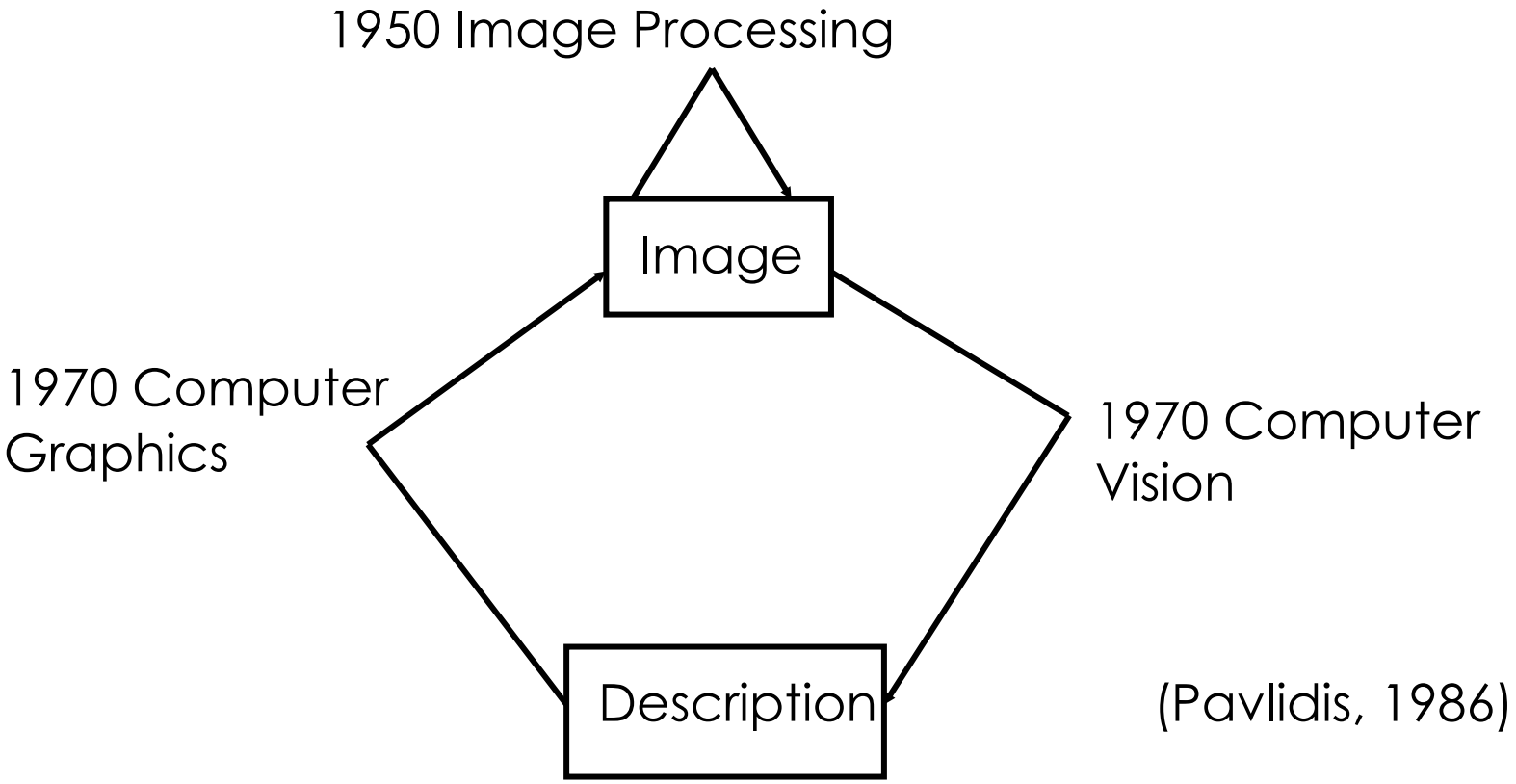
Pengenalan Citra Digital

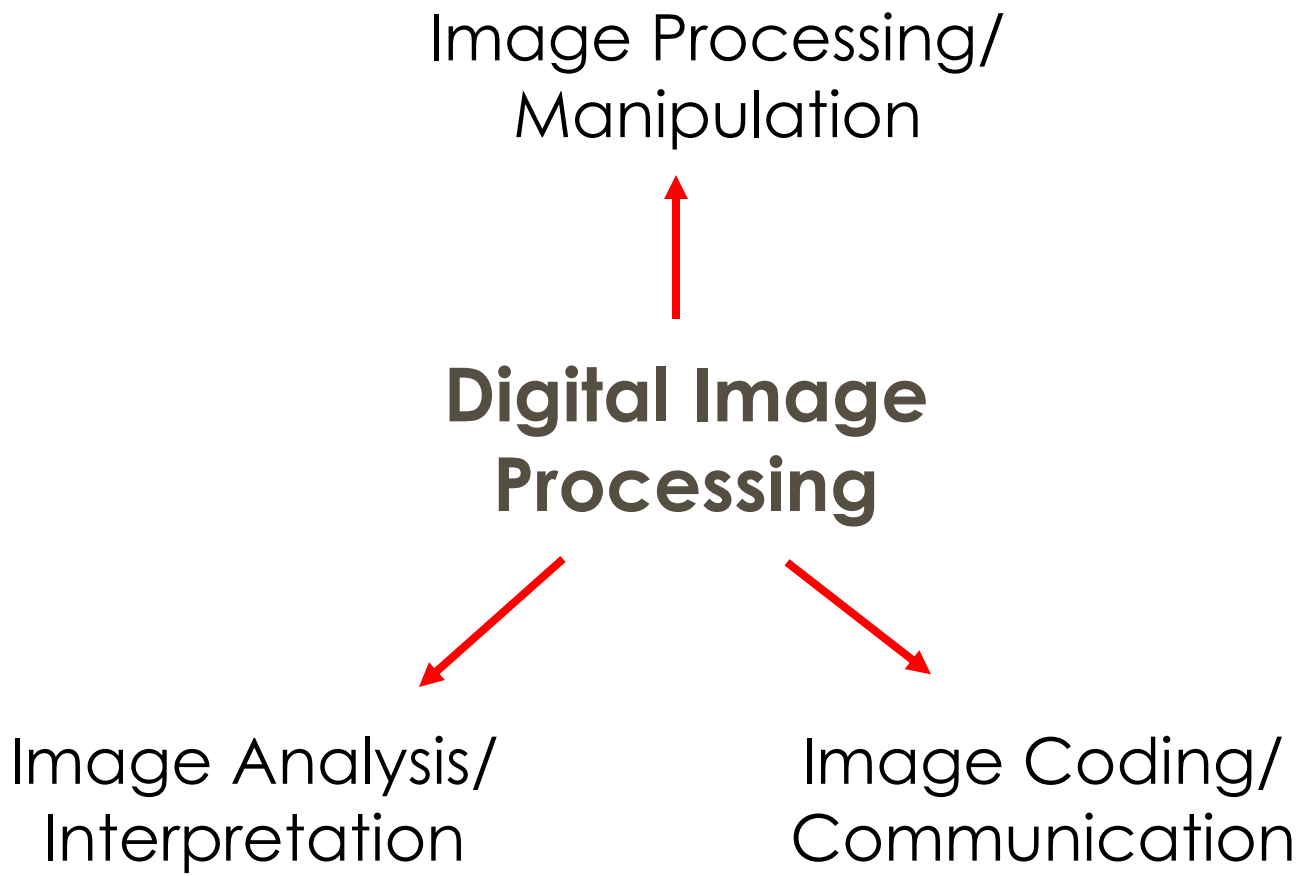
Chapter 1

Pengantar PCD

- Tiga Bidang Berkaitan dengan Proses Citra



Hal yang dilakukan di PCD



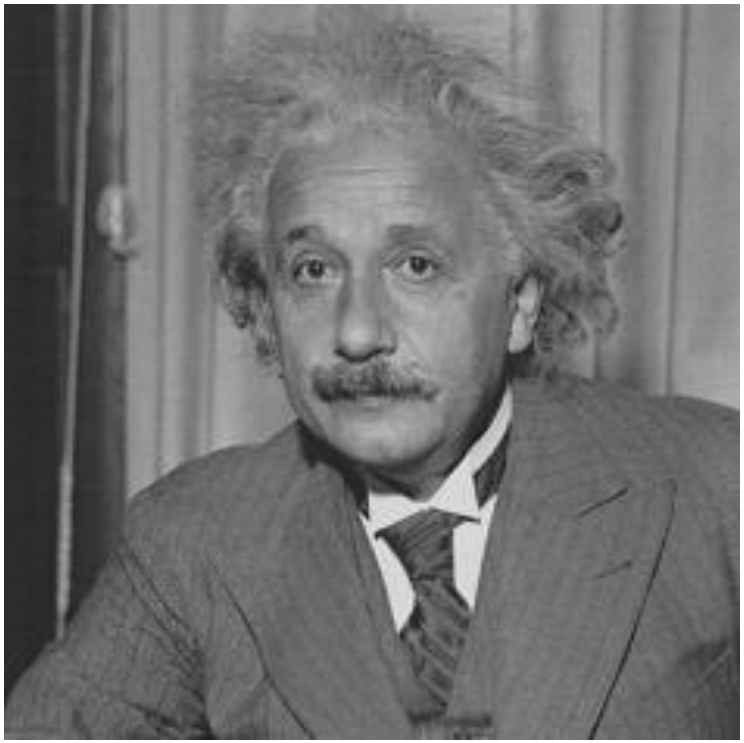
Pengolahan Citra Digital

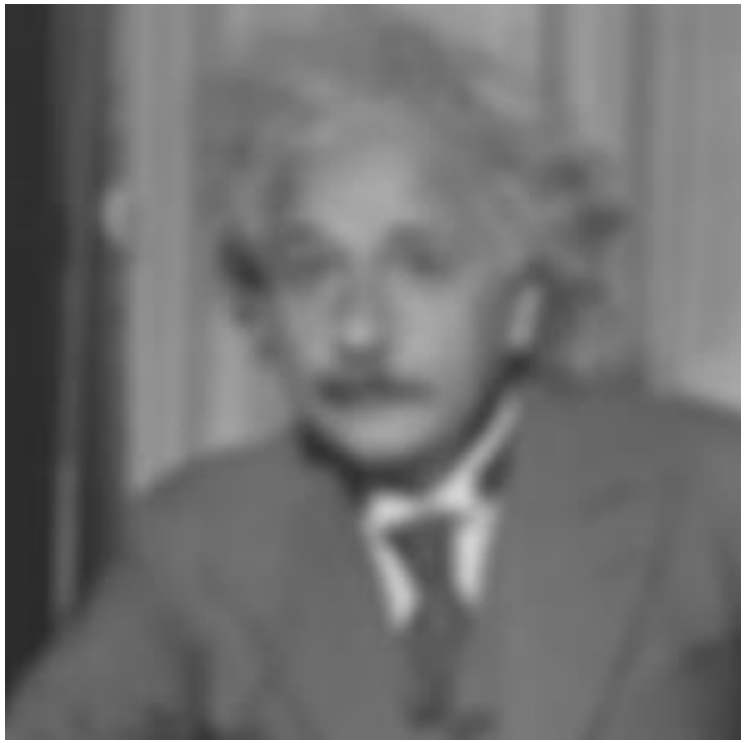
- Perbaikan kualitas citra (*Image Enhancement*)
- Pemugaran citra (*Image Restoration*)
- Segmentasi citra (*Image Segmentation*)
- Rekonstruksi citra (*Image Reconstruction*)
- Penambahan efek citra (Image Stylization)
- Pemampatan citra (*Image Compression*)
- Analisis citra (*Image Analysis*)

Peningkatan Kontras

Penajaman *(Sharpening)*

Pengkaburan *(Bluring)*

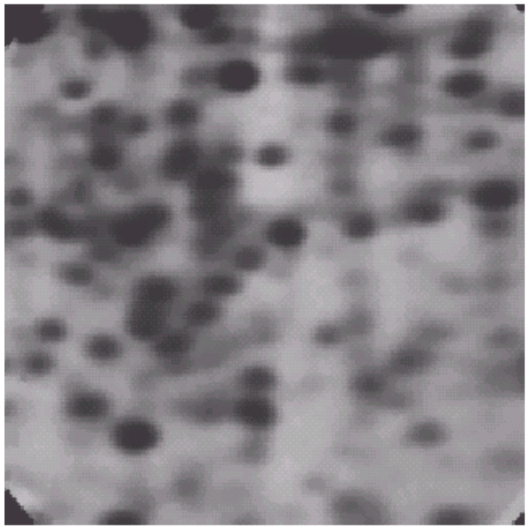


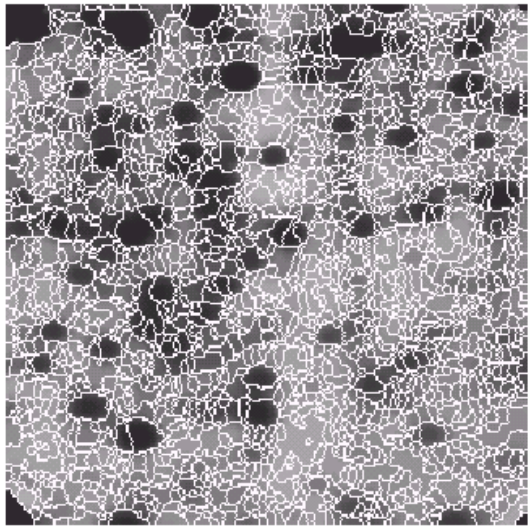


Menghilangkan Noise

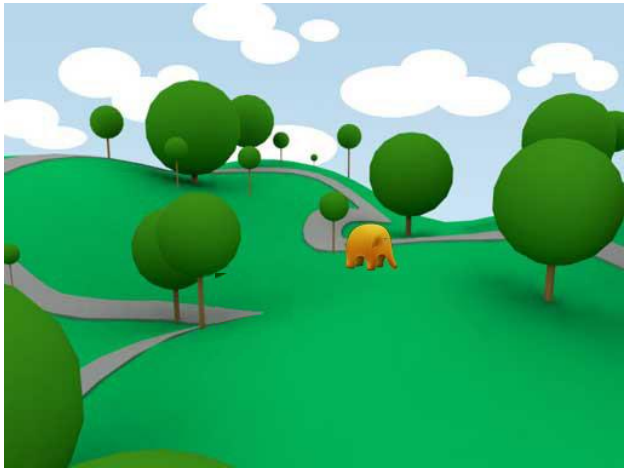
Pemugaran Citra

Segmentasi Citra

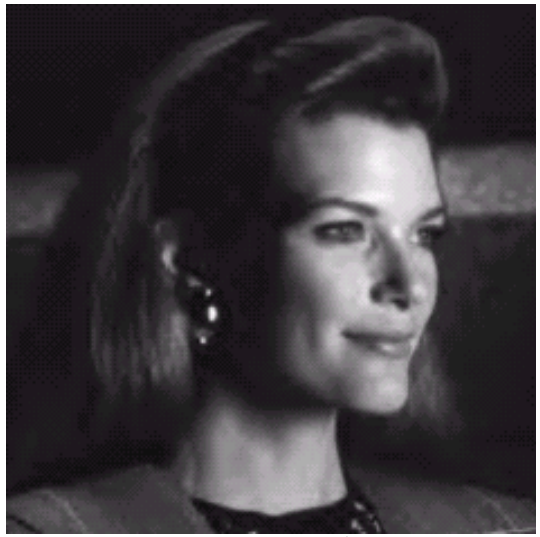




Rekonstruksi Citra



Kompresi Citra



original image
262144 Bytes

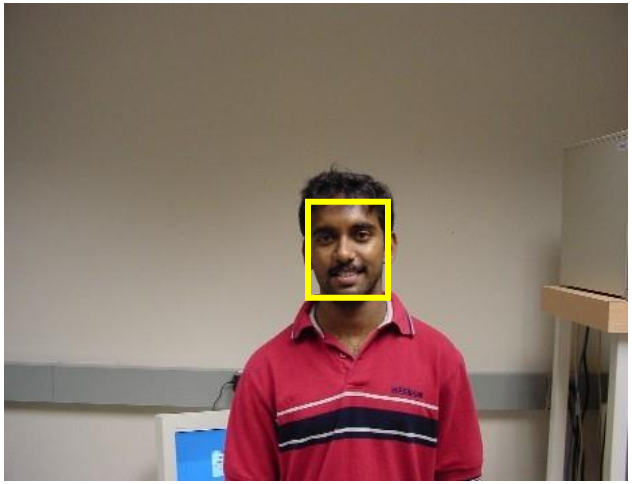
compression ratio (CR) = 108:1

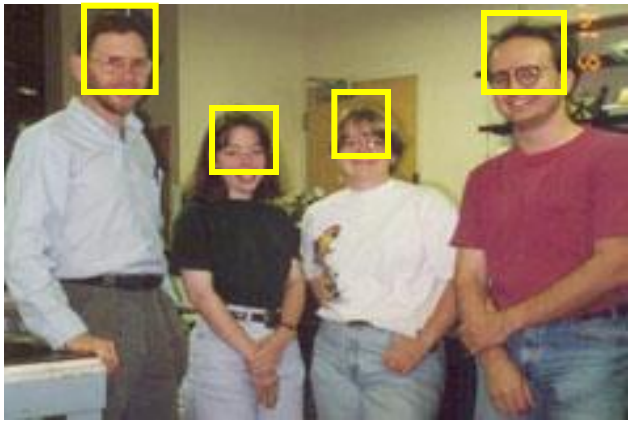
image encoder → compressed bitstream
0011100001001101…
(2428 Bytes) → **image decoder**

Image Analysis: Edge Detection

From [Gonzalez & Woods]

Image Analysis: Face Detection





From Prof. Xin Li

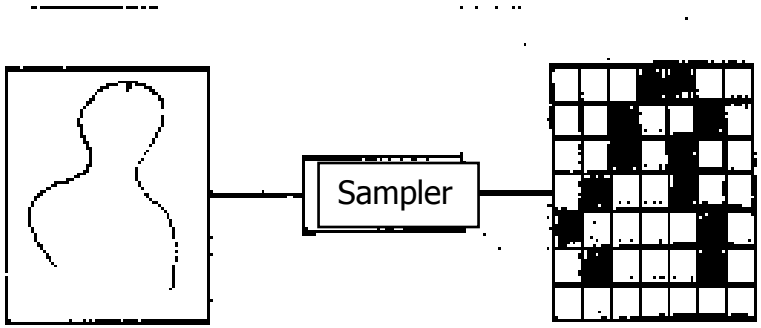
Image Analysis: Skin Detection

Image Analysis: Image Matching

From Prof. Xin Li

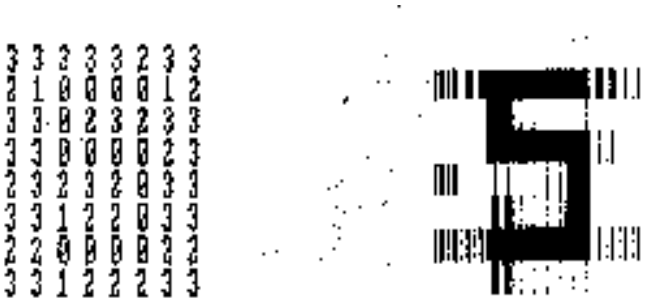
Pengertian Citra Digital

- Citra Digital
  - Citra digital merupakan **fungsi intensitas cahaya** f(x,y), dimana harga x dan y merupakan koordinat spasial dan nilai fungsi tersebut pada setiap titik (x,y) merupakan tingkat keabuan citra pada titik tersebut;
  - Citra digital adalah citra f(x,y) dimana dilakukan **diskritisasi koordinat spasial** (sampling) dan **diskritisasi tingkat keabuan** (kuantisasi);
  - Citra digital merupakan **suatu matriks** dimana indeks baris dan kolomnya menyatakan suatu titik pada citra tersebut dan elemen matriksnya (yang disebut sebagai elemen gambar / piksel / pixel / picture element / pels) menyatakan tingkat keabuan pada titik tersebut.

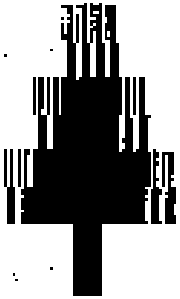


Citra kontinue

Citra digital



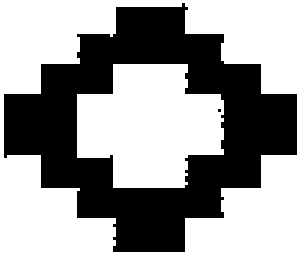
Matriks citra dengan obyek angka 5



Resolusi spasial :

Tinggi (16 x 16)

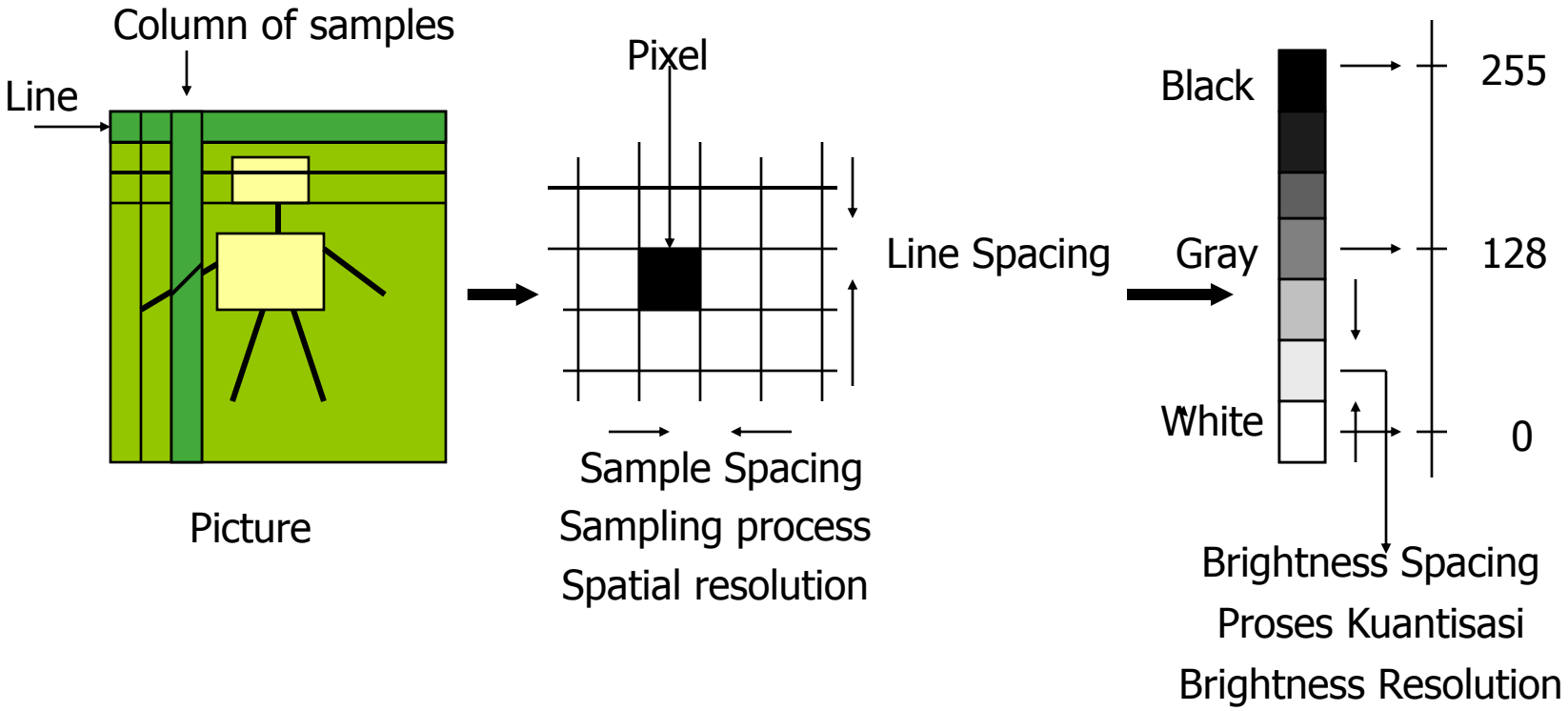
Rendah (8 x 8)



Resolusi keabuan :

Tinggi (4)

Rendah (2)


Column of samples
Line
Picture
Pixel
Sample Spacing
Sampling process
Spatial resolution
Line Spacing
Black
Gray
White
255
128
0
Brightness Spacing
Proses Kuantisasi
Brightness Resolution

Alur Diagram PCD

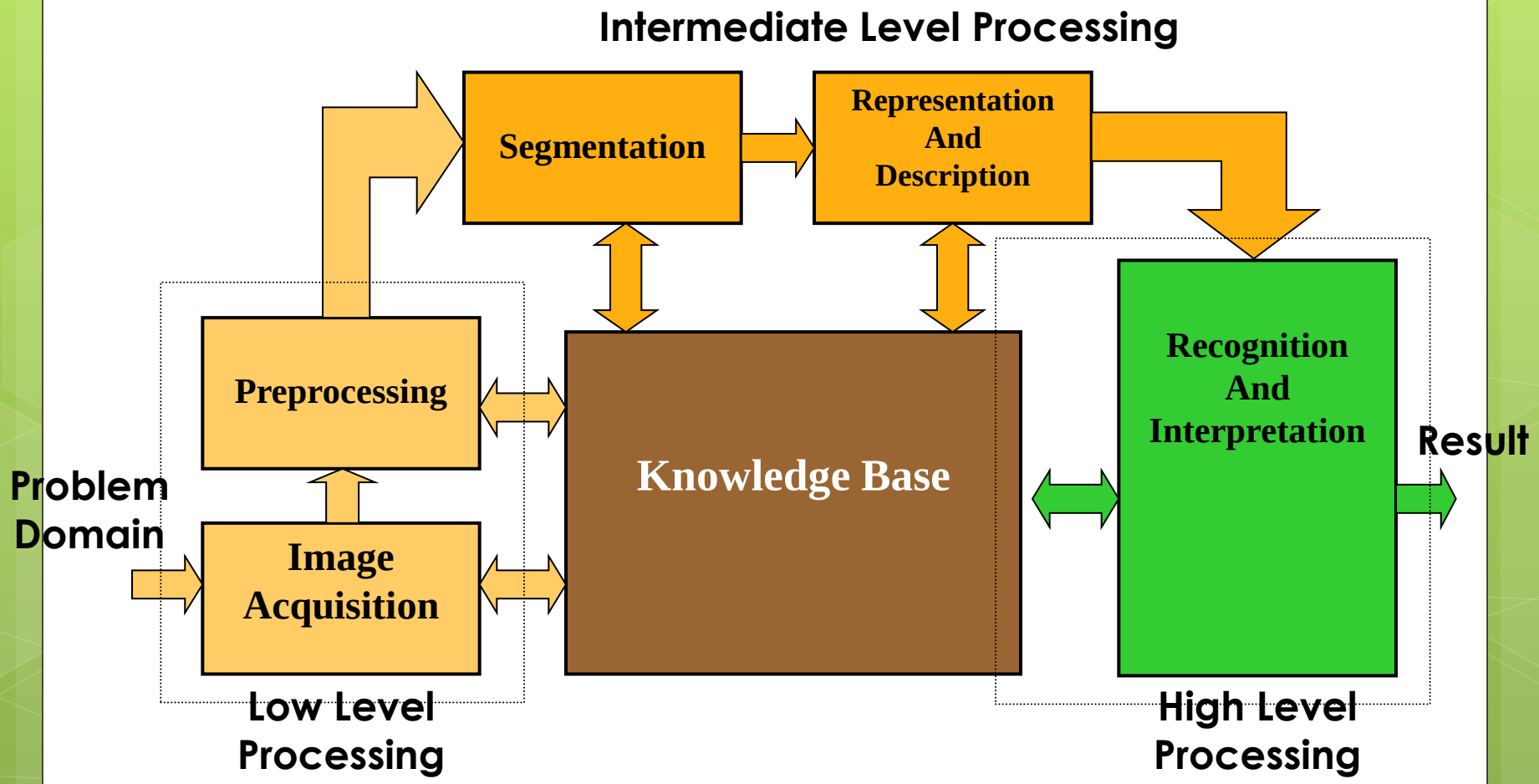
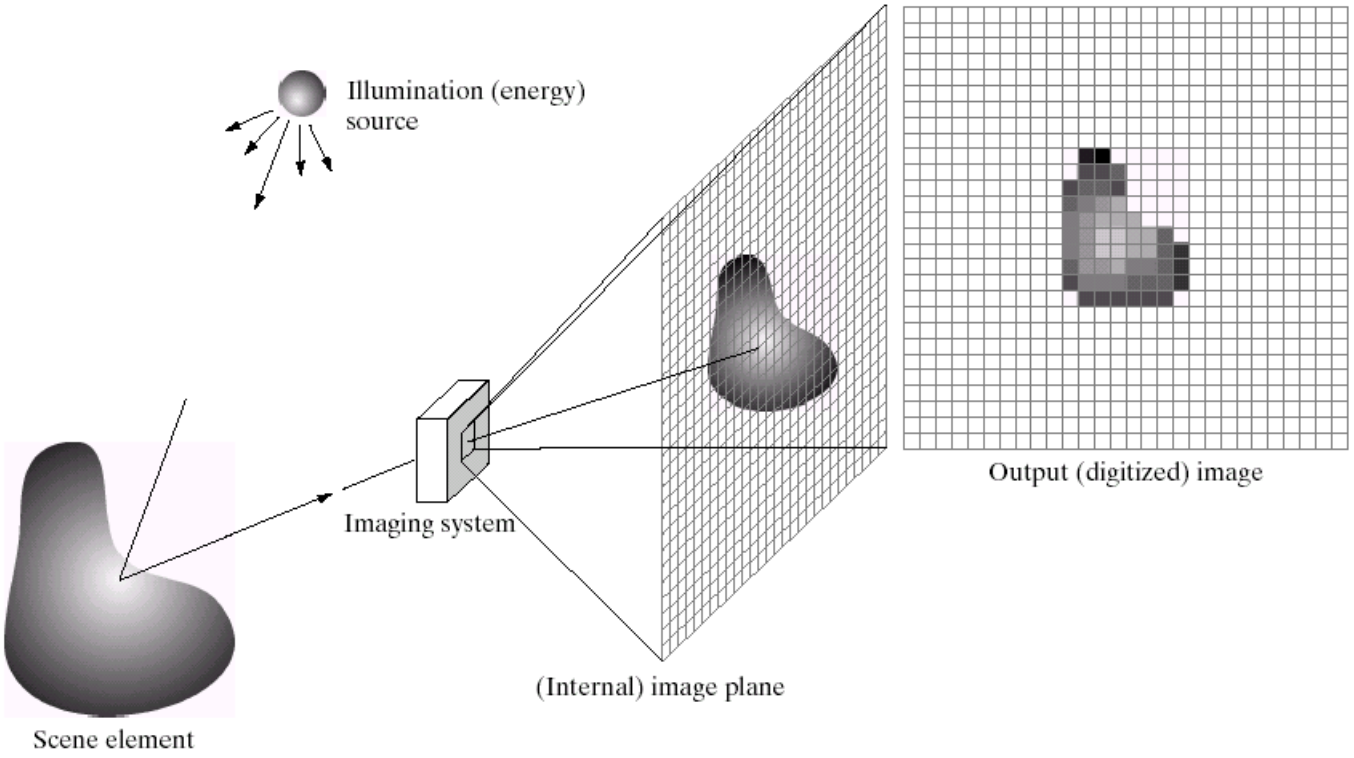


Image Acquisition / Formation



a
b c d e

FIGURE 2.15 An example of the digital image acquisition process. (a) Energy ("illumination") source. (b) An element of a scene. (c) Imaging system. (d) Projection of the scene onto the image plane. (e) Digitized image.

Image Acquisition / Formation

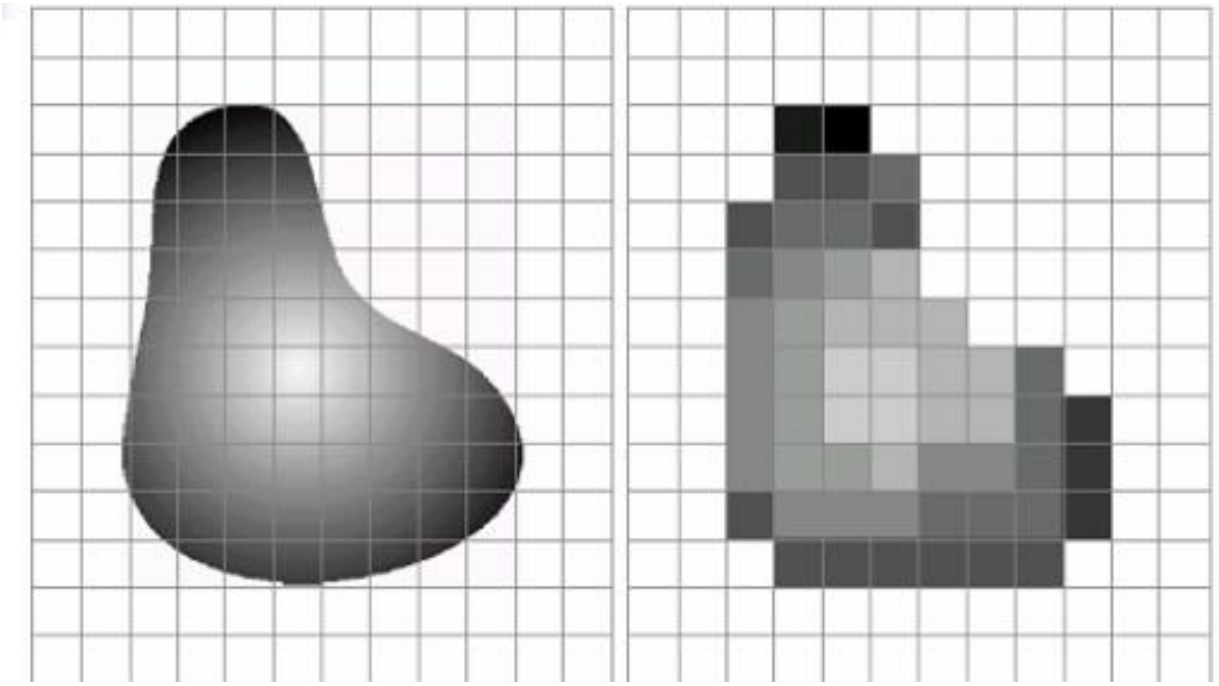
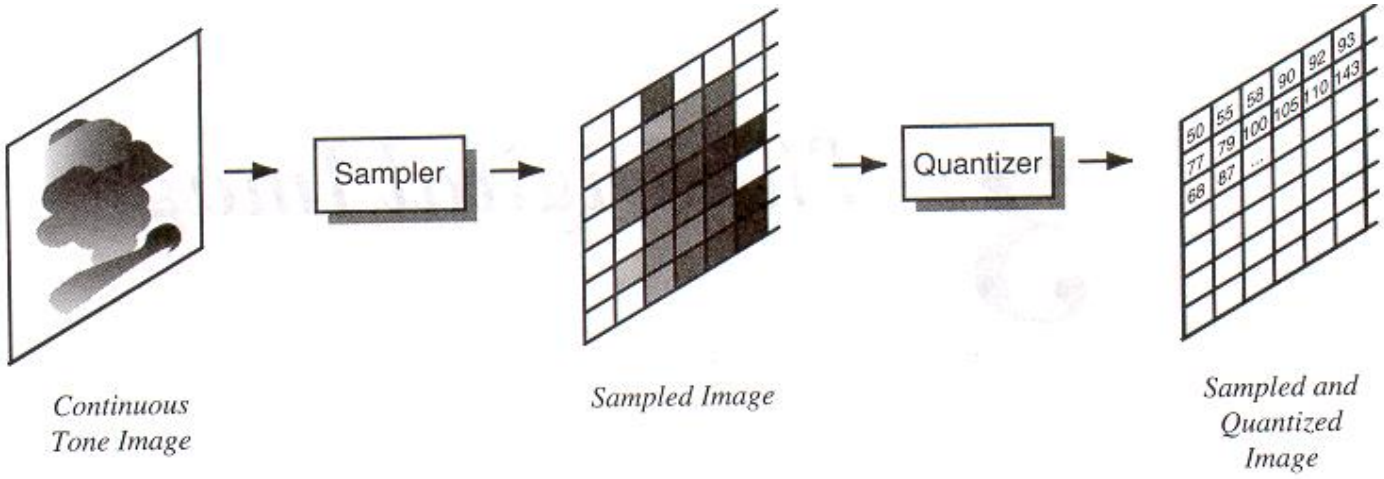


Image Acquisition / Formation



Representasi Matriks

Nilai matriks pada bagian citra yang ditandai

99	71	61	51	49	40	35	53	86	99
93	74	53	56	48	46	48	72	85	102
101	89	57	53	54	52	64	82	88	101
107	82	64	63	59	60	81	90	93	100
114	93	76	69	72	85	94	99	95	99
117	108	94	92	97	101	100	108	105	99
116	114	109	106	105	108	108	102	107	110
115	113	109	114	111	111	113	108	111	115
110	113	111	109	106	108	110	115	120	122
103	107	106	108	109	114	120	124	124	132

Representasi Matriks

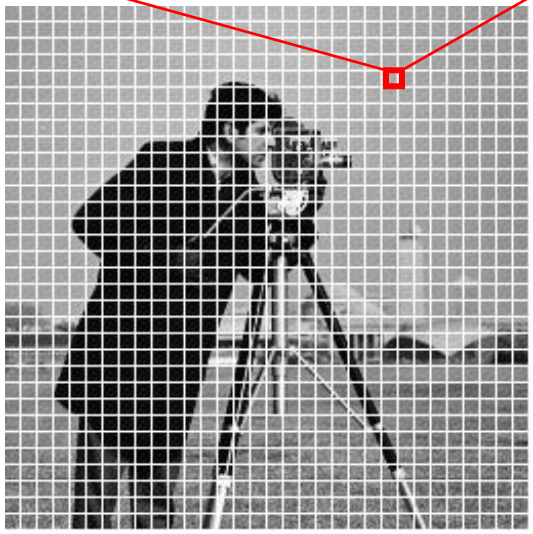
$$\mathbf{A} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

$$\begin{bmatrix} 183 & 160 & 94 & 153 & 194 & 163 & 132 & 165 \\ 183 & 153 & 116 & 176 & 187 & 166 & 130 & 169 \\ 179 & 168 & 171 & 182 & 179 & 170 & 131 & 167 \\ 177 & 177 & 179 & 177 & 179 & 165 & 131 & 167 \\ 178 & 178 & 179 & 176 & 182 & 164 & 130 & 171 \\ 179 & 180 & 180 & 179 & 183 & 169 & 132 & 169 \\ 179 & 179 & 180 & 182 & 183 & 170 & 129 & 173 \\ 180 & 179 & 181 & 179 & 181 & 170 & 130 & 169 \end{bmatrix}$$

H=256

W=256

Divide into 8x8 blocks



Resolusi Citra

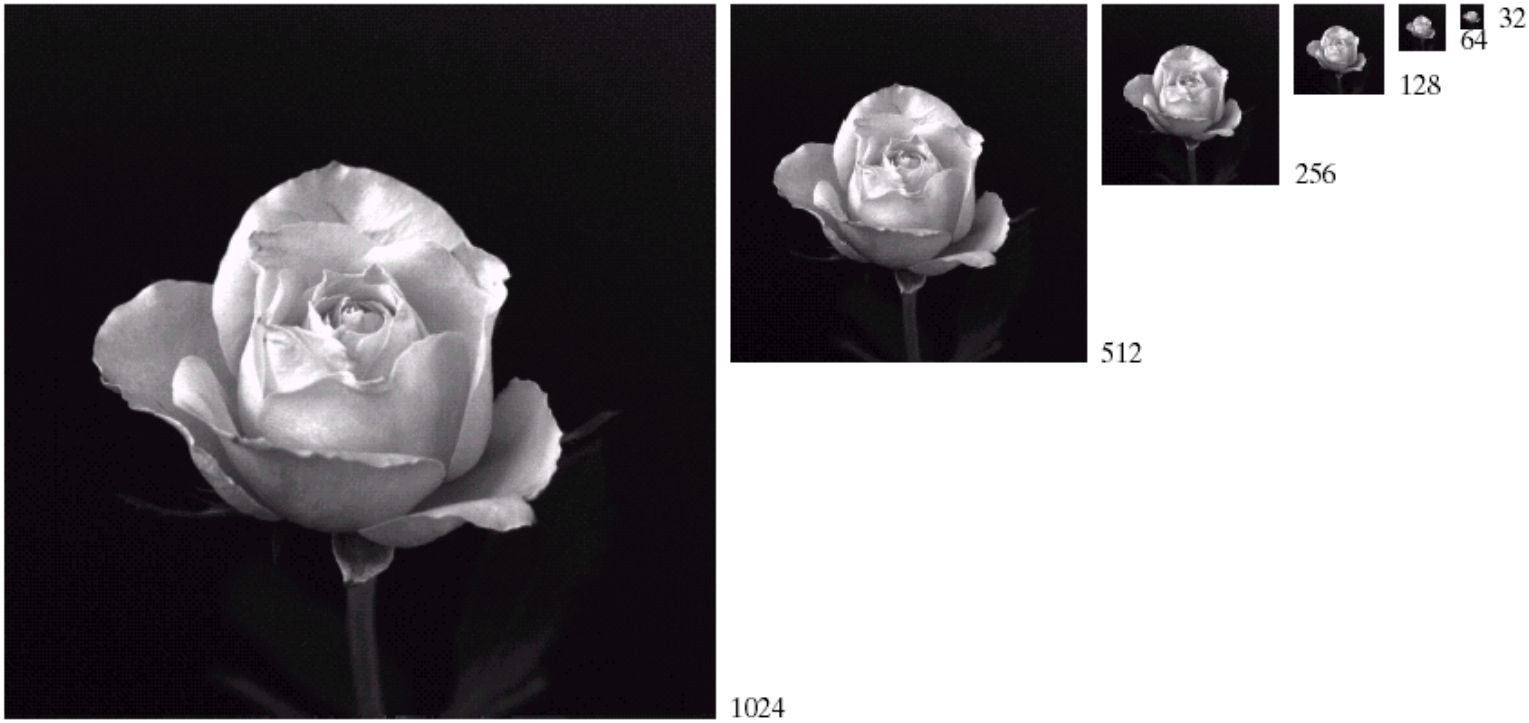
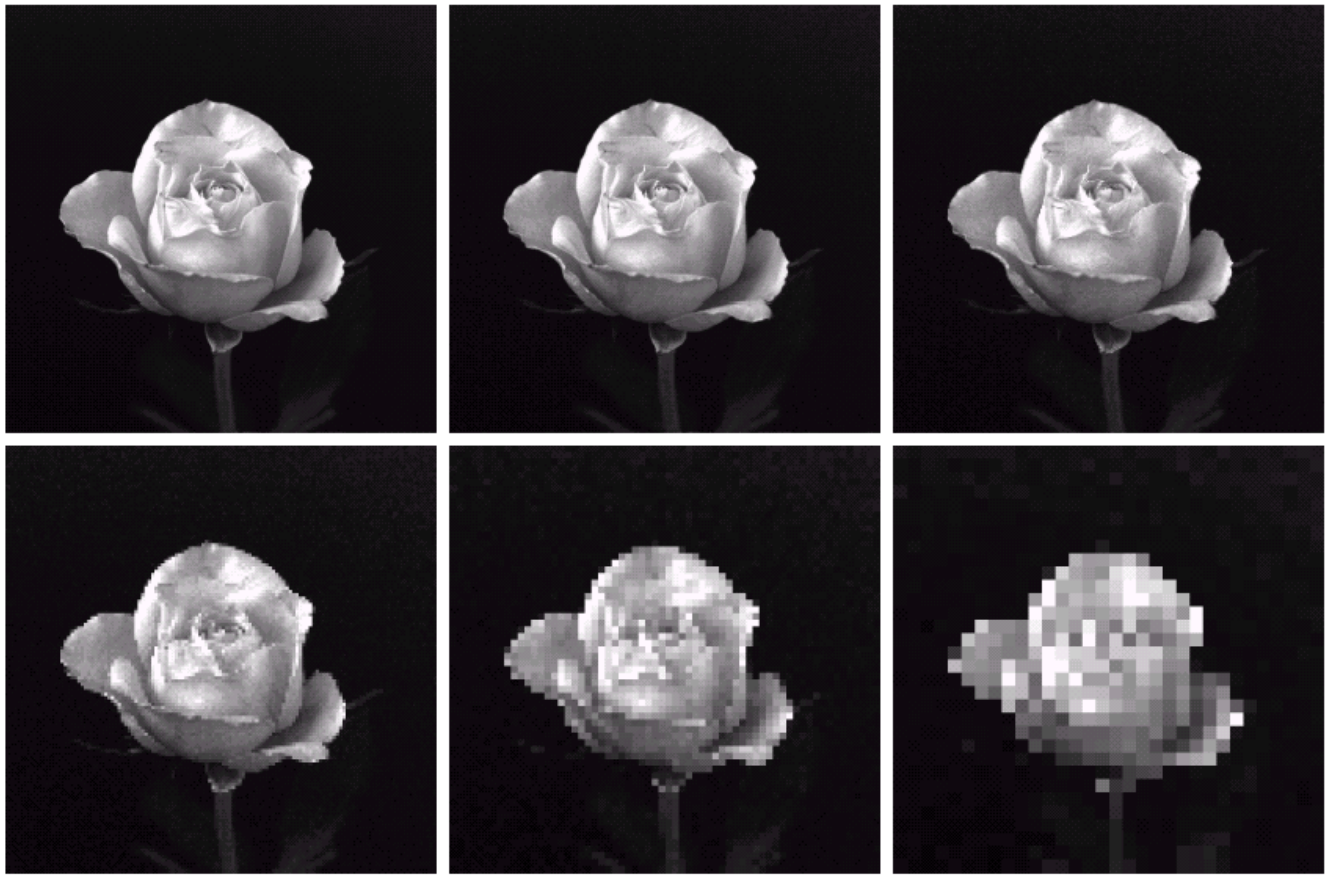


FIGURE 2.19 A 1024 × 1024, 8-bit image subsampled down to size 32 × 32 pixels. The number of allowable gray levels was kept at 256.

Resolusi Citra



a b c
d e f

FIGURE 2.20 (a) 1024 × 1024, 8-bit image. (b) 512 × 512 image resampled into 1024 × 1024 pixels by row and column duplication. (c) through (f) 256 × 256, 128 × 128, 64 × 64, and 32 × 32 images resampled into 1024 × 1024 pixels.

Thank You !