Image Enhancement

Purpose: Modify image to bring out features (hidden otherwise)

- Two kinds
  - Spatial domain
  - Frequency domain

Spatial filtering

$f(x,y)$ = input.

$g(x,y)$ = enhanced img. = output.

Spare domain process: Trafo with T

$$T[f(x,y)] = g(x,y)$$

T can be either only a fn of (x,y) pixel in f, or neighboring pixels in f around (x,y)

Simple case : T 1X1 → Gray level Transformation

T . looks at single pixel in f(x,y)
determine g at (x,y).

$S = T(r)$

output pixel at (x,y)

input pixel at (x,y)

Shown 3.2 of b/w.

more complex *

3x3 region.

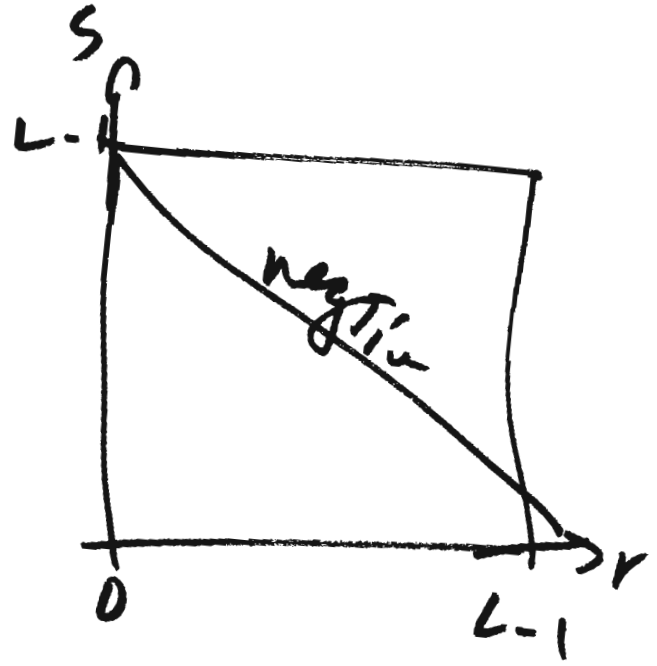
mask ← 5x5

7x7

Gray level Transformation

① Image Negative:

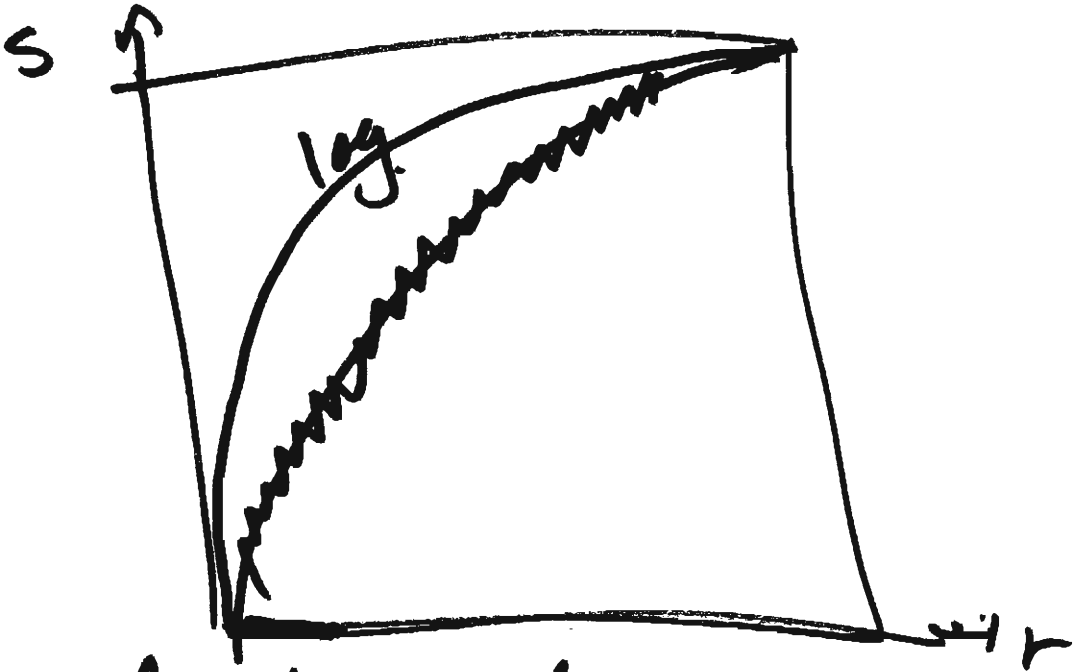
$$S = L - 1 - r$$



3.3 G/W

(2) Log Transformation:

$$S = c \log(1+r)$$



- expand values of dark pixels → overall image.
- Compresses the dynamic range.

(3) Power Law Trafomith.

$$S = C\, r^{\gamma}$$

C, γ are positive

Fig 3.6 in G/W

CRT = Cathode Ray Tube

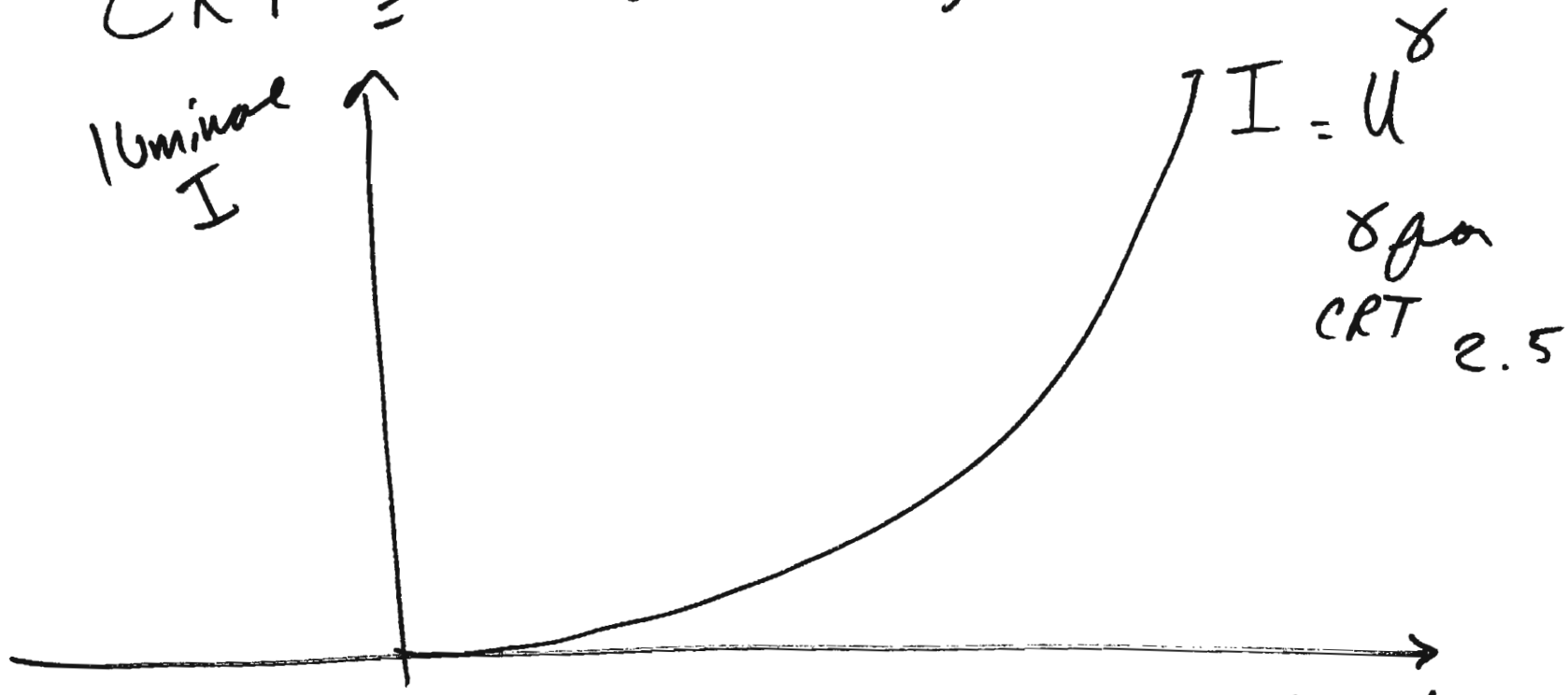


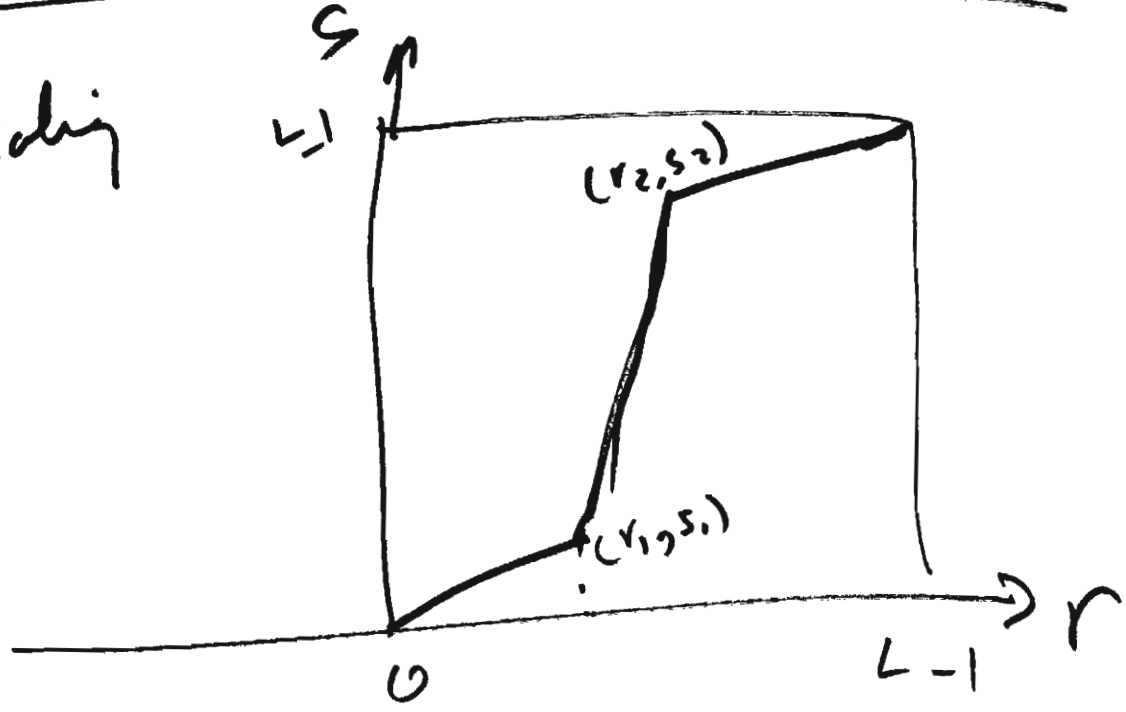
Fig 3.7 (a) (b) (c)

Correcting input image according to some power law so that it is rendered correctly in the output device

Gama Correction

Piecewise Linear Transformation

① Contrast Stretching



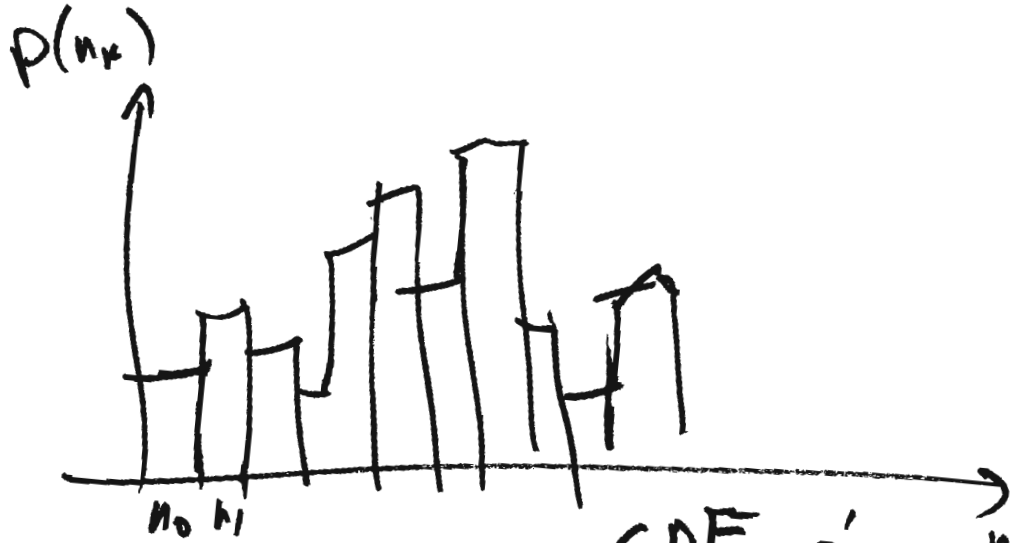
3.10

② Gray level Slicing.

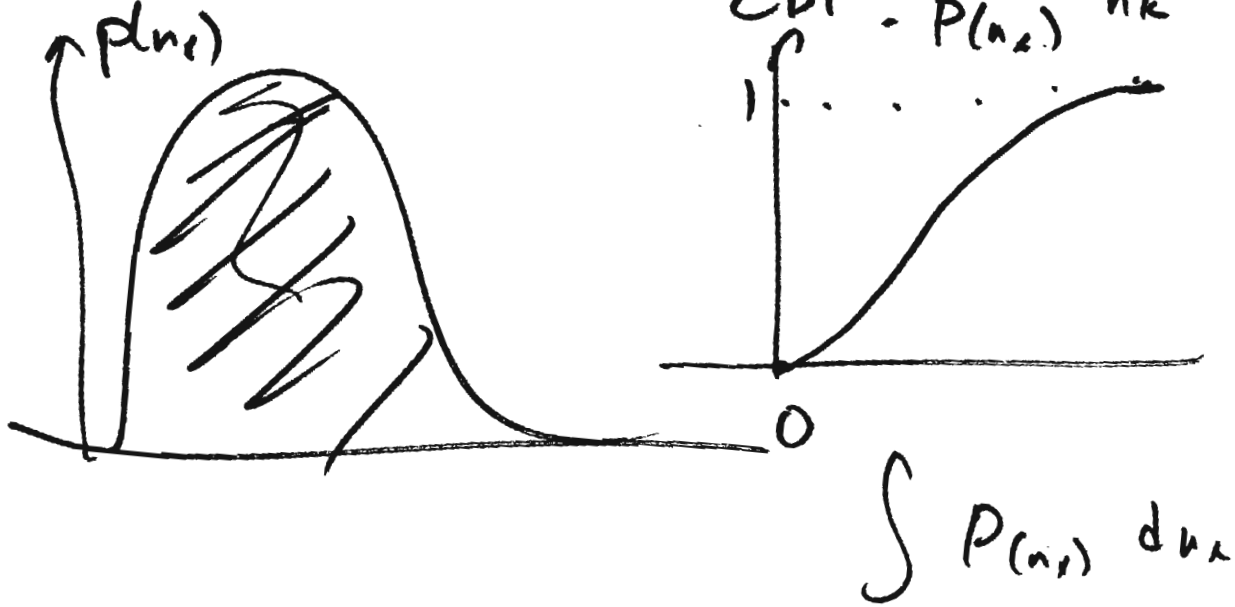
Histogram Processing

what is a histogram?

$0 \rightarrow L-1$ $\quad n_k$



pdf



$$\int P_{(n_k)}\, dn_k$$