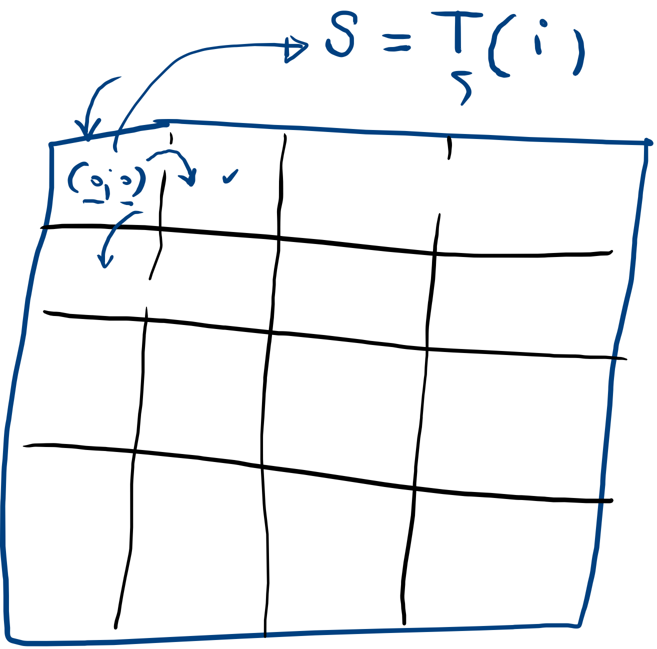
Contrast Enhancement

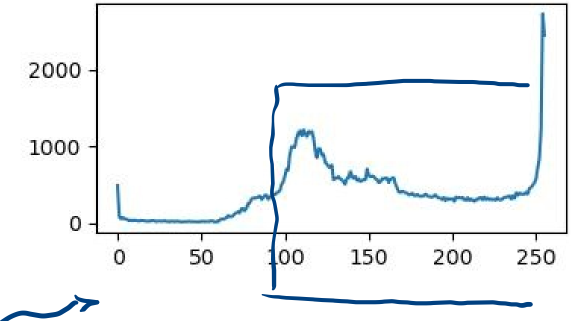
- contrast stretch
- " clipping
- Gamma Correction
- Histogram equalization

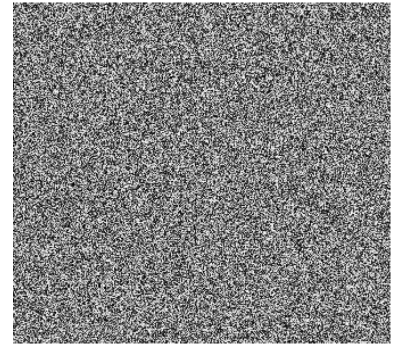


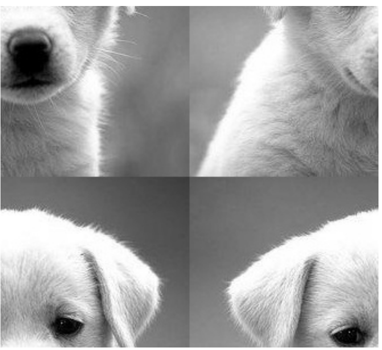
روش کار سیستم به صورت جزء!

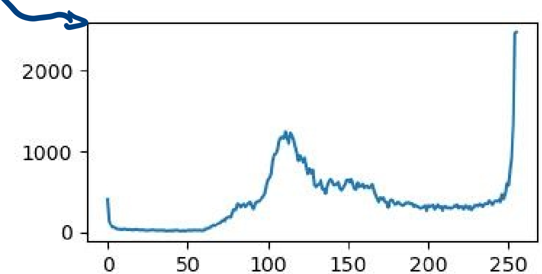
مقدار PX را بررسی و تغییر می‌دهد!

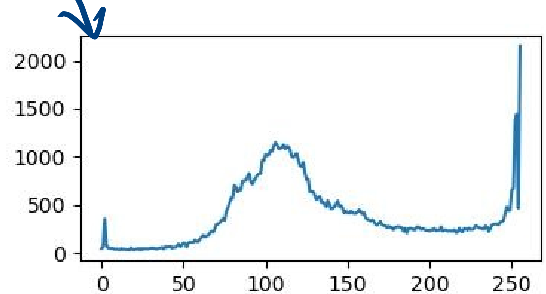
Histogram مستقل از مکان px ها!



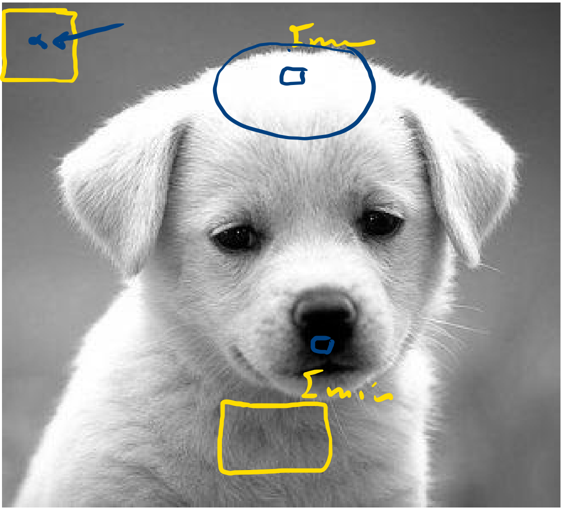




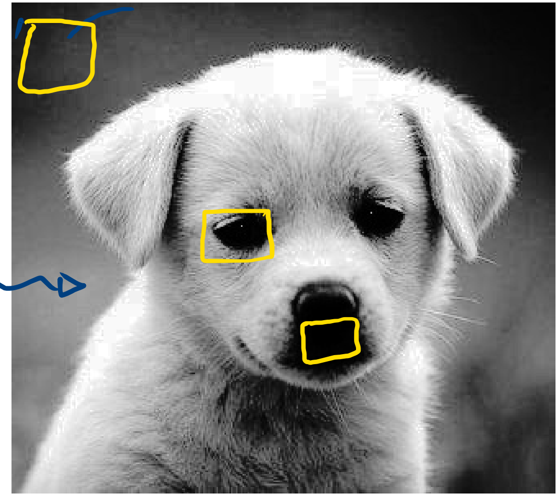




global contrast enhancement.

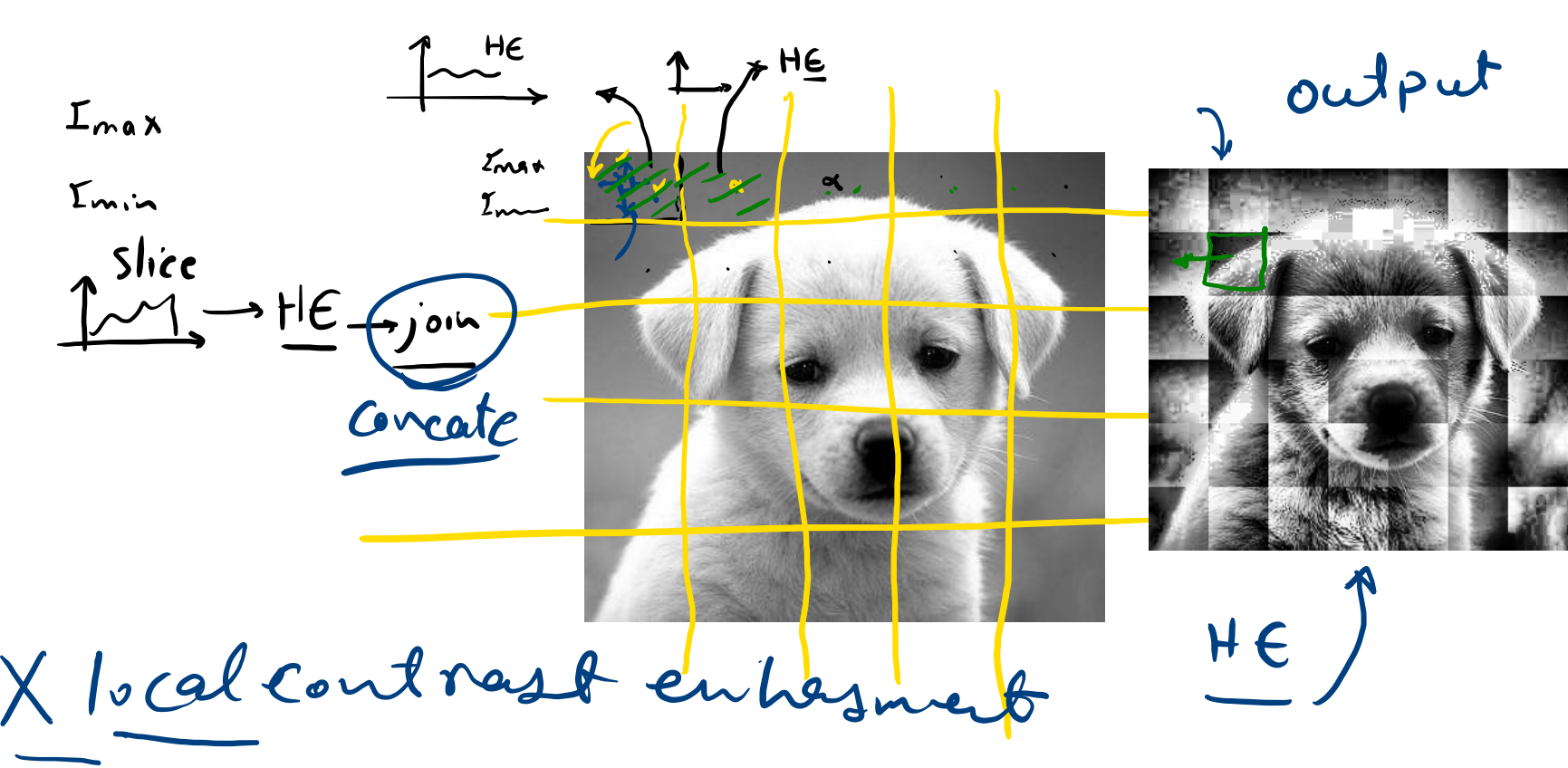


Original



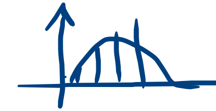
HE

در این تصویر به علت
زیاد بودن سطح های
روشن، به جای متعادل
شدن تصویر ~~contrast~~
شده حتی سطح های کم نور
تصویر تاریک تر شود!



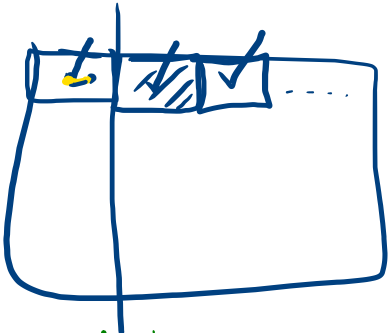
X local contrast enhancement

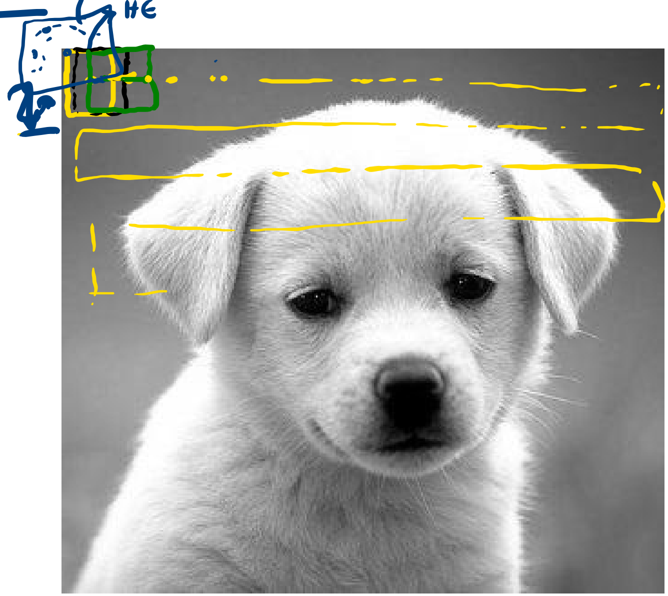
window Vùng mxn : 20x20 → zero padding.



AHE

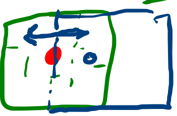
HE



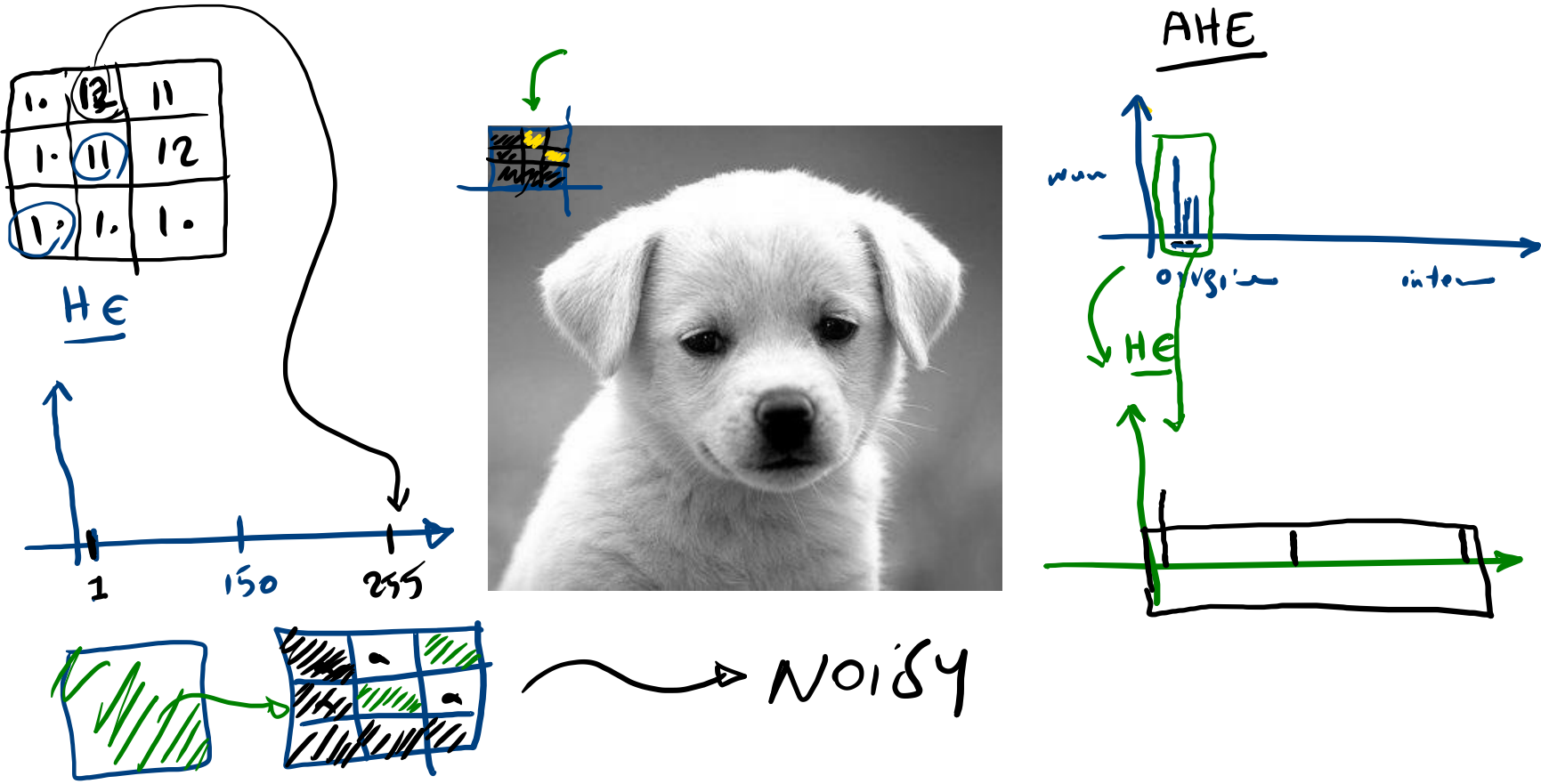


ACE

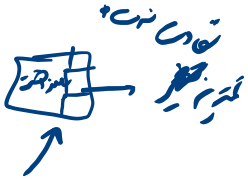
window

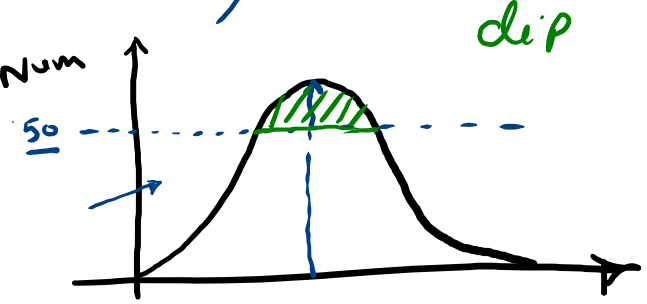


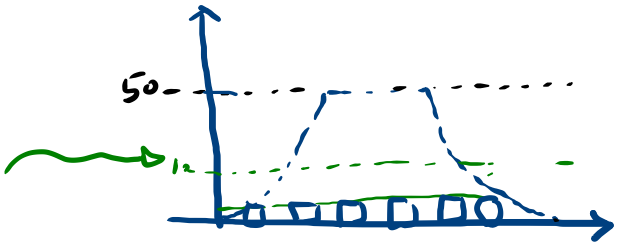
Adaptive Contrast enhancement → HE

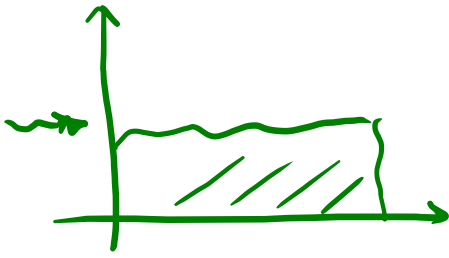

AHE
HE
1
150
255
HE
Noisy

Contrast limitation AHE ⇝ CLAHE







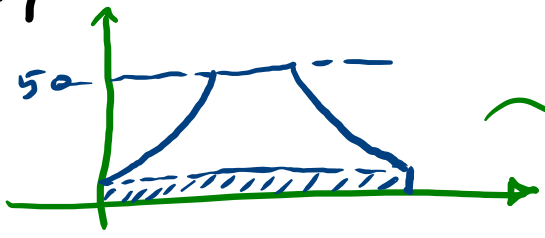


HE

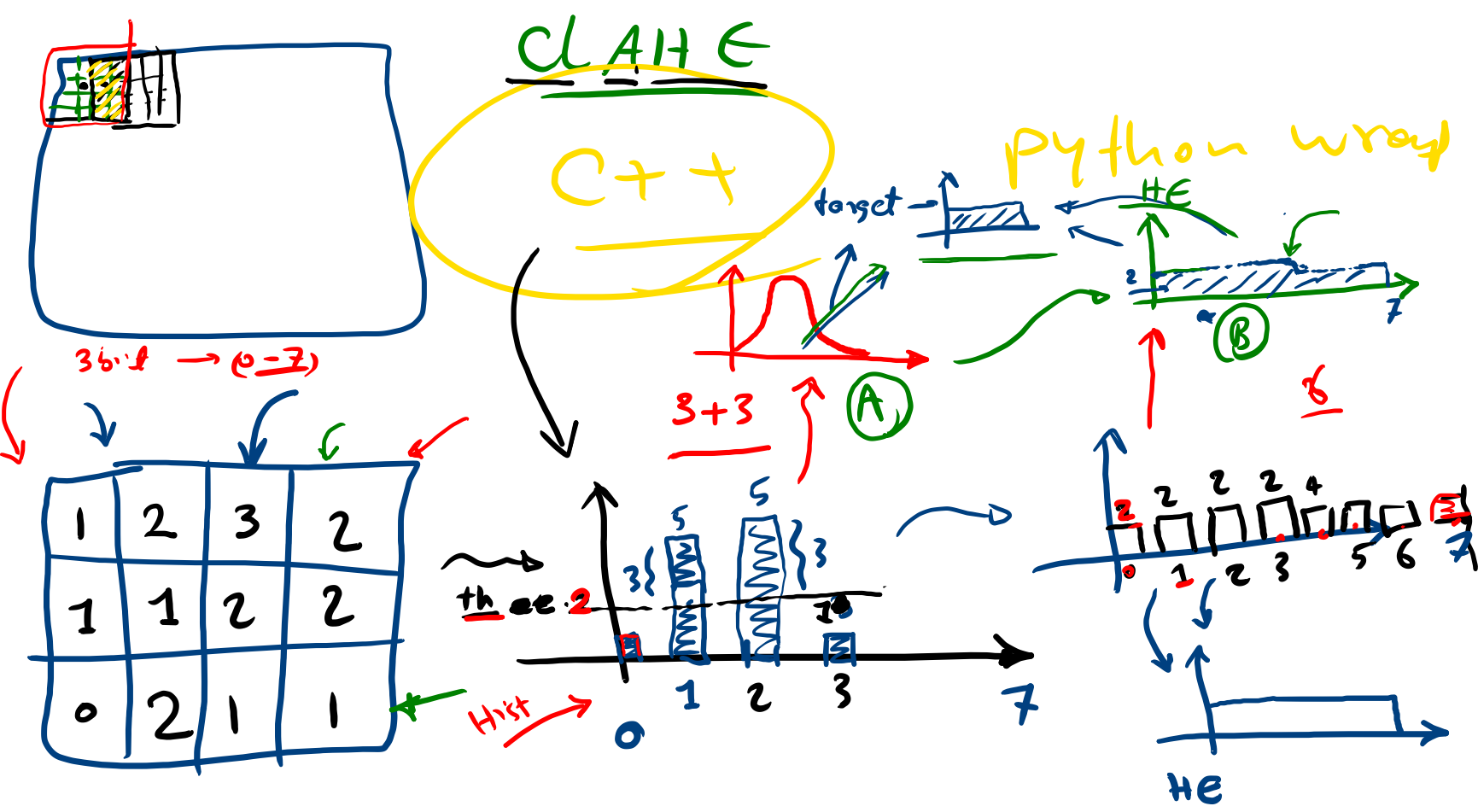
Orginal Image.

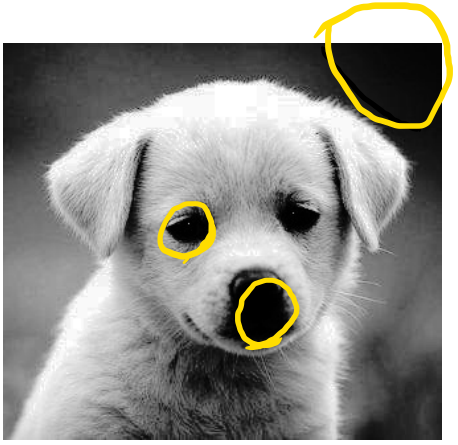
intensity

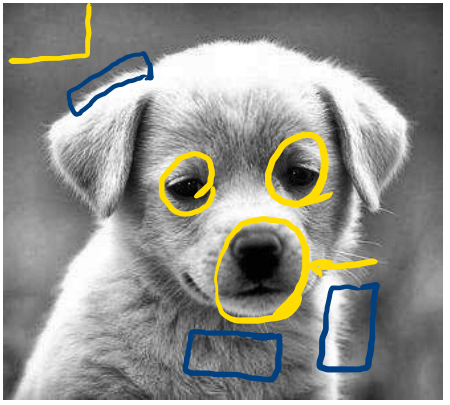
50 × 50 → 2500



HE


CLAHE
C++
python wrap
target
HE
3+3
A
B
3bit → (0~7)
C
1 2 3 2
1 1 2 2
0 2 1 1
threshold
Hist
0 1 2 3 7
HE





original

HE

CLAHE

pixel → HE

window → CLAHE

NOISE

تغییرات روشنایی یا رنگ در تصویر که در صحنه واقعی وجود ندارد

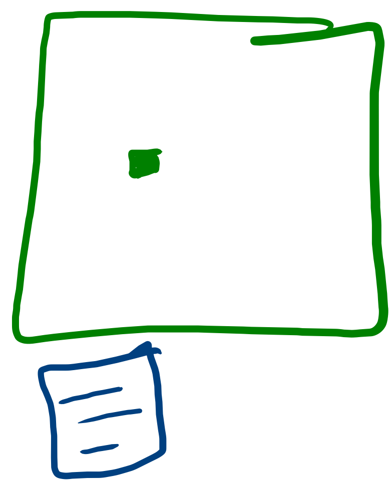
Original Scene

به اکثر نویز که سیستم مستقیمی نقصان در دستگاه تصویر
برداری !

1- lens

- Image Sensor:

IC → محاسبات نورها →



2. Gaussian Noise.

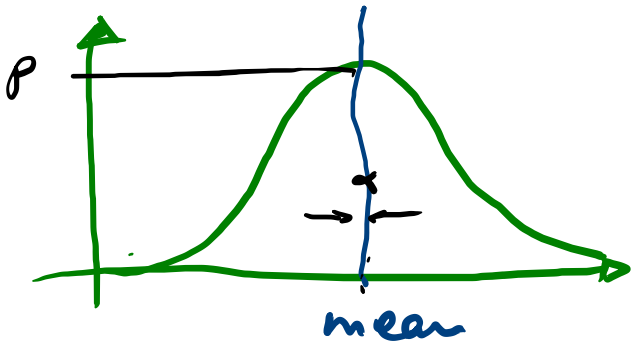
without noise.

$w = s + n$

w: original image

s

n: noise.

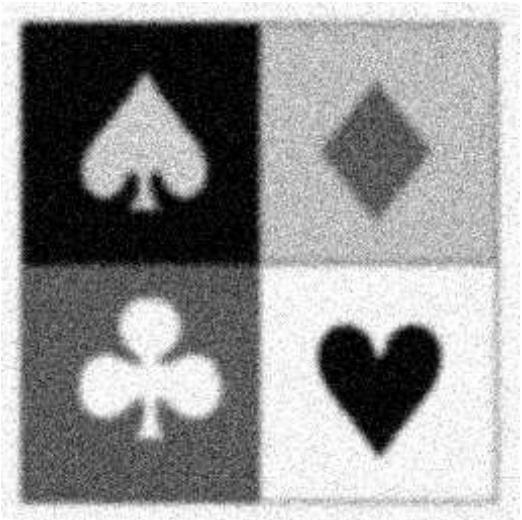


$$p = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(z-\mu)^2}{2\sigma^2}}$$

Gaussian

Gray

→ during Image processing



→ Convolution ✓

filter ✓

edge detect ✓

2. Salt and pepper.

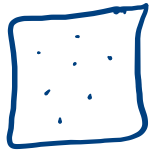
نمک و فلفل

255

0

Salt

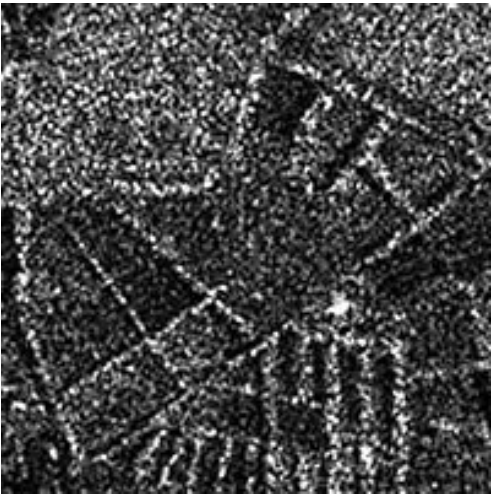
نمک

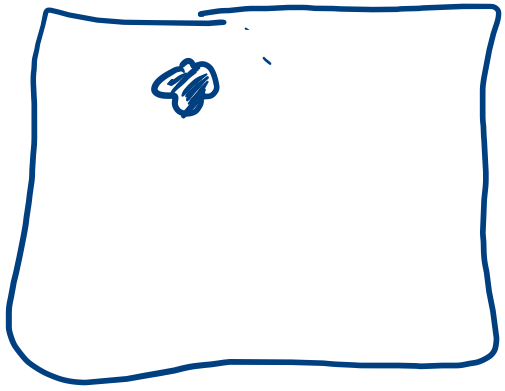


photon ← ذره‌ی کوانتوم نور

3. Speckle Noise.

خرش



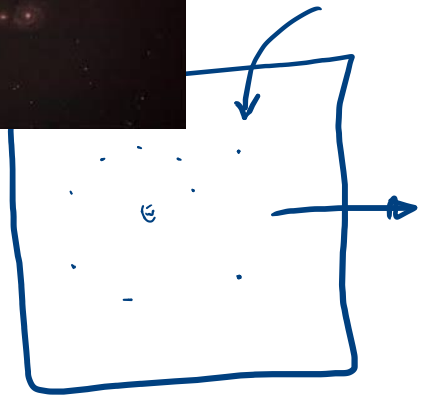


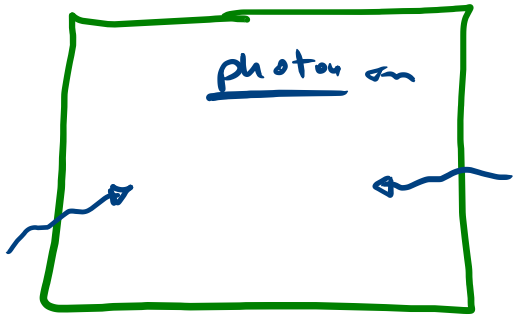
Laser

low light

4. thermal noise

Image sensor. astronomy



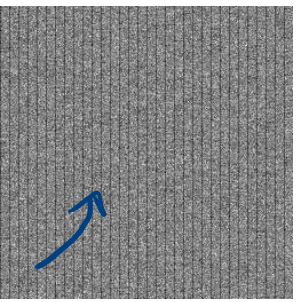


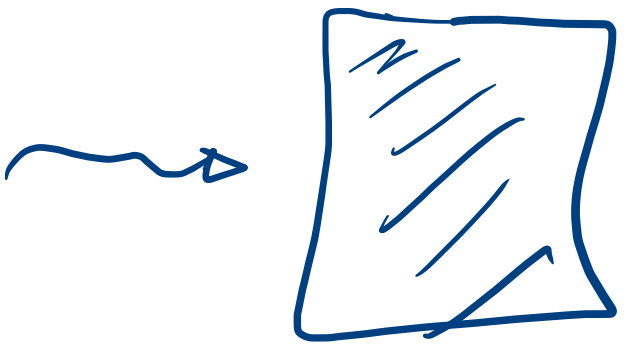
CCD → cooler

5. fixed pattern

Calibration

dark frame image

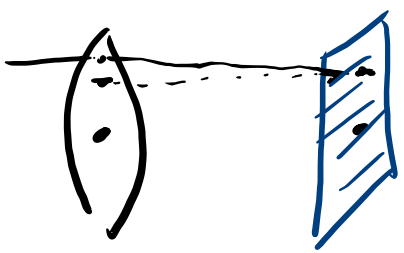




توفق باشید.

Ch

Fpn



x


End