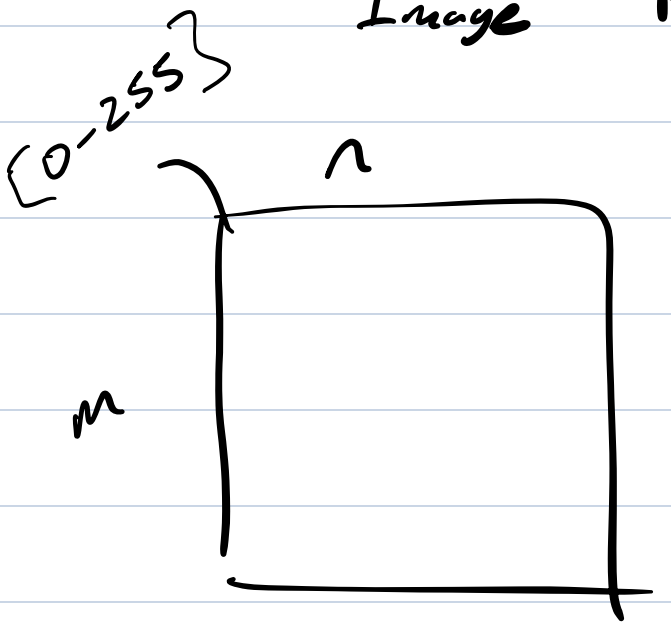
Image Processing Operators



- a image is a function takes in one or more Matrices and produces an output image.

$$g(x) = h(f(x))$$

$$g(i,j) = h(f(i,j))$$

X = an image

i, j = are pixel location

· add and Subtract Constant

$$g(i,j) = f(i,j) + b$$

↗ output image

↗ original image

$f(i,j)$ b

* Must be the same size

Example - taking the negative of an image.

↓ inverting of the colors

Negative of a gray scale image

$$B'(x) = 255 - B(x)$$

↑

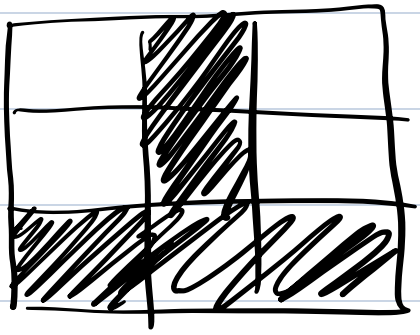
- Matrix the size of image X.
- all values are set to 255.

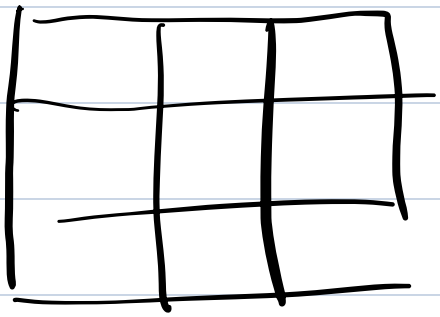
input image

255	0	255
255	0	255
0	0	0

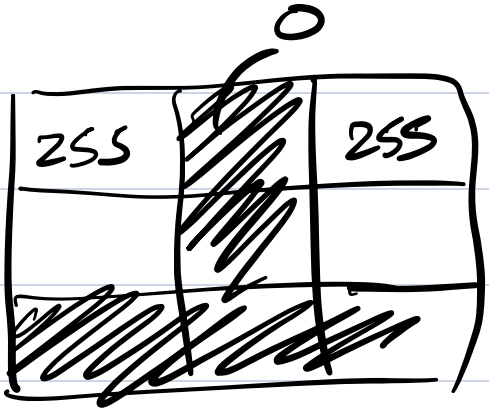
255 matrix

255	255	255
255	255	255
255	255	255



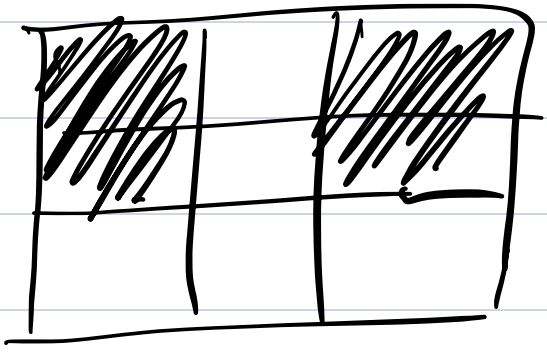


-

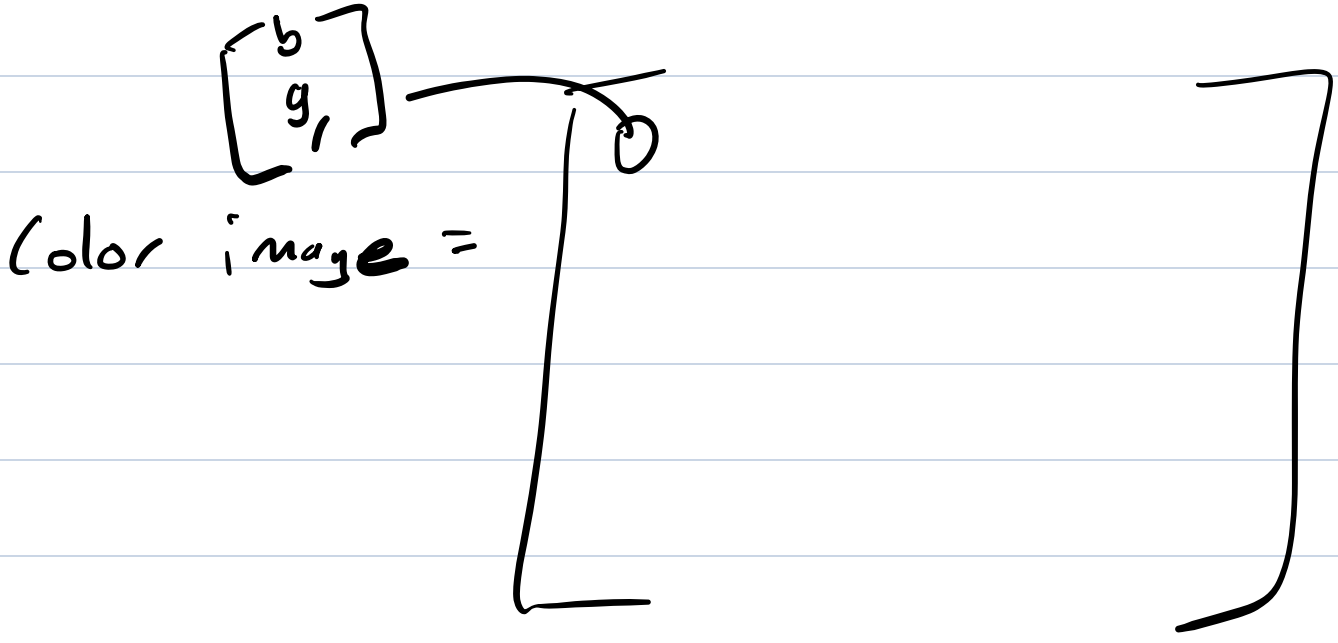


=

0	255	0
0	255	0
255	255	255



- Converting an (colored) image to grayScale



Color image =

- Average method = $(r + g + b)/3$ ← does not work

or

★ → $r/3 + g/3 + b/3$

8-bits → max value can only be 255

r: 100

g: 100 t = 300 ← overflow

b: 100

max 255 →
$$\begin{array}{r} 300 \\ -255 \\ \hline 45 \end{array}$$

- NTSC Formula - is closer to how humans see in grayscale

$$0.299 \cdot R + 0.587 \cdot G + 0.114 \cdot B$$

r	0	0
g	0	255
b	255	0

pure blue: $255 \cdot 0.114 = 29.07$

green: $255 \cdot 0.587 = 149.6$

darker

lighter.