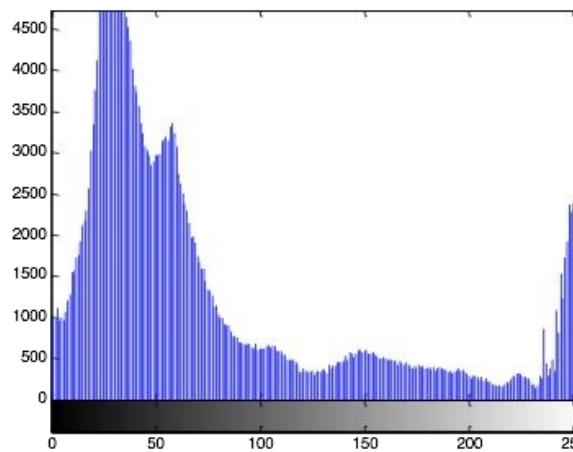
low (or poor) Contrast





poor contrast α

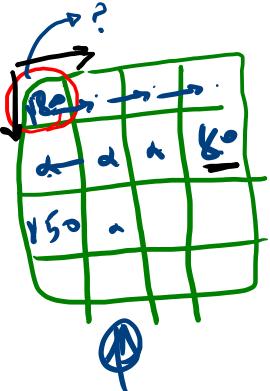
$DR \rightarrow \text{good}$



Good contrast

Contrast Stretching

متضاد! مترافق!



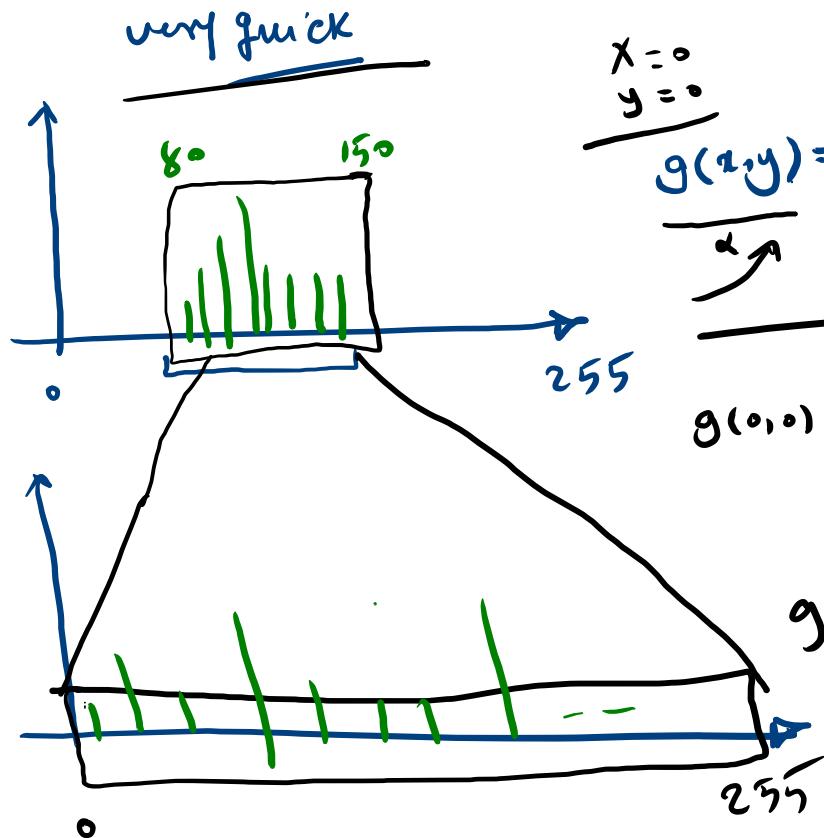
$$I: 120$$

$$I_{\min}: 80$$

$$I_{\max}: 150$$

$$\text{Max}: 255$$

$$\text{Min}: 0$$



very quick

$$g(x,y) = \frac{I - I_{\min}}{I_{\max} - I_{\min}} (Max - Min) + Min$$

$$g(0,0) = \frac{120 - 80}{150 - 80} (255 - 0) + 0 =$$

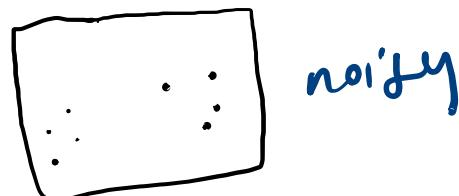
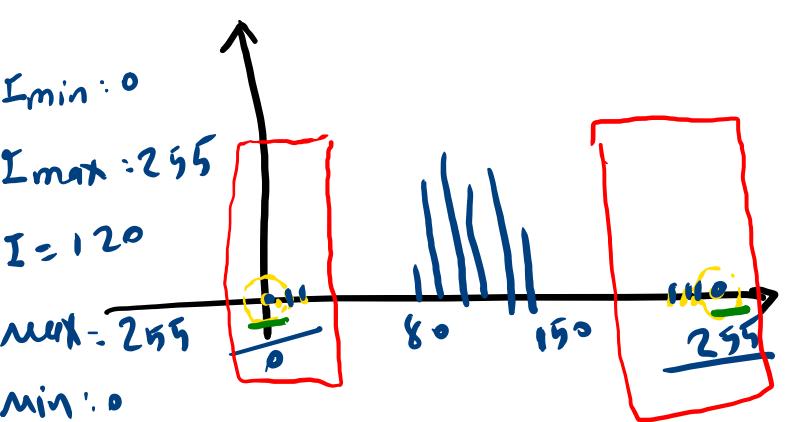
$$g(0,0) = \frac{40}{70} (255)$$

$$= \frac{140}{70} \approx \underline{\underline{200}}$$

→ 147

2. Contrast stretching.

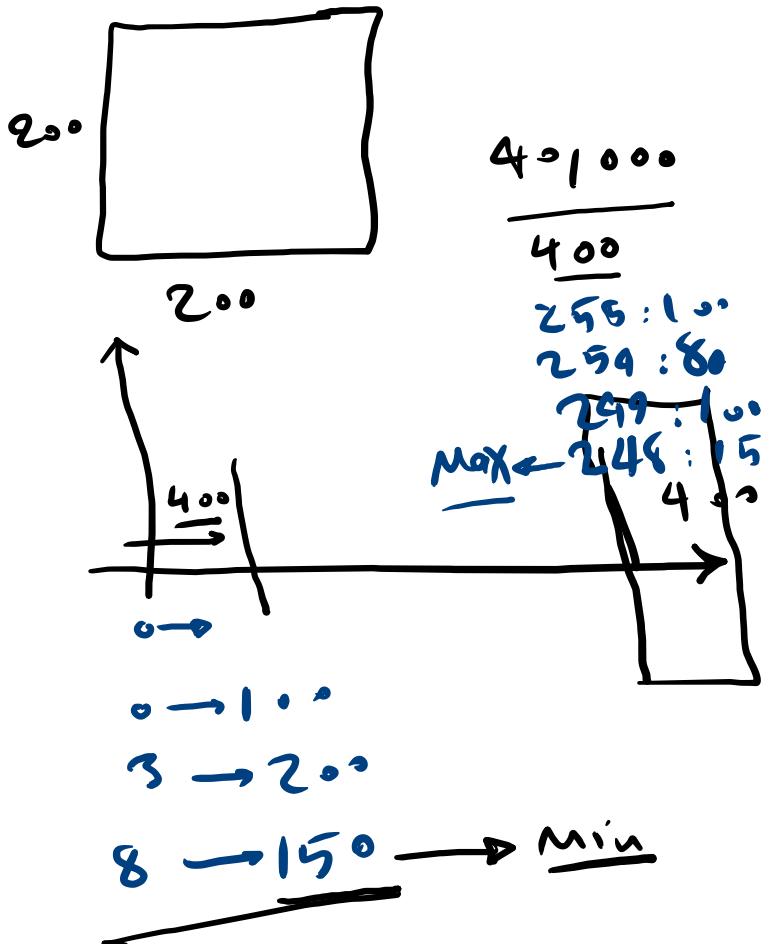
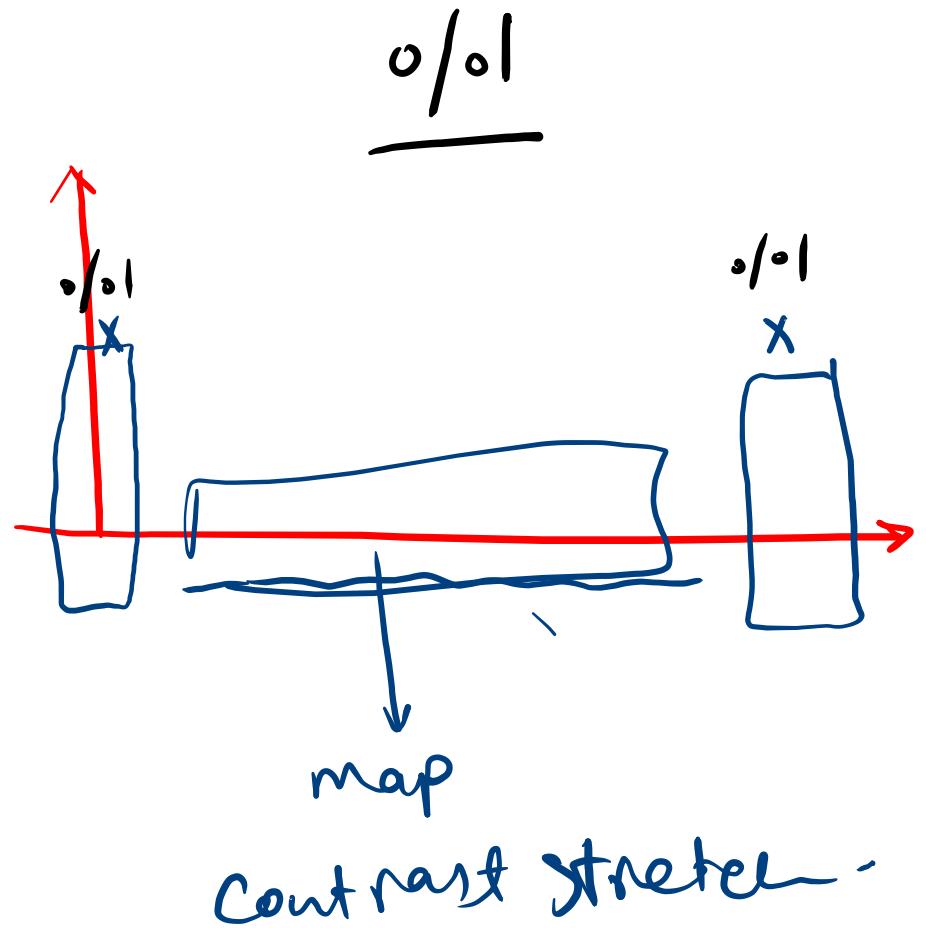
$$g(x,y) = \frac{I - I_{\min}}{I_{\max} - I_{\min}} (Max - min) + min$$



$$g(0,0) = \frac{120 - 0}{255 - 0} (255 - 0) + 0 = 120$$

Contrast

clipping.



مُعْصِلَةُ الْمَوَازِينِ
مُعْصِلَةُ الْمَوَازِينِ

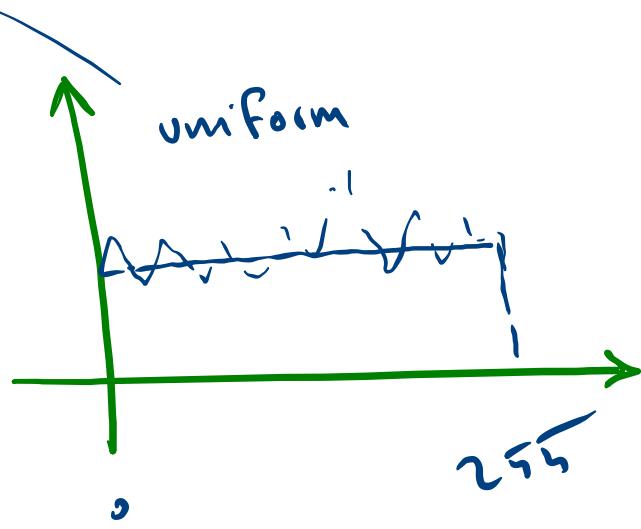
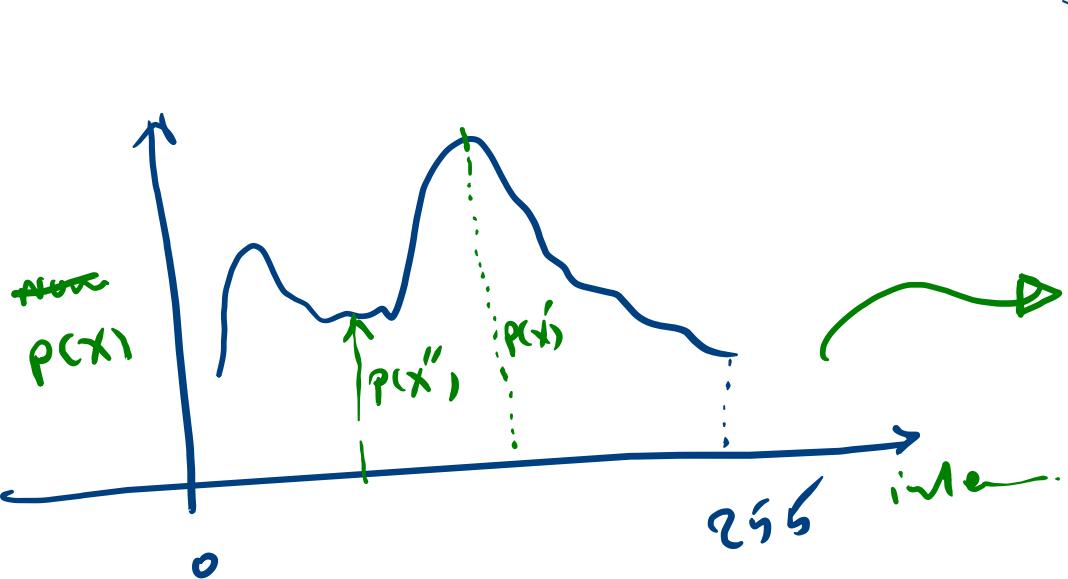
Stretch

مُعْصِلَةُ الْمَوَازِينِ

مُعْصِلَةُ الْمَوَازِينِ

clipping

Histogram equalization

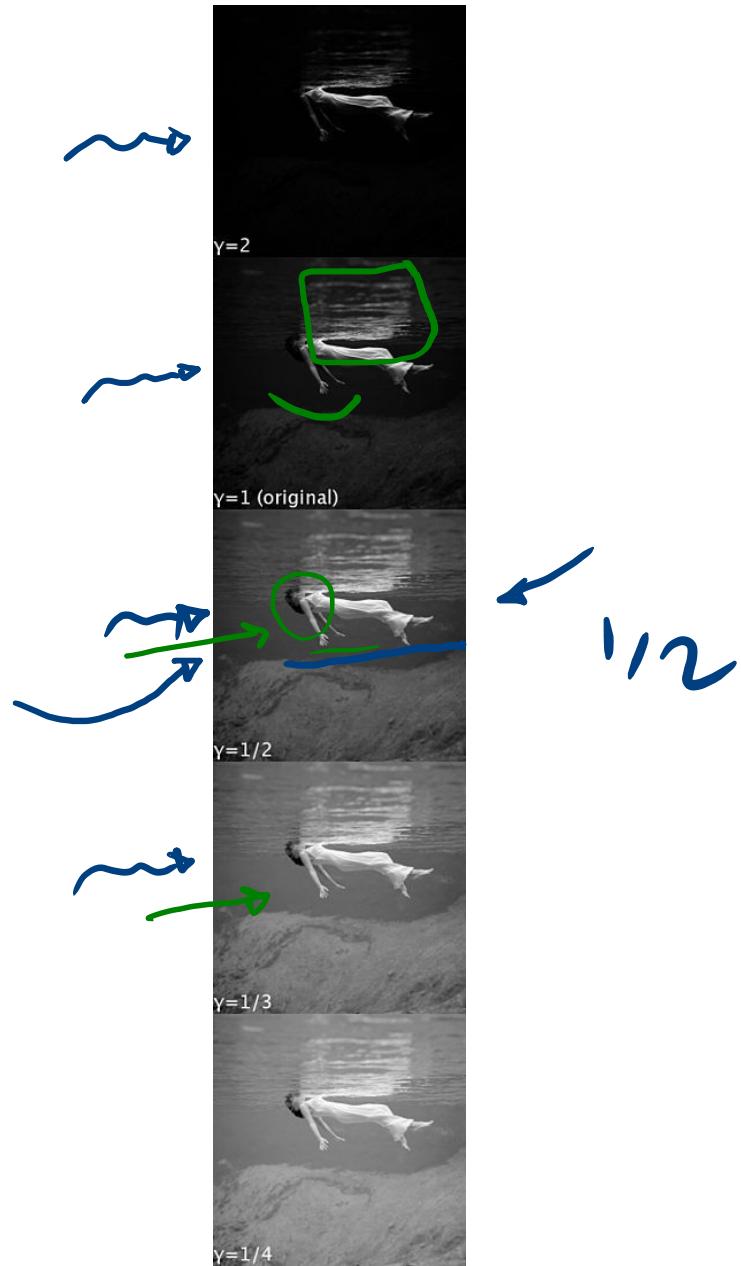


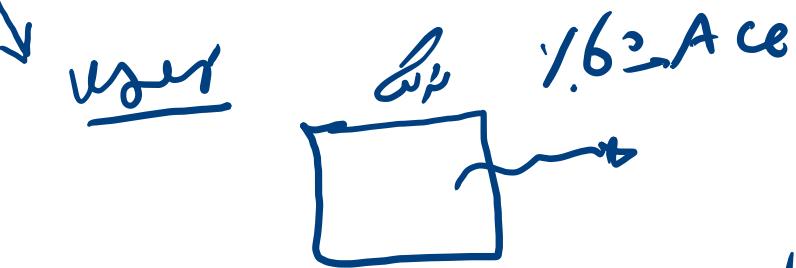
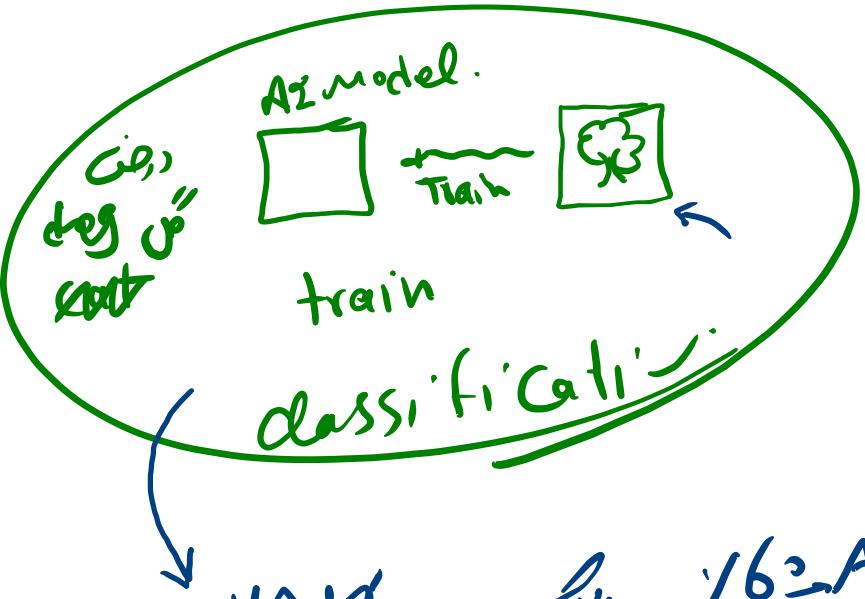
اگر میخواهیم هر آنرا باز بسازیم
لطفاً این را از ویرایش عفی نباشد!

اگر میخواهیم این را باز بسازیم
لطفاً این را از ویرایش عفی نباشد!

Gamma

$$\gamma = \left(\frac{I - I_{min}}{I_{max} - I_{min}} \right)^8 \left(\frac{I_{max} - I_{min}}{I_{max} - I_{min}} + \frac{I_{min}}{I_{max} - I_{min}} \right)$$





۰.۹۵ → Ace

تصویری!

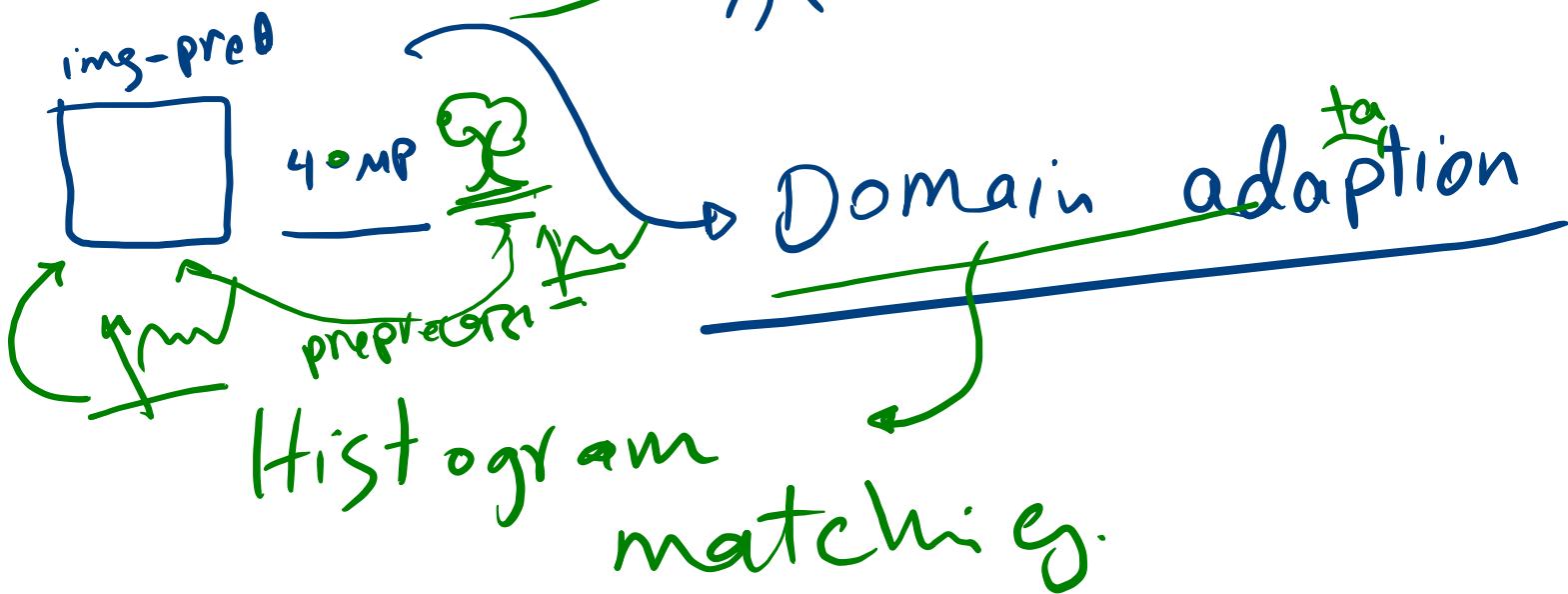
اویسی ملک

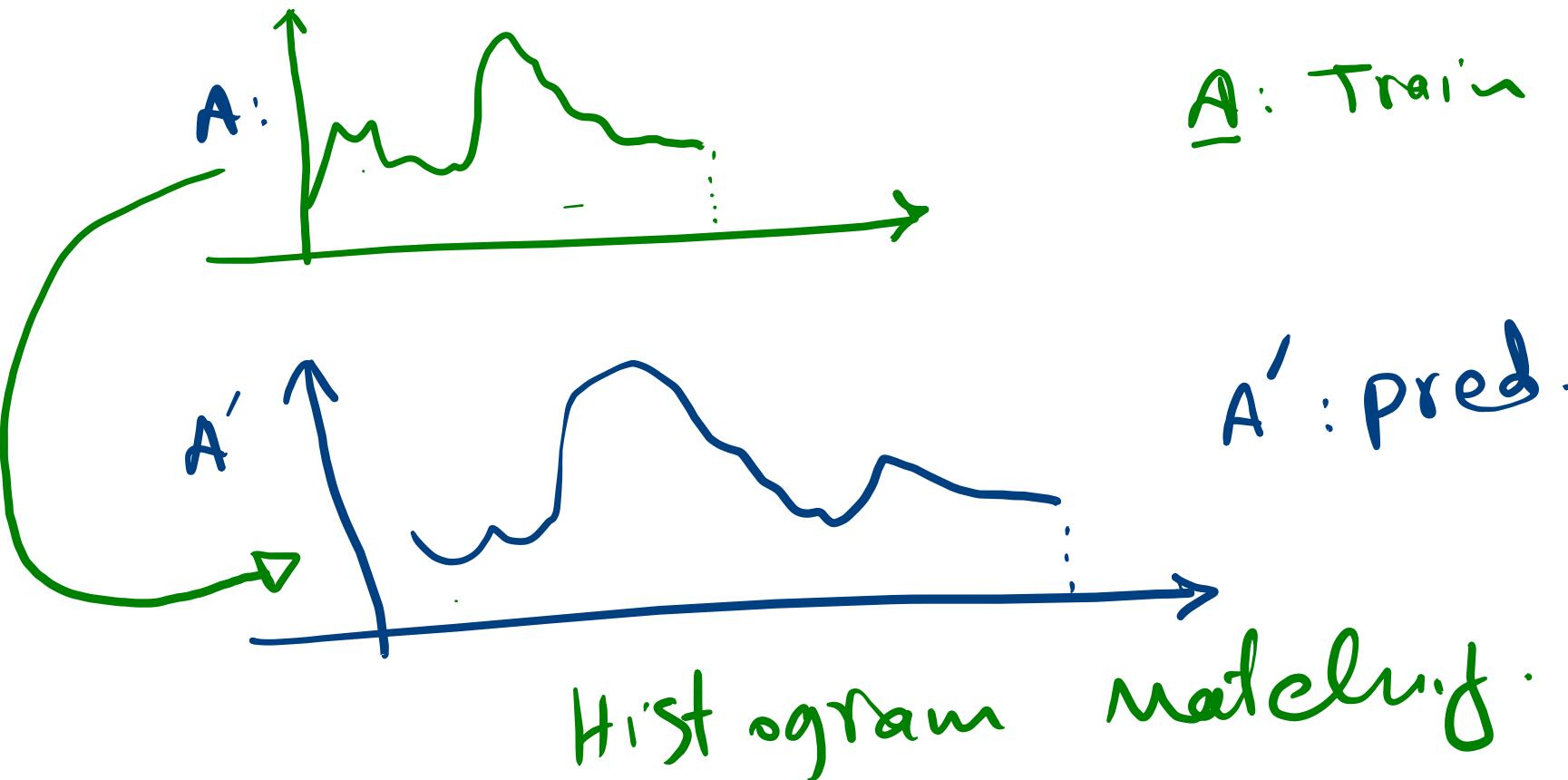
لور + پاکتھر لعنت رجیداری

A:



B:



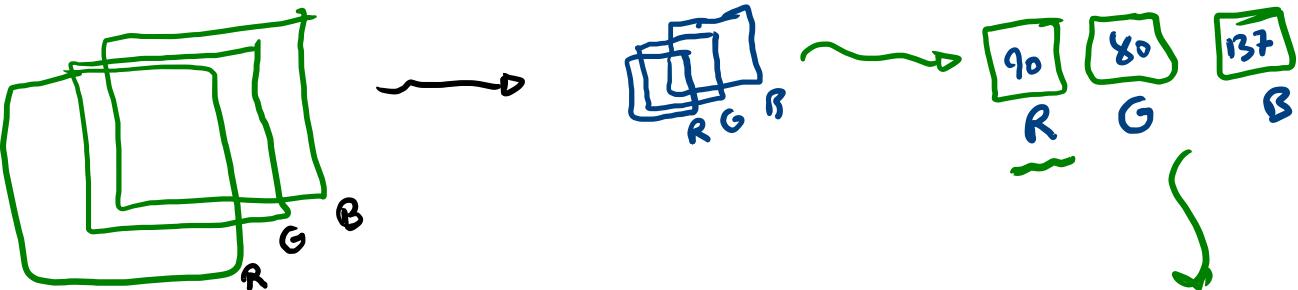




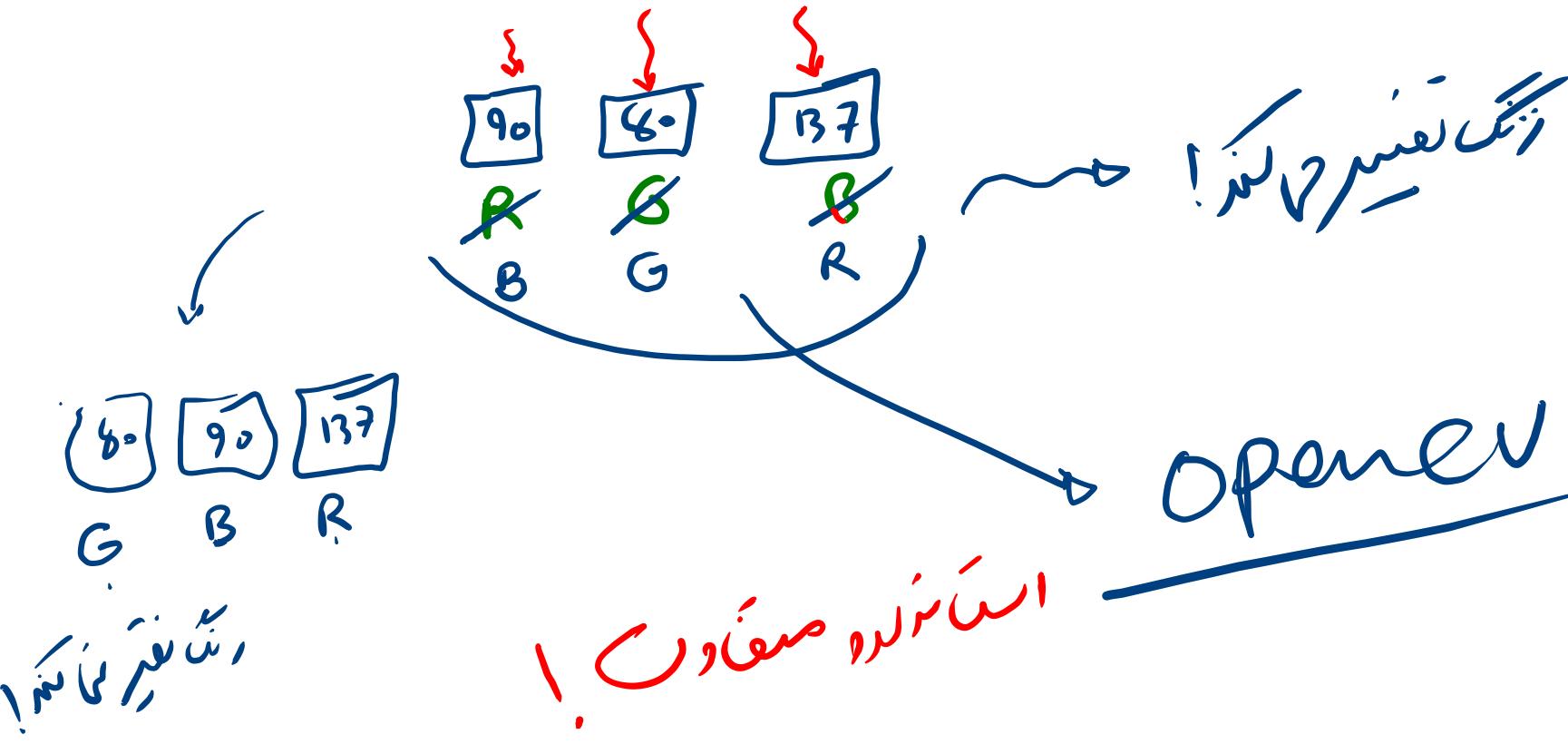
Extra

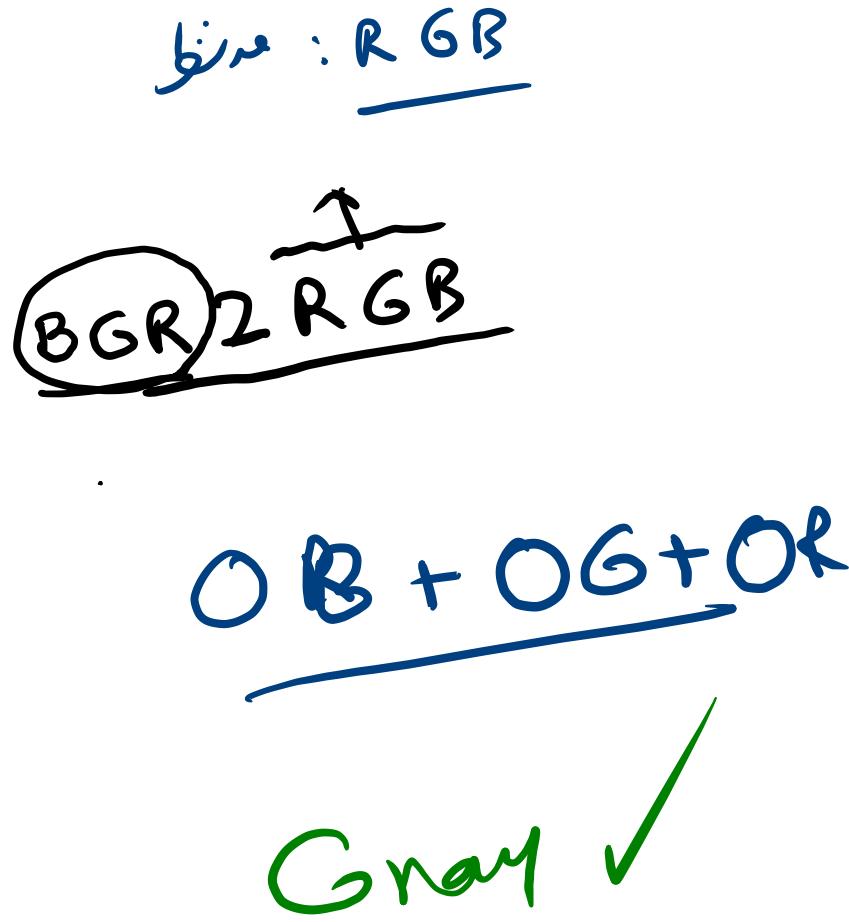
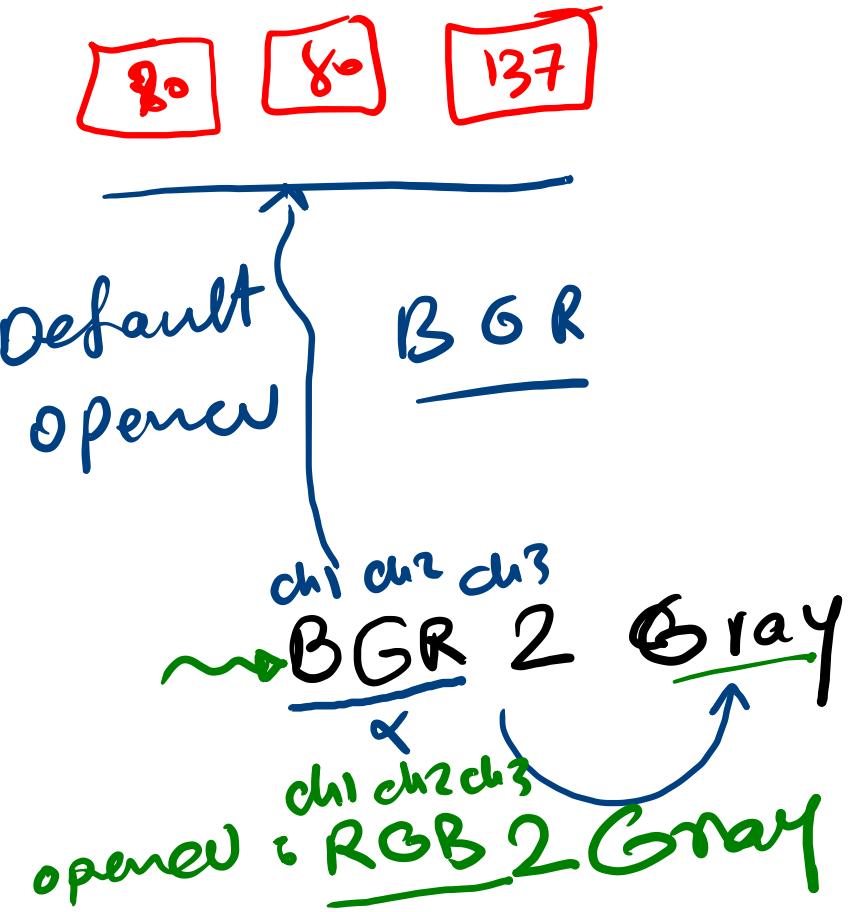
RGB or BGR?

OpenedCV



جذب فرجه من الصورة كل بعده
R \leftarrow Ch1 / ملحوظ
G \leftarrow Ch2
B \leftarrow Ch3





$$\text{Gray} = \cdot3R + \cdot5G + \cdot2B$$

```

path = r'images/colors.png'

color_image = cv2.imread(path)
gray_image2 = cv2.cvtColor(color_image, cv2.COLOR_RGB2GRAY)
plt.subplot(3, 1, 1)
plt.imshow(gray_image2, cmap='gray')
plt.title('Gray Image using COLOR_RGB2GRAY')
plt.axis('off')

color_image = cv2.imread(path)
color_image3 = cv2.cvtColor(color_image, cv2.COLOR_BGR2GRAY)
plt.subplot(3, 1, 2)
plt.imshow(color_image3, cmap='gray')
plt.title('Gray Image using COLOR_BGR2GRAY')
plt.axis('off')

gray_image1 = cv2.imread(path, 0)
plt.subplot(3, 1, 3)
plt.imshow(gray_image1, cmap='gray')
plt.title('Gray Image using IMREAD_GRAYSCALE')
plt.axis('off')

```

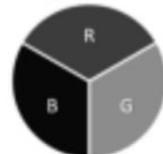
Gray Image using COLOR_RGB2GRAY



Gray Image using COLOR_BGR2GRAY



Gray Image using IMREAD_GRAYSCALE



~~$$\text{Gray} = \cdot3R + \cdot5G + \cdot2B$$~~