Digital Images

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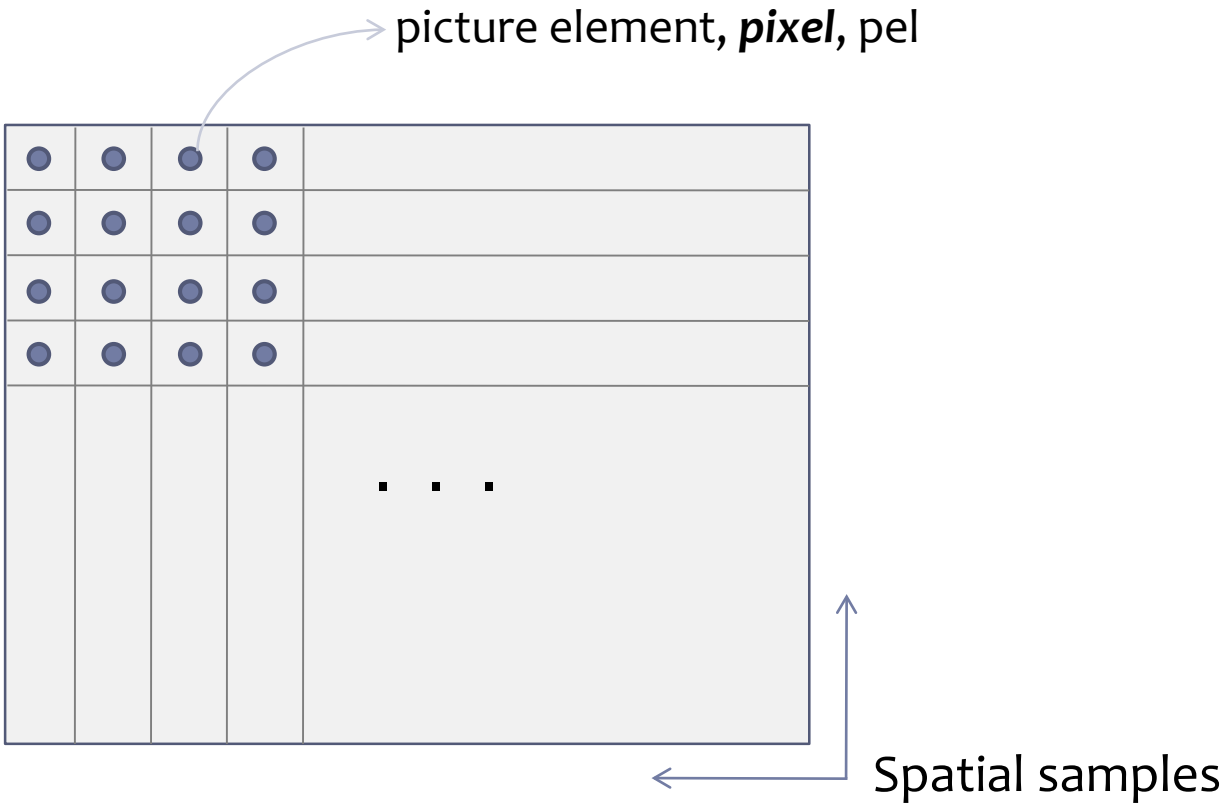
학습내용

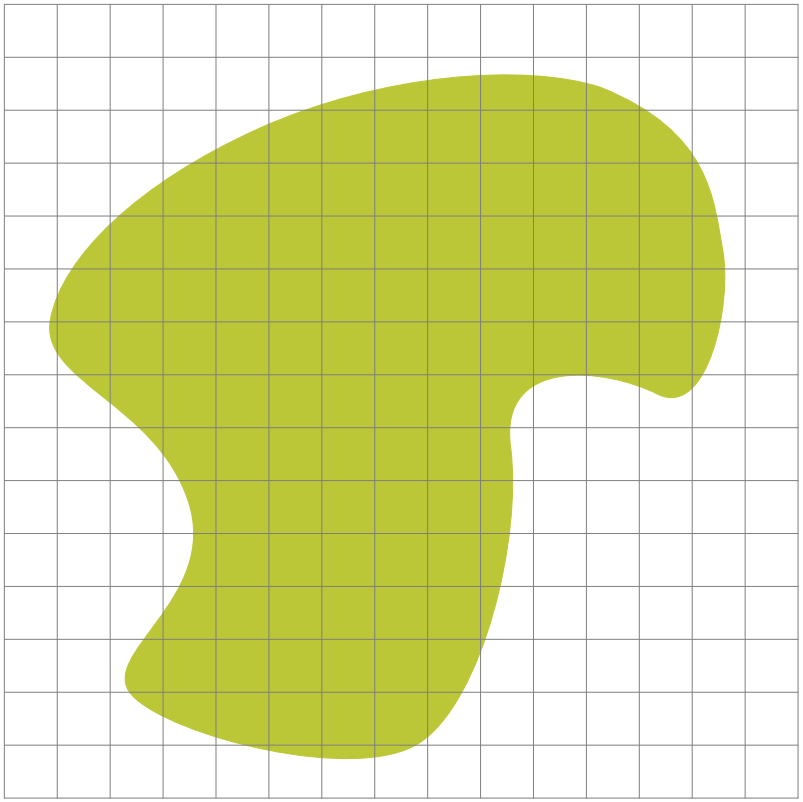
- 영상 신호의 디지털화 과정
- 디지털 영상(bitmap)의 표현 방법
- 디지털 영상(bitmap)의 종류

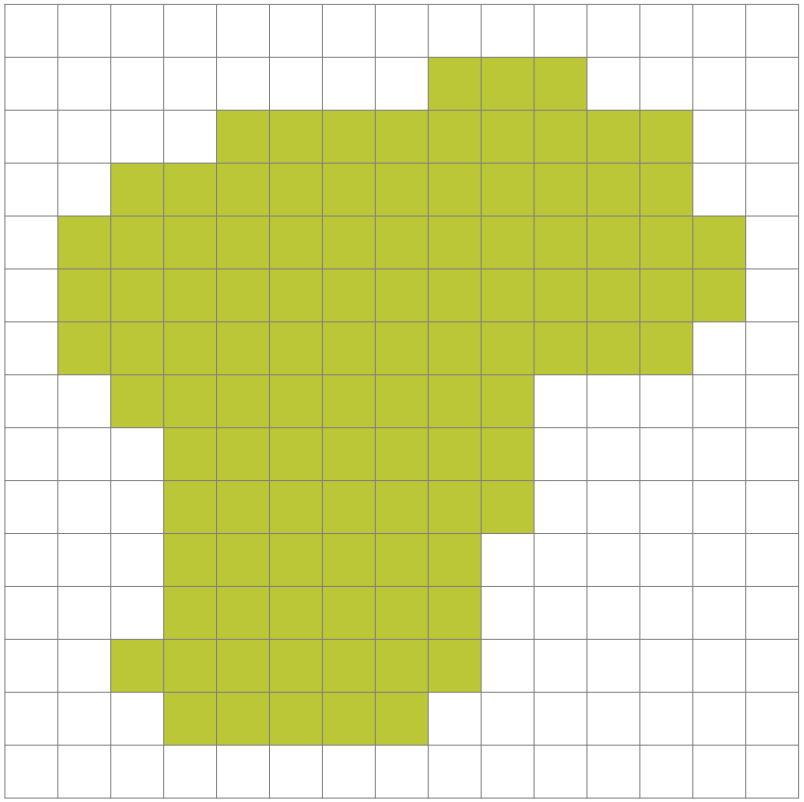
영상 신호의 디지털화 과정

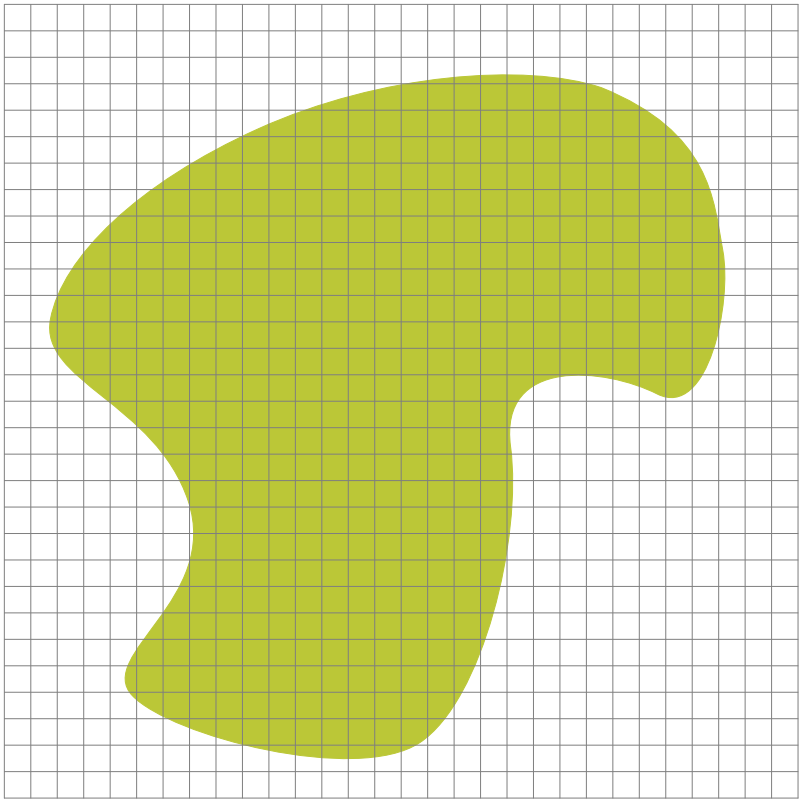
Sampling ⇨ Quantizing ⇨ Coding

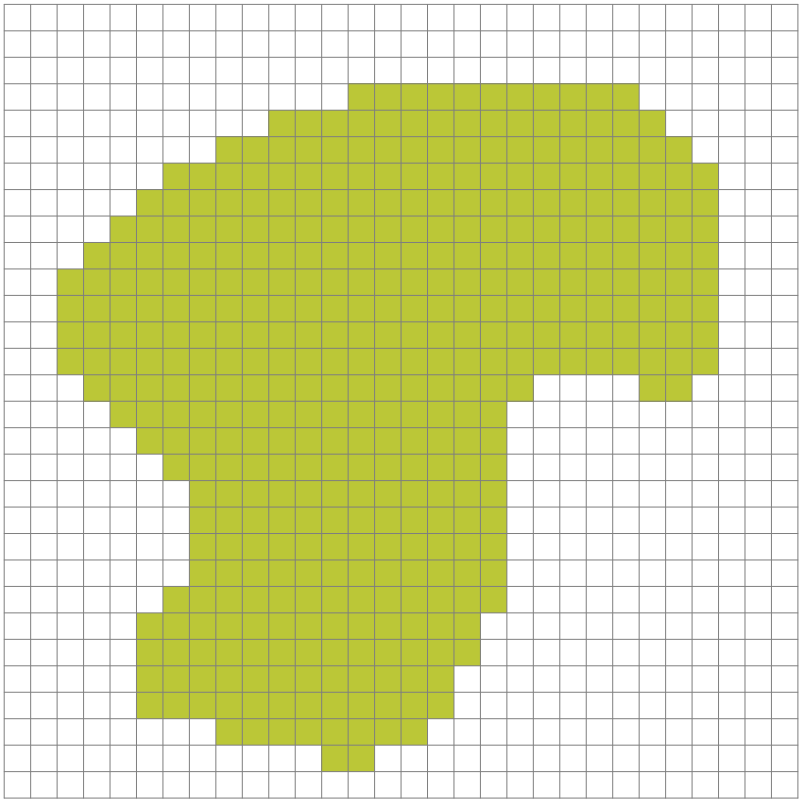
Sampling

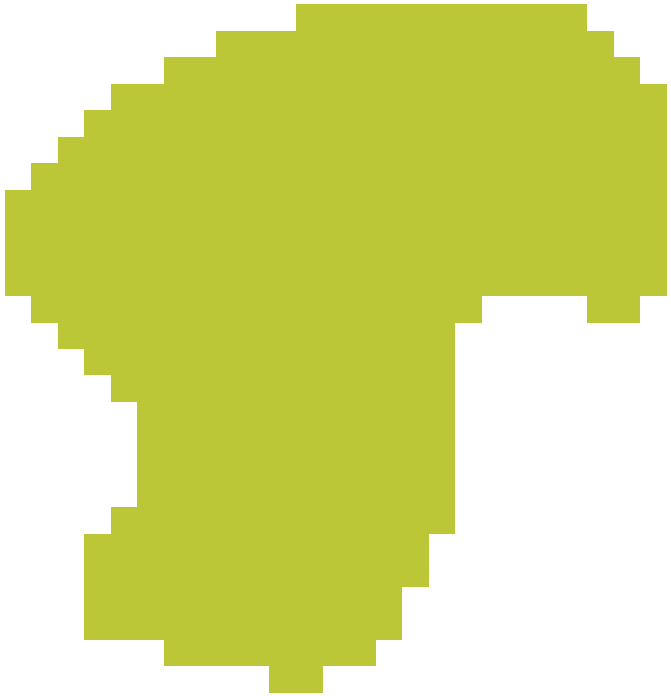










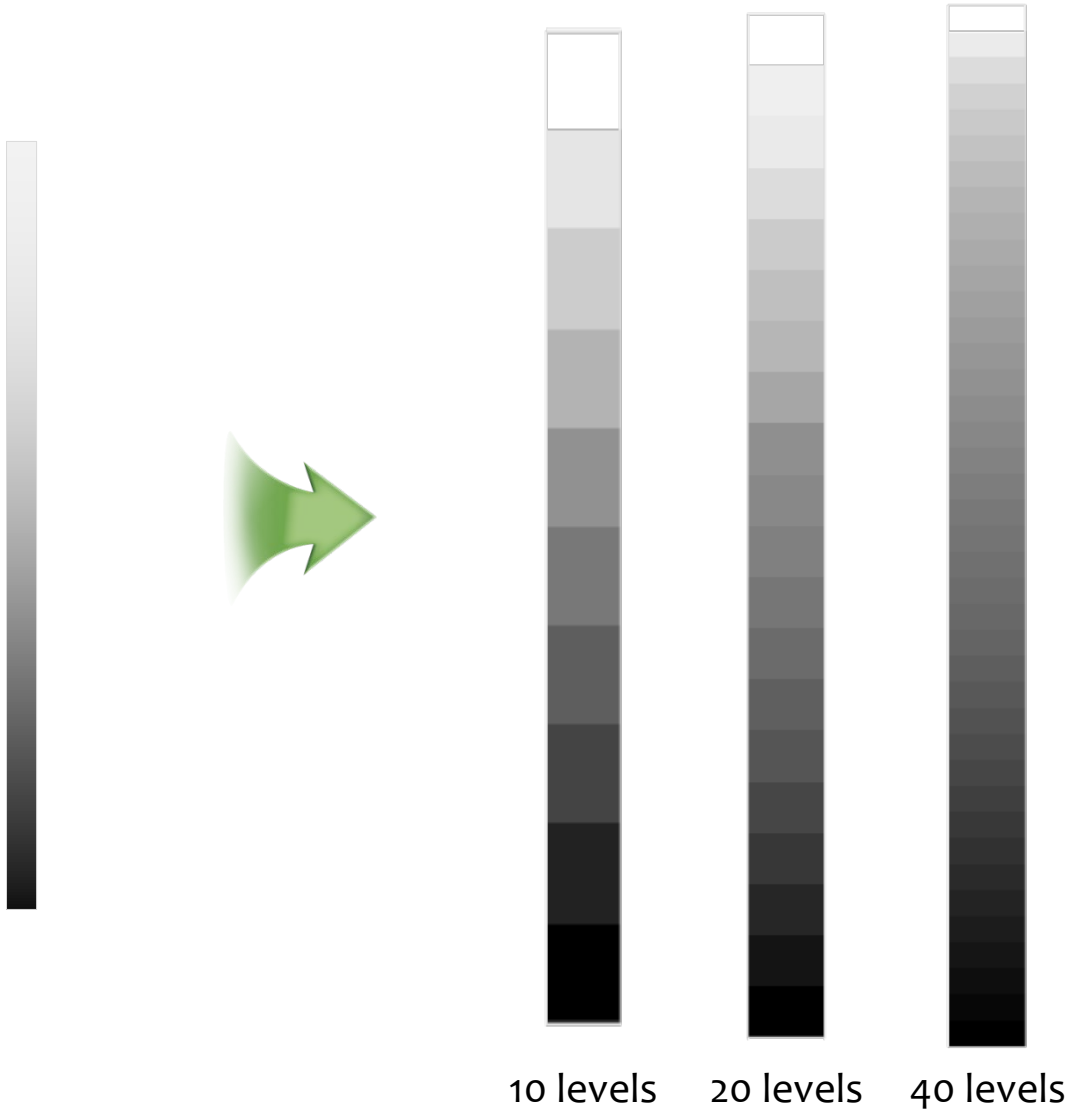


(a) 64 x 64 영상

(b) 128 x 128 영상

(c) 256 x 256 영상

Quantization



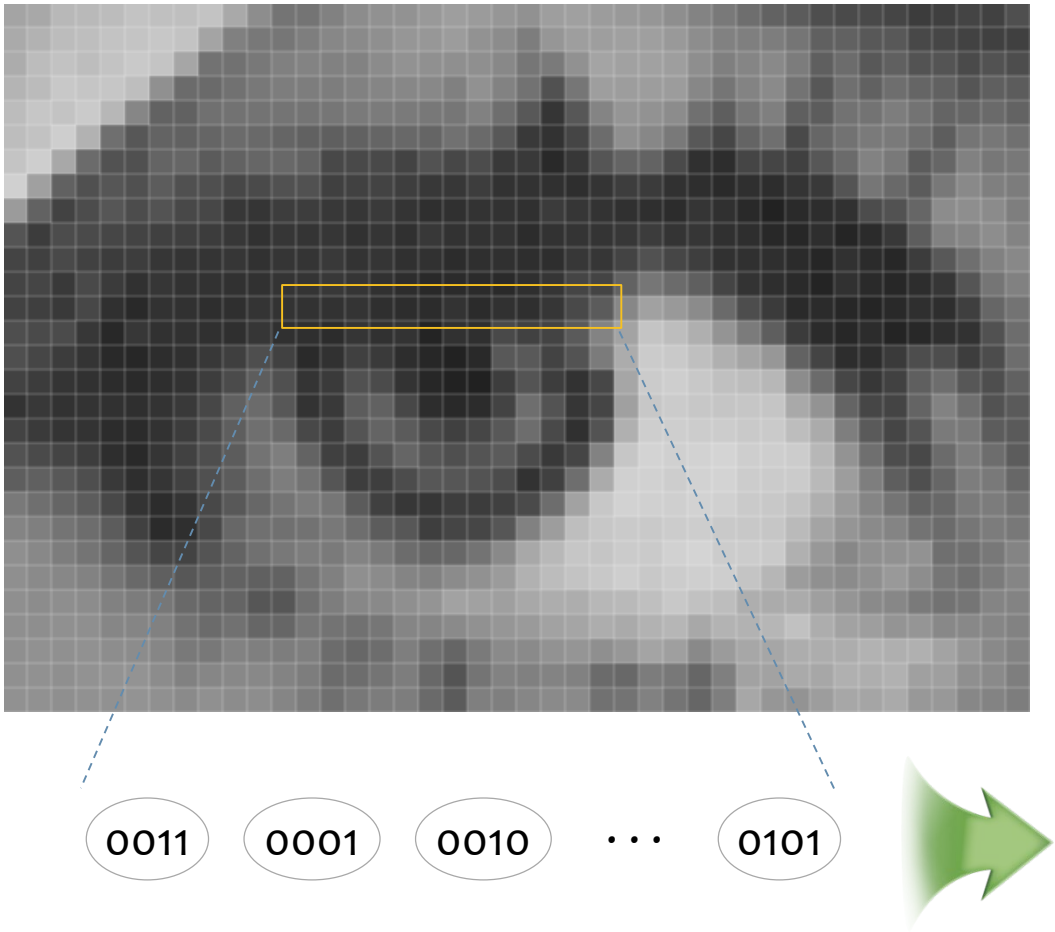
(a) 2 levels

(b) 4 levels

(c) 16 levels

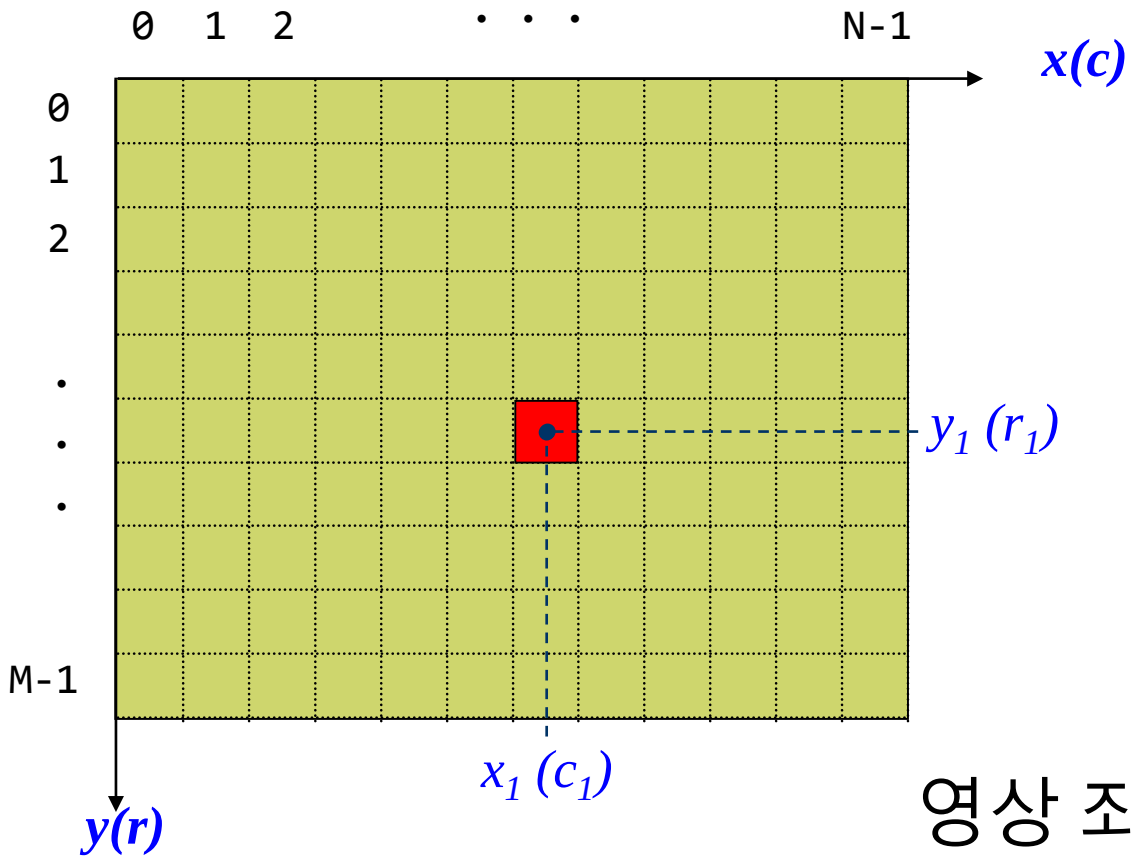
(d) 256 levels

Coding



디지털 영상의 표현 방법

bitmap (raster) image



영상 좌표 ⇨ (x_1, y_1)

행렬 위치 ⇨ (r_1, c_1)

***I*(*x*, *y*)**

where

x, *y*: spatial coordinates

I: intensity (gray level)

$$I(x,y)=\begin{bmatrix} I(0,0) & \dots & I(N-1,0) \\ . & . & . \\ . & & . \\ I(0,M-1) & \dots & I(N-1,M-1) \end{bmatrix}$$

디지털 영상의 종류

binary image

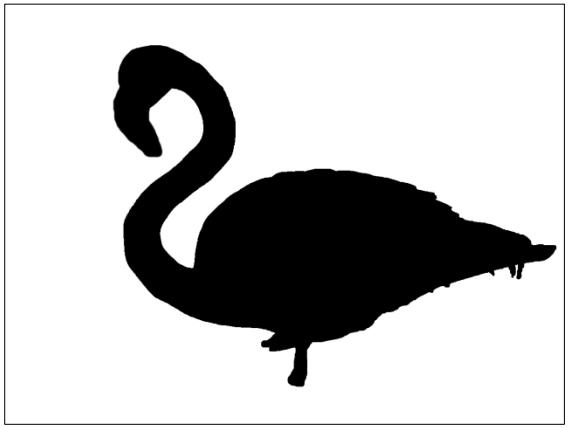
grayscale image

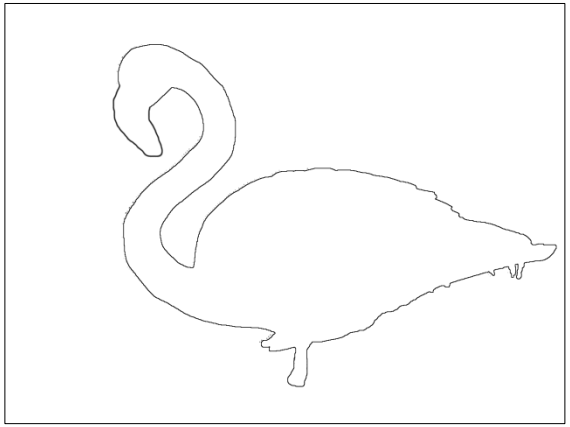
color image

multi-spectral image

binary image

1 bit / pixel





grayscale image

typically 8 bit / pixel

147	146	148	150	153
145	149	151	154	156
149	152	153	156	157
150	153	155	157	158
149	151	152	156	159

color image ⇨ true color image

R

217	216	218	220	223
215	219	221	224	226
219	222	223	226	227
220	223	225	227	228
219	221	222	226	229

G

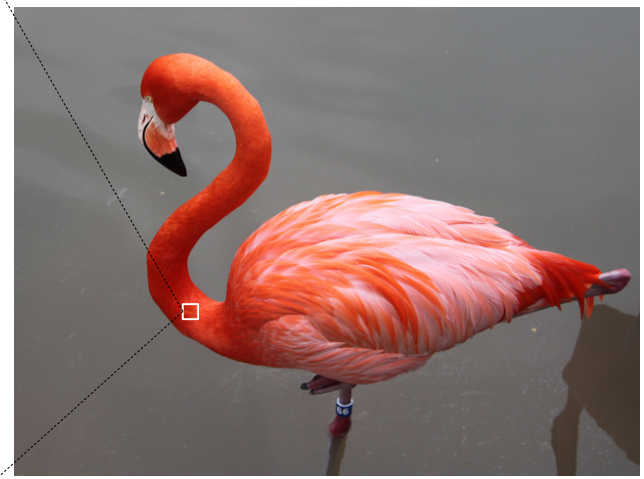
57	56	58	60	63
55	59	61	64	66
59	62	63	66	67
60	63	65	67	68
69	61	62	66	69

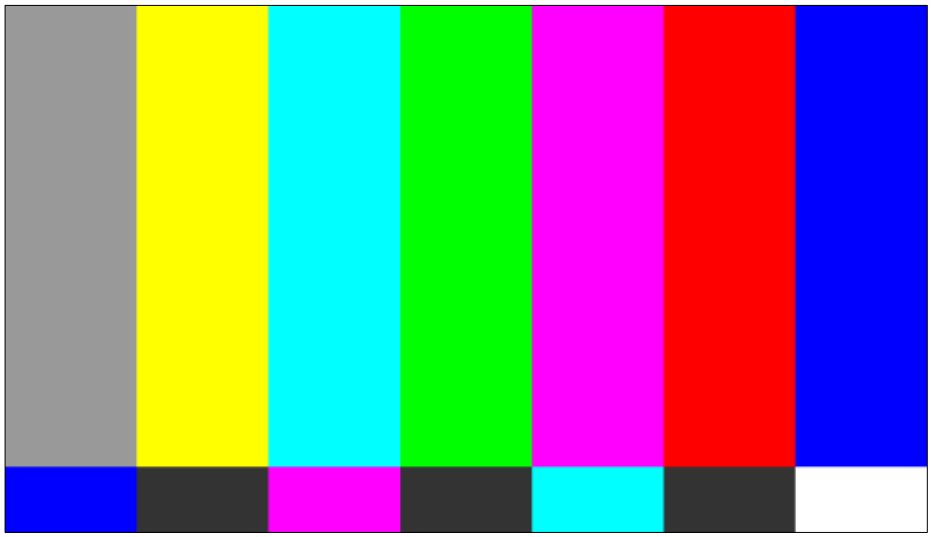
B

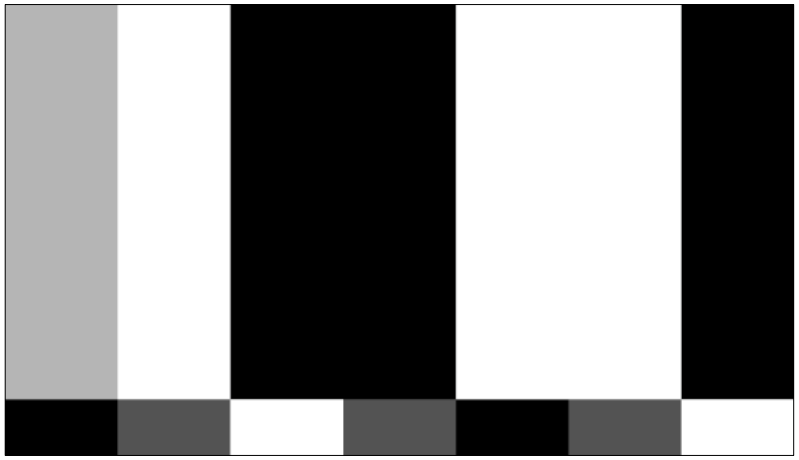
37	36	38	40	43
35	39	41	44	46
39	42	43	46	47
40	43	45	47	48
39	41	42	46	49

typically 24 bit / pixel

(= 16,777,216 colors)

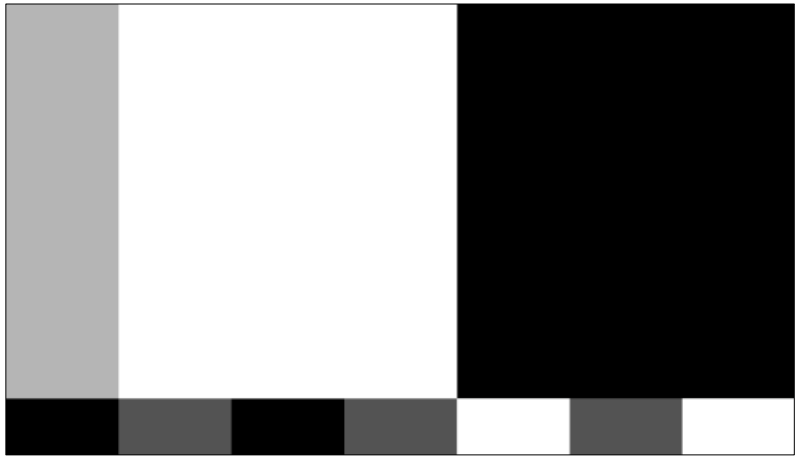


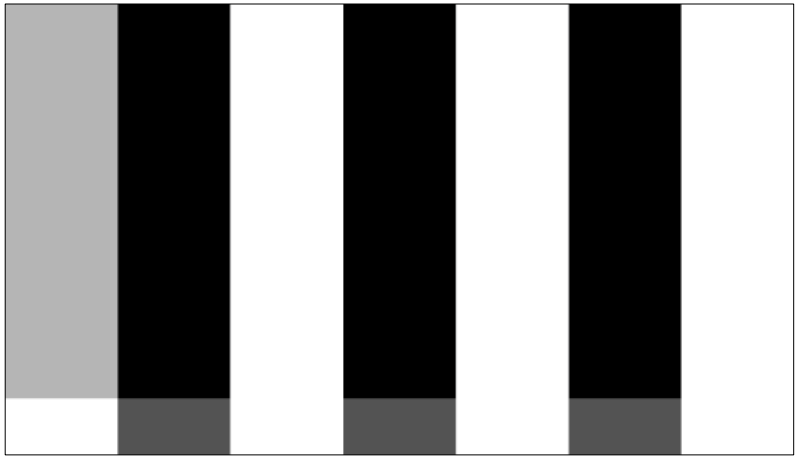




R

G





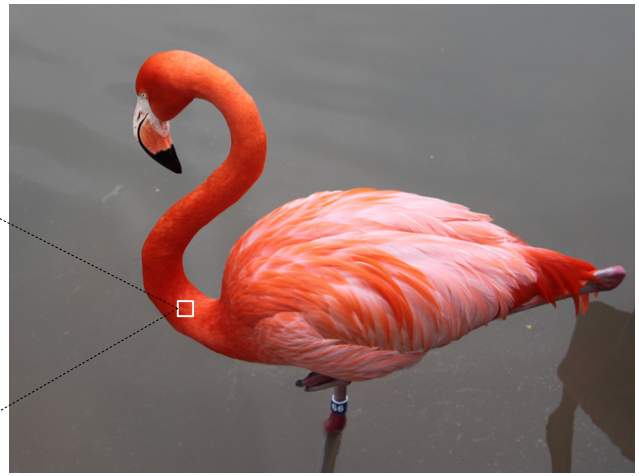
B

color image ⇨ indexed color image

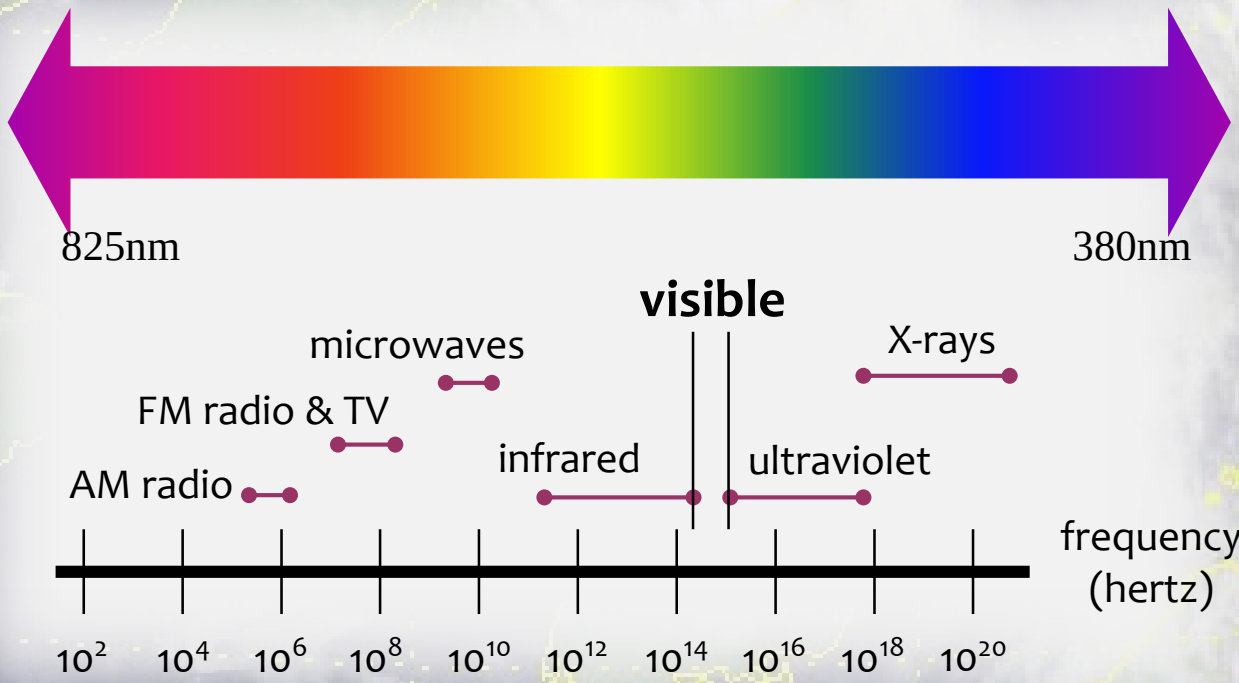
	R	G	B
…		…	
9	215	55	35
10	220	60	40
…		…	

Lookup Table (LUT)

8	8	8	10	13
9	9	11	14	16
10	10	13	16	17
10	13	15	17	18
11	11	12	16	19



multi-spectral image



요약

- 영상 신호의 디지털화 과정
  - Sampling ⇨ Quantization ⇨ Coding
- 디지털 영상(bitmap)의 표현 방법
  - bitmap ⇨ $\boldsymbol{I}(x, y)$
- 디지털 영상(bitmap)의 종류
  - binary, gray-scale, color, multi-spectral images

Reference

- R. Gonzalez, R. Woods, **Digital Image Processing (2nd Edition),** Prentice Hall, 2002
- Scott E Umbaugh, **Computer Imaging**, CRC Press, 2005