Image Processing

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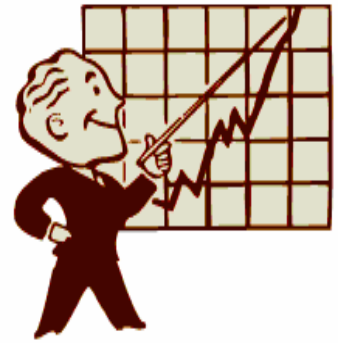


Image & Video Processing

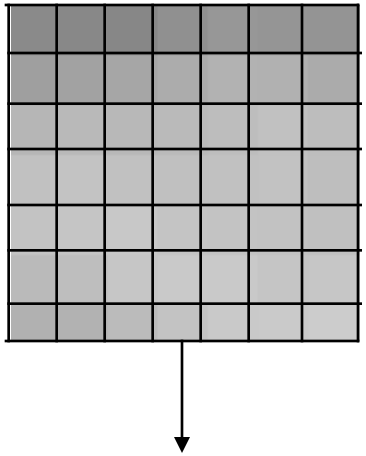
	TOPIC
1	Image Fundamentals
2	Image Enhancement
3	Image Segmentation
4	Image Transform
5	Image Restoration
6	Video Formation
7	Motion Estimation

Image Fundamentals

Image acquisition, Sampling and Quantization, Image Resolution, Basic Relationship Between Pixels, Color Images, RGB, HSI and other models

[1] Digital Image

[1] Digital Image



$$\begin{bmatrix} 180 & 182 & 181 & 190 & 195 & 192 & 190 \\ 196 & 197 & 197 & 200 & 200 & 199 & 196 \\ 200 & 200 & 200 & 201 & 201 & 201 & 200 \\ 202 & 202 & 202 & 201 & 201 & 201 & 204 \\ 202 & 202 & 202 & 201 & 201 & 201 & 204 \\ 199 & 200 & 205 & 203 & 202 & 202 & 204 \\ 199 & 198 & 200 & 201 & 202 & 203 & 204 \end{bmatrix}$$

[2] Spatial Resolution Vs Tonal Resolution

SPATIAL RESOLUTION	TONAL RESOLUTION
(1) It is referred to as	(1) It is referred to as
(2)	(2)
(3)	(3)
(4)	(4)

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SPATIAL RESOLUTION	TONAL RESOLUTION
(1) It is referred to as Sampling	(1) It is referred to as Quantization
(2)	(2)
(3)	(3)
(4)	(4)

[2] Tonal Resolution Vs Spatial Resolution

SPATIAL RESOLUTION	TONAL RESOLUTION
(1) It is refererd to as Sampling	(1) It is referred to as Quantization
(2) It is determined by no. of samples in the image.	(2) It is determined by no of gray levels in the image.
(3)	(3)
(4)	(4)

Change of
Spatial Resolution

[2] Tonal Resolution Vs Spatial Resolution

SPATIAL RESOLUTION	TONAL RESOLUTION
(1) It is referred to as Sampling	(1) It is referred to as Quantization
(2) It is determined by no. of samples in the image.	(2) It is determined by no of gray levels in the image.
(3) Increase in spatial resolution increases minute details .	(3)
(4)	(4)

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SPATIAL RESOLUTION	TONAL RESOLUTION
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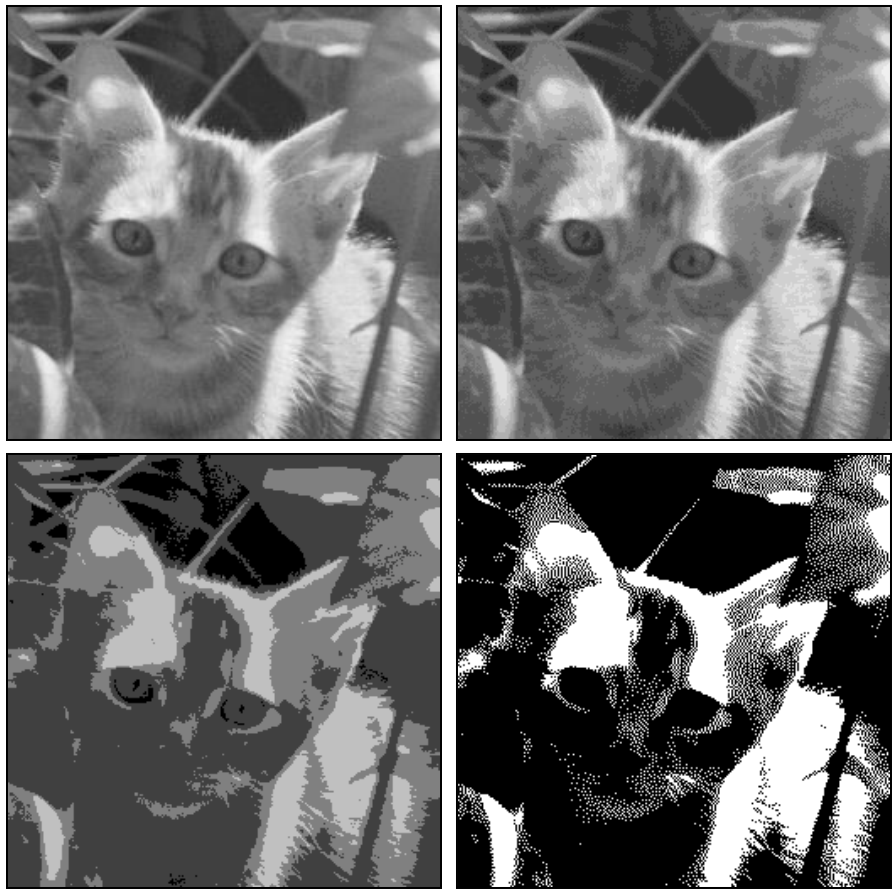
(2) It is determined by no. of samples in the image.	(2) It is determined by no of gray levels in the image.
(3) Increase in spatial resolution increases minute details .	(3)
(4) Decrease in spatial resolution gives Checker Board (i.e. Blocking) effect.	(4)



Change of
Tonal Resolution

Grey-scale quantization

Image quantization(example)

- 256 gray levels (8bits/pixel) 32 gray levels (5 bits/pixel) 16 gray levels (4 bits/pixel)



- 8 gray levels (3 bits/pixel) 4 gray levels (2 bits/pixel) 2 gray levels (1 bit/pixel)



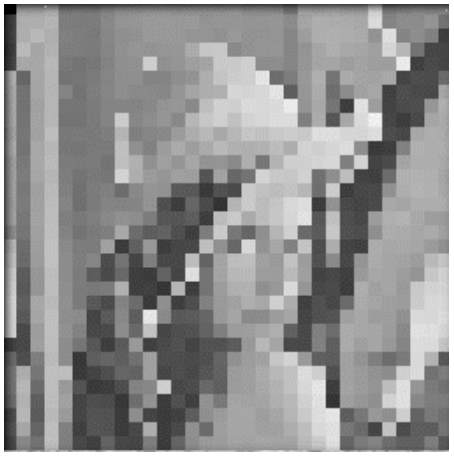
Image sampling (example)

original image

sampled by a factor of 2

sampled by a factor of 4

sampled by a factor of 8



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(3) Increase in spatial resolution increases minute details .	(3) Increase in tonal resolution improves quality & contrast of picture.
(4) Decrease in spatial resolution gives Checker Board (i.e. Blocking) effect.	(4)

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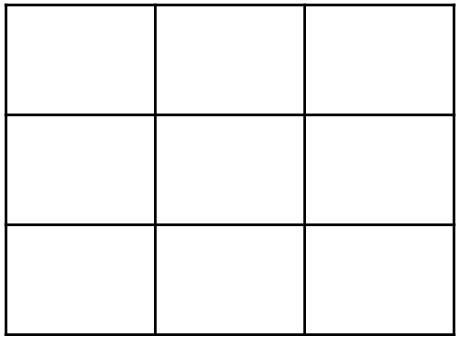
SPATIAL RESOLUTION	TONAL RESOLUTION
(1) It is referred to as Sampling	(1) It is referred to as Quantization
(2) It is determined by no. of samples in the image.	(2) It is determined by no of gray levels in the image.
(3) Increase in spatial resolution increases minute details .	(3) Increase in tonal resolution improves quality & contrast of picture.
(4) Decrease in spatial resolution gives Checker Board (i.e. Blocking) effect.	(4) Decrease in tonal resolution gives false contour in image.

[3] Co-ordinate Systems

[4] Neighbours of PIXEL



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[5] Connectivity of PIXELs

- Two pixels can be connected if they are adjacent in some sense (either in 4 direction or 8 direction way) **AND** their values are almost same as given by some **criteria of similarity** { V }.

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(1) 4 Point Connectivity

Two pixels P and Q with their values from { v } are said to be 4-point connected if

(2) 8 Point Connectivity

Two pixels P and Q with their values from { v } are said to be 8-point connected if

(3) Mixed Point Connectivity

Two pixels P and Q with their values from { v } are said to be M-point connected if

[6] Distance Measure

- **Q1 Given**

$$\mathbf{F} = \begin{bmatrix} 0 & \mathbf{3} & 0 & 2 & 3 \\ 1 & \mathbf{7} & 2 & 3 & 1 \\ 0 & \mathbf{0} & 1 & 6 & 4 \\ 4 & \mathbf{2} & 4 & 7 & 3 \\ 1 & \mathbf{3} & 5 & 7 & 2 \end{bmatrix}$$

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