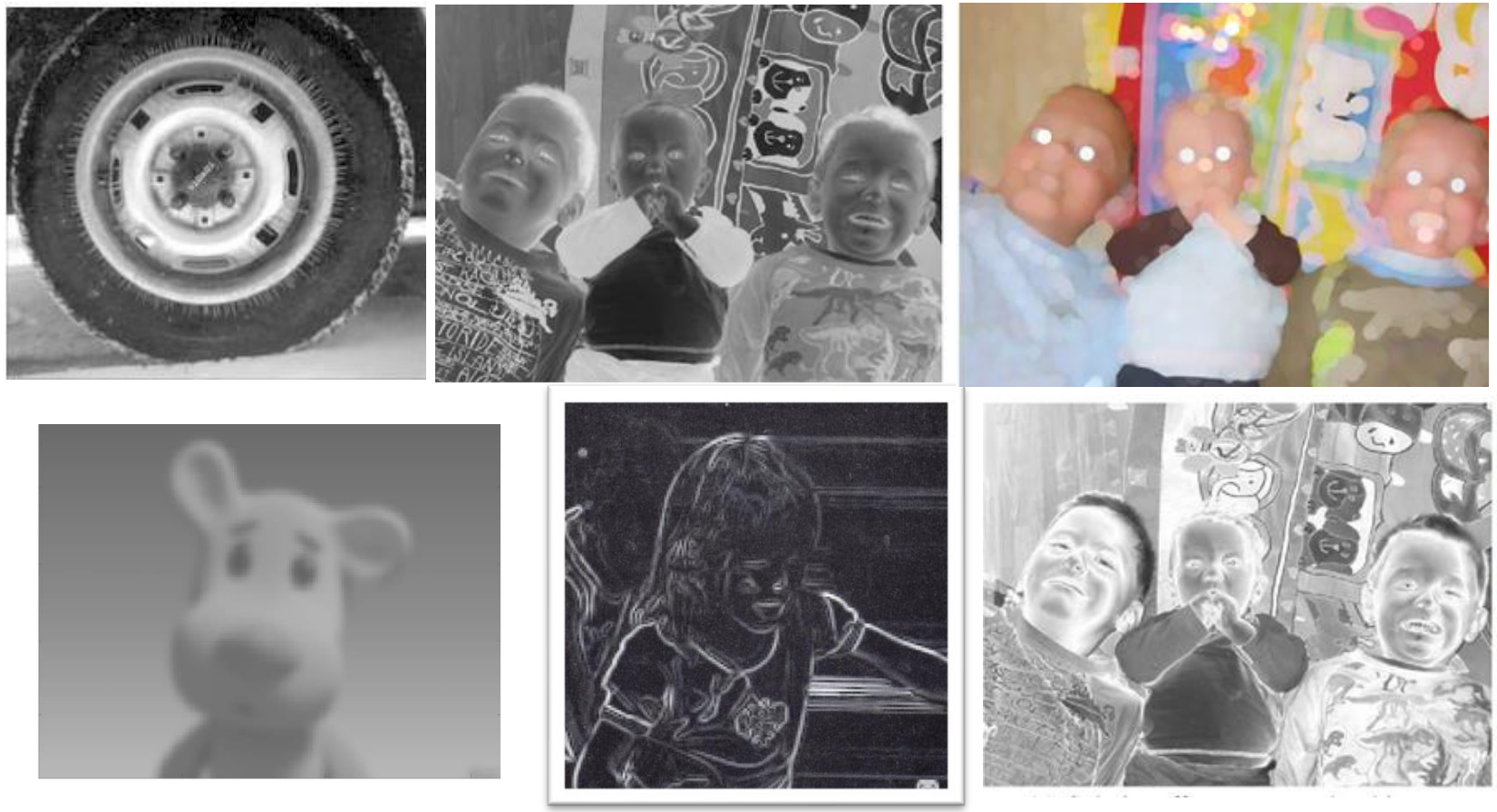
Pixel-based Operation

Pixel-based Operation

What would we the effects of changing pixel intensity?



http://what-when-how.com/introduction-to-video-and-image-processing/visual-effects-introduction-to-video-and-image-processing-part-1/
http://www.cs.uregina.ca/Links/class-info/425/Lab3/

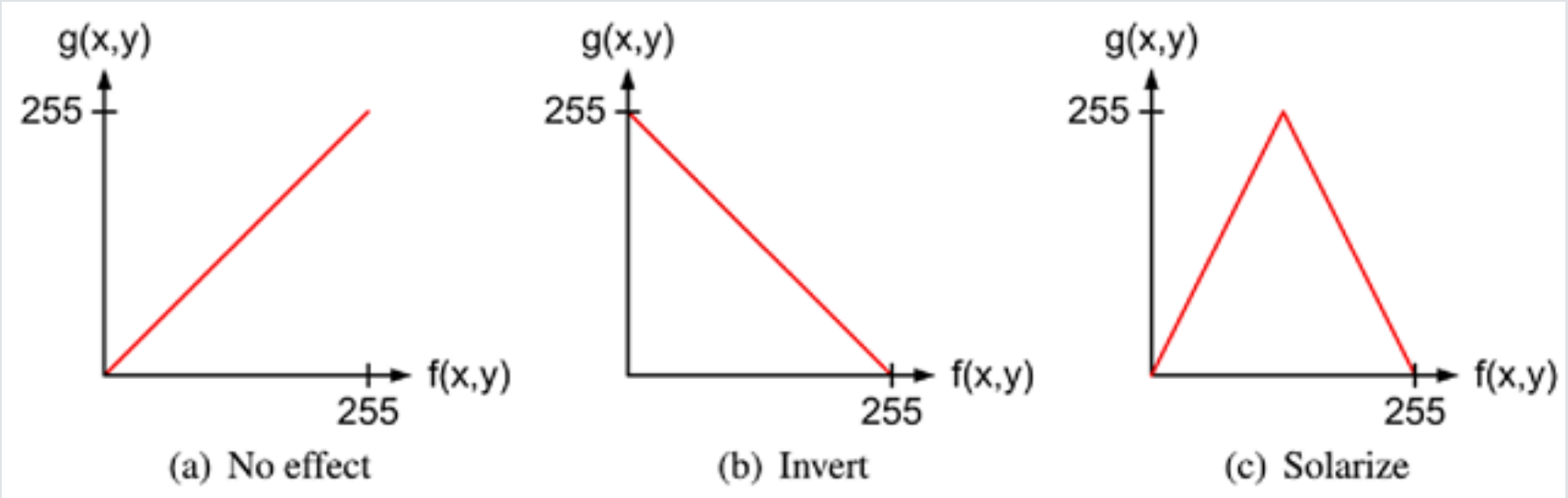
IF WE PERFORM
MATH OPERATION ON AN IMAGE,

What will happen?

MATH:
LINEAR OPERATION

- $g(x,y) = \mathbf{a}\, f(x,y) + \mathbf{b}$
  - f(x,y) : (i/p) image intensity @ (row x, column y)
  - g(x,y): (o/p) image intensity @ (row x, column y)
  - a : slope (contrast)
  - b : translation (shifting)

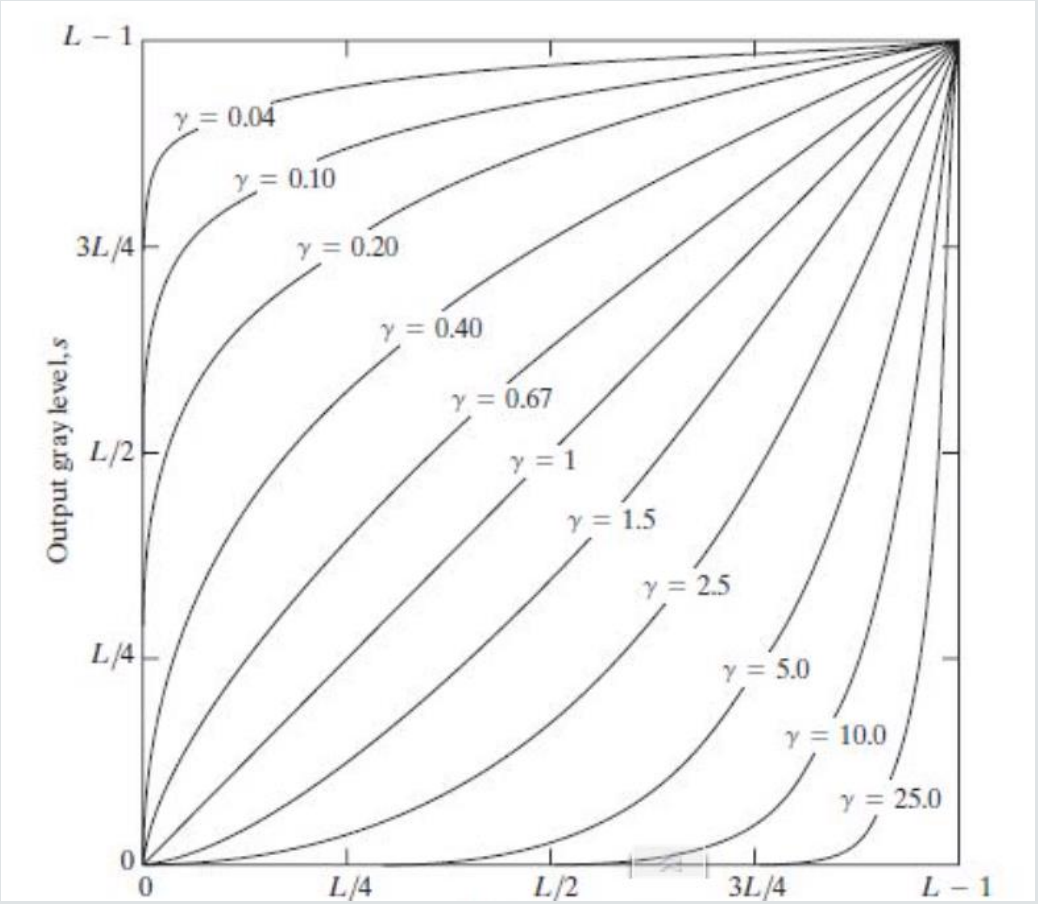
120	130	140	150
120	130	140	150
120	130	140	150
120	130	140	150

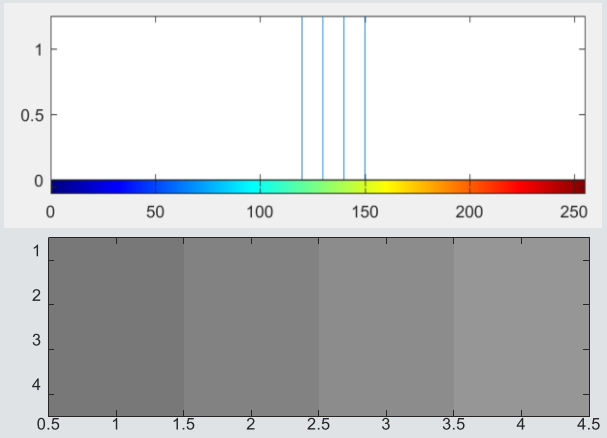


(a) No effect (b) Invert (c) Solarize

MATH:
GAMMA OPERATION

- g(x,y) = a (f(x,y) ^ γ) + b
  - f(x,y) : (i/p) image intensity @ (row x, column y)
  - g(x,y): (o/p) image intensity @ (row x, column y)
  - a : slope (contrast)
  - b : translation (shifting)

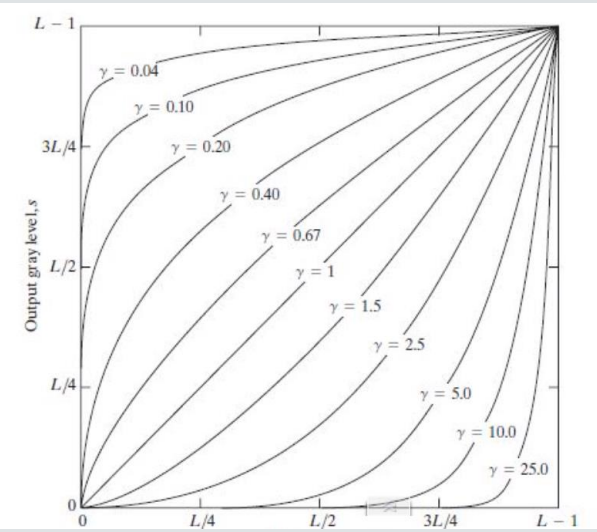


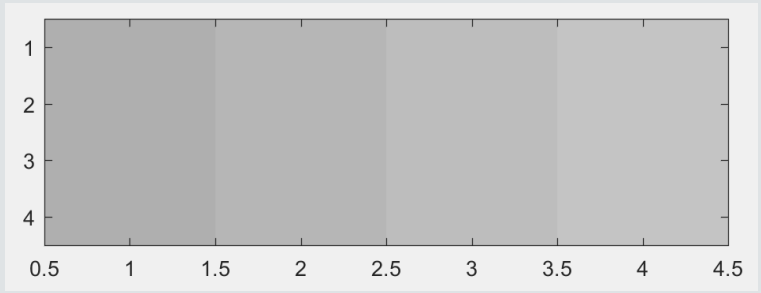


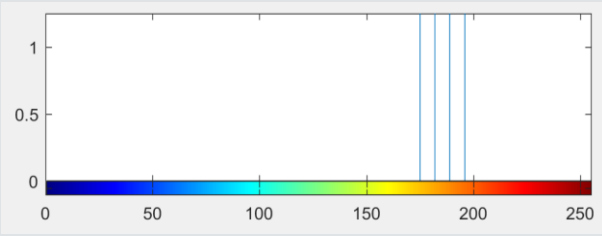
120	130	140	150
120	130	140	150
120	130	140	150
120	130	140	150

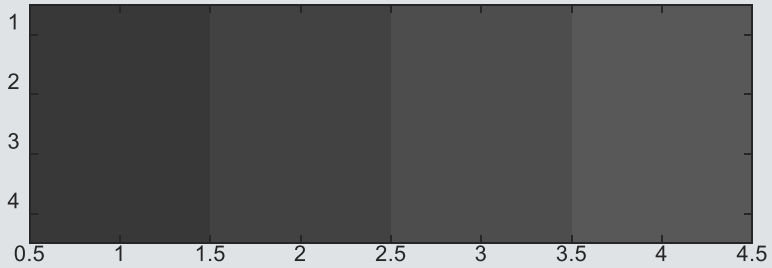
```
a = 1; b = 0; gamma=0.5;
B= round((a*((A/255).^gamma) + b)*255)
```

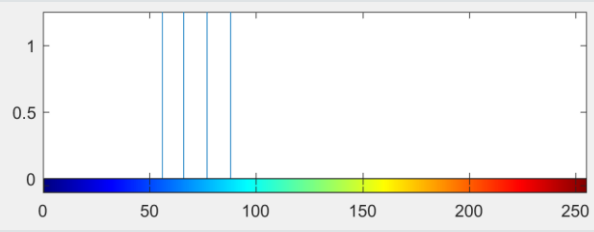
175	182	189	196
175	182	189	196
175	182	189	196
175	182	189	196











```
a = 1; b = 0; gamma=2;
B= round((a*((A/255).^gamma) + b)*255)
```

56	66	77	88
56	66	77	88
56	66	77	88
56	66	77	88

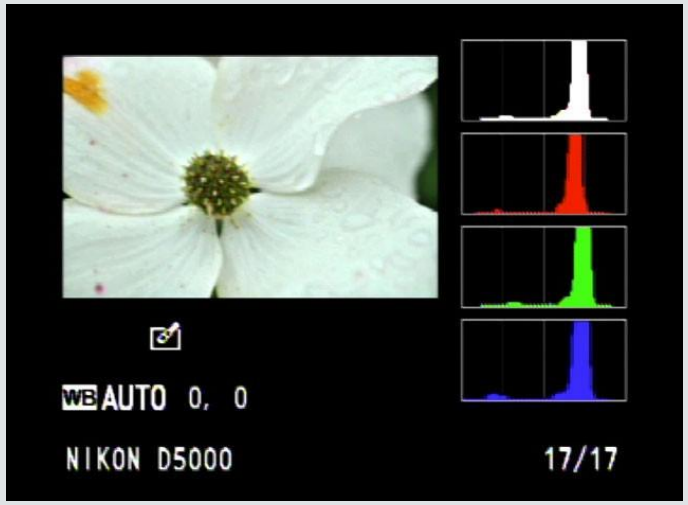
WHAT CAN HISTOGRAM TELL US?

- Statistical distribution of
  - Intensity
  - Colors
- Separable Histogram
  - Brightness distribution
- Color distribution
  - Color distribution

BASIC IMAGE STATISTICS

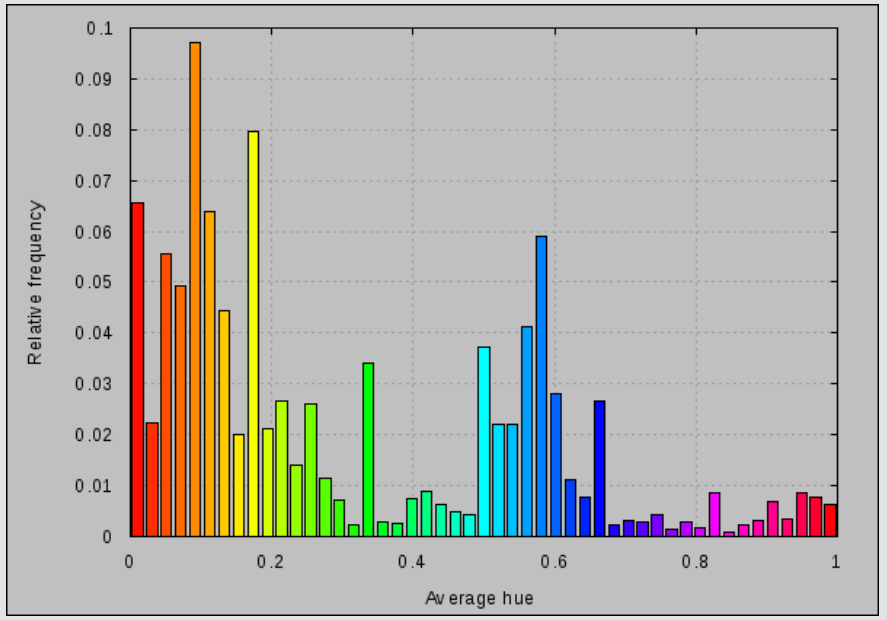
HISTOGRAM MODEL

- Histogram (Frequency counting)

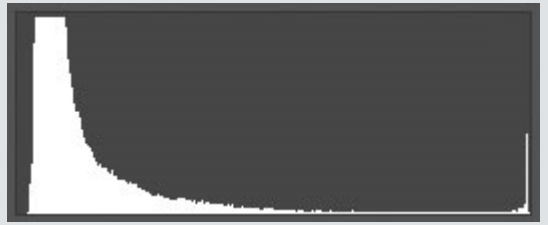


Combined color channel Histogram

Separable Histogram for each color channel

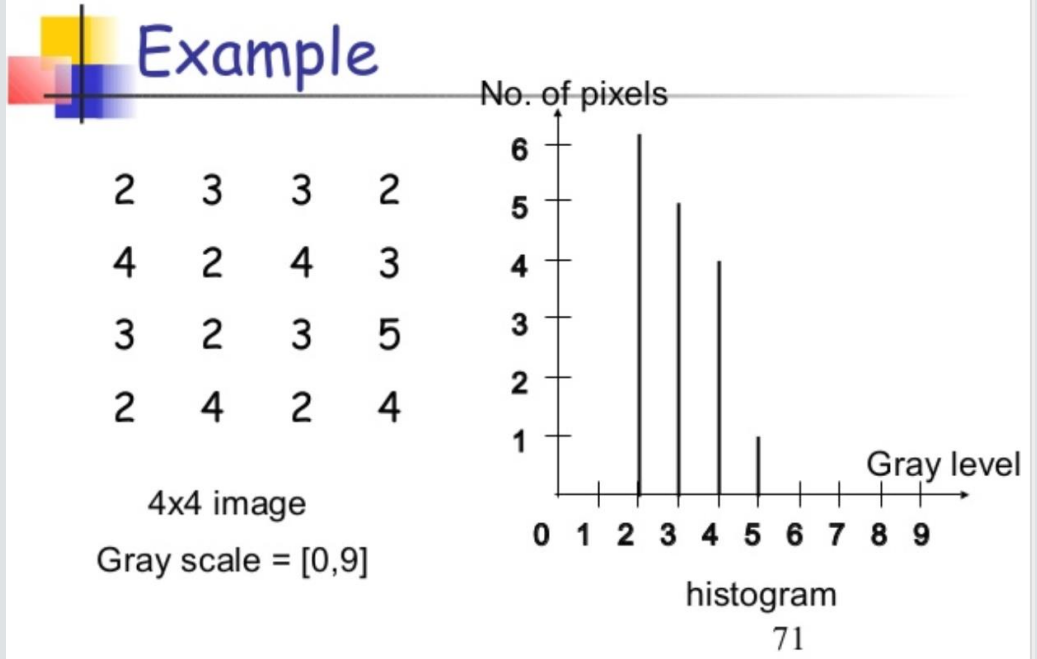


CAN HISTOGRAM TELL US IMAGE QUALITY?



MATH:
HISTOGRAM EQUALIZATION OPERATION

Intensity level	0	1	2	3	4	5	6	7	8	9
Hist	0	0	6	5	4	1	0	0	0	0
Normalized	0	0	6/16	5/16						
CDF	0	0	6/16	11/16						
Equalized intensity	0	0	(6/16) * 9 =3.33 75 =3							



https://www.slideshare.net/ASHI14march/enhancement-in-spatial-domain