<20/06/18>

*IEE 239

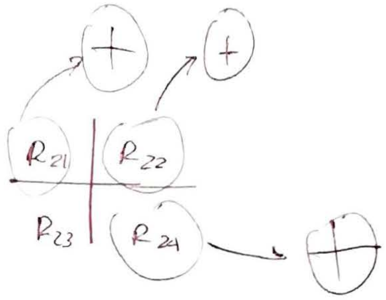
Segmentación (cont)

I) Split and Merge

Ej.:

<u>2013-2</u>: (preg. 5)

$$f(x,y) = \begin{pmatrix} R_1 & R_2 \\ R_3 & R_4 \end{pmatrix}$$



$$Q_R = \begin{cases} 1; & \text{median}\{R\} > 5 \\ 0; & \text{otros casos} \end{cases}$$

R_{1SORT}
↳ ORDENANDO LA REGIÓN 1 ASCENDENTE:

$R_{1SORT} = \{1, 2, 2, 3, 3, 4, 4, 5, 6, 6, 6, 6, 7, 7, 8, 8\}$

median $\{R_1\} = 5.5$

$Q_{R1} = 1$

$R_{2SORT} = \{1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 7, 7, 7, 9, 10\}$

median $\{R_2\} = 3.5$

$Q_{R2} = 0$

*Similarmente:

median $\{R_3\} = 3.5$; $Q_{R3} = 0$

median $\{R_4\} = 3.5$; $Q_{R4} = 0$

Median $\{R_{21}\} = 2.5$; $Q_{R21} = 0$

Median $\{R_{22}\} = 5$; $Q_{R22} = 0$ ∴ solo se cumple para R23, se sigue separando los demás.

Median $\{R_{23}\} = 7$; $Q_{R21} = 1$

Median $\{R_{24}\} = 2.5$; $Q_{R24} = 0$

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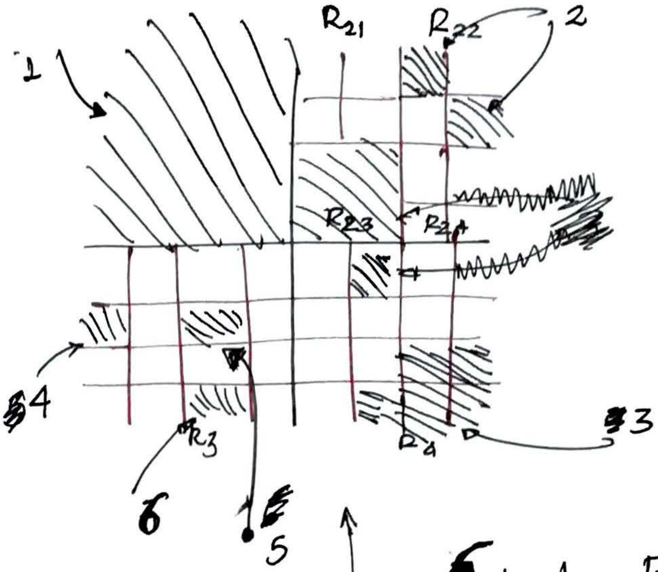
*ETAPA 1: SPLITTING.

- $\text{Median}\{R_{31}\} = 3.5$; $Q_{R31} = 0$
- $\text{Median}\{R_{32}\} = 3.5$; $Q_{R32} = 0$
- $\text{Median}\{R_{33}\} = 3.5$; $Q_{R33} = 0$
- $\text{Median}\{R_{34}\} = 4.5$; $Q_{R34} = 0$



0 objetos

1 plano de fondo

$\text{Median}\{R_{41}\} = 2.5$; $Q\{R_{41}\} = 0$

$\text{Median}\{R_{42}\} = 2.5$; $Q_{R42} = 0$

$\text{Median}\{R_{43}\} = 3.5$; $Q_{R43} = 0$

$\text{Median}\{R_{44}\} = 6.5$; $Q_{R44} = 1$

* ETAPA 2 : MERGING

* MÉTODO INICIAL:

Múltiples soluciones:

* RELAJAR EL MÉTODO.

SIMPLIFICACIÓN EN EL ~~PASO~~ PASO 2: MERGE.

→ θ - ADYACENCIA.

- UNIR CUADRANTES ADYACENTES. $\{R_i, R_j\}$

SI AMBAS CUMPLEN Q INDIVIDUALMENTE.

RGB - SEGMENTACIÓN:

*) UMBRALIZACIÓN DE IMÁGENES A COLORES: EJ:

$$f(x,y) = \{ f_R(x,y) ; f_G(x,y) ; f_B(x,y) \}$$

$$f_R = \begin{pmatrix} \underline{2} & 5 & 11 \\ 7 & 9 & 4 \\ 14 & 3 & 8 \end{pmatrix}, \quad f_G = \begin{pmatrix} \underline{10} & 8 & 4 \\ 13 & 2 & 13 \\ 14 & 2 & 4 \end{pmatrix}$$

$$f_B = \begin{pmatrix} \underline{12} & 5 & 9 \\ 4 & 3 & 7 \\ 14 & 4 & 5 \end{pmatrix}$$

$$g(x,y) = \begin{cases} 1 ; & D_2\{f(x,y), C\} < 4 \\ 0 ; & \text{otros casos} \end{cases} \quad ; \quad C = \{\underset{C_R}{7}, \underset{C_G}{5}, \underset{C_B}{2}\}$$

$* \; D_2 \{A, B\} = \left(\sum_{i=0}^{n} (a_i - b_i)^2 \right)^{1/2}$

[DISTANCIA EUCLIDIANA]

$$f_R - C_R = \begin{pmatrix} -5 & -2 & 4 \\ 0 & 2 & -3 \\ 7 & -4 & 1 \end{pmatrix}$$

$$f_G - C_G = \begin{pmatrix} 5 & 3 & -1 \\ 8 & -3 & 8 \\ 9 & -3 & 1 \end{pmatrix}$$

$$f_B - C_B = \begin{pmatrix} 10 & 3 & 7 \\ 2 & 1 & 5 \\ 12 & 2 & 3 \end{pmatrix}$$

$$D_2 \{f, C\} = \left[(f_R - C_R)^2 + (f_G - C_G)^2 + (f_B - C_B)^2 \right]^{1/2}$$

$$= \begin{pmatrix} 12.25 & 4.69 & 8.12 \\ 8.25 & 3.74 & 9.9 \\ 16.36 & 5.39 & 3.32 \end{pmatrix}$$

$$g = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$\circ\circ \; f_{2\,(x,y)} : \{ f_{2R}, f_{2g}, f_{2B} \}$

$$= \left\{ \underbrace{\begin{pmatrix} 0 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 8 \end{pmatrix}}_{f_{2R}}, \underbrace{\begin{pmatrix} 0 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{pmatrix}}_{f_{2G}}, \underbrace{\begin{pmatrix} 0 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{pmatrix}}_{f_{2B}} \right\}$$

* MORFOLOGÍA MATEMÁTICA:

$$f(x,y) = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \; ; \; f \in \{0;1\}$$

i) $Q_f: \{(2,2);(2,3);(2,4);\ (3,2);(3,3);(3,4);\ (4,2);(4,3);(4,4)\}$

ii) REFLEXIÓN:

$\hat{Q}_f: \{(-2,-2);(-2,-3),(-2,-4);(-3,-2);(-3,-3);(-3,-4);(-4,-2);(-4,-3);(-4,-4)\}$

$$\hat{f}(x,y) = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

iii) TRASLACIÓN:

$Q_{f\{z=(2,1)\}} = \{(4,3);(4,4);(4,5);(5,3);(5,4);(5,5);(6,3);(6,4);(6,5)\}$

$$\tilde{f}(x,y) = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 \end{pmatrix}$$

iv) EROSIÓN: (SIMILAR A CORRELACIÓN)

$f(x,y); h(x,y) = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$; $Q_H: \{(0,0);(0,1);(1,0),(1,1)\}$

$Q_{H\{z=(2,2)\}} = \{(2,2),(2,3),(3,2),(3,3)\} \subseteq Q_f$

$\therefore$ $Q_f \ominus Q_H = \{(2,2), (2,3), (3,2), (3,3)\}$

$$f(x,y) = \begin{pmatrix} \underline{0} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 11 & 11 & 1 & 0 & 0 \\ 0 & 0 & 11 & 11 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

v) DILATACIÓN (SIMILAR A CONVOLUCIÓN)

$$f(x,y) \; ; \; h(x,y) = \begin{pmatrix} \underline{1} & 1 \\ 1 & 1 \end{pmatrix}$$

$$\hat{h}(x,y) = \begin{pmatrix} 1 & 1 \\ 1 & \underline{1} \end{pmatrix}$$

$$\hat{Q}_H = \{(0,0), (0,-1), (-1,0), (-1,-1)\}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 01 & 01 & 01 & 01 & 0 \\ 0 & 0 & 01 & 01 & 01 & 01 & 0 \\ 0 & 0 & 01 & 01 & 01 & 01 & 0 \\ 0 & 0 & 01 & 01 & 01 & 01 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

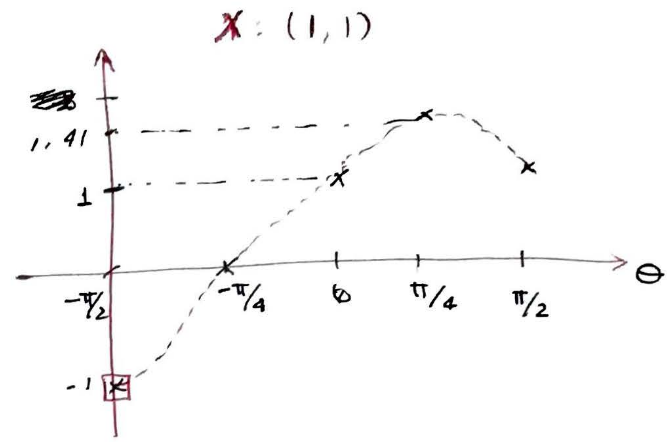
2017-1

resolución infinita

PREGUNTA 1

A)

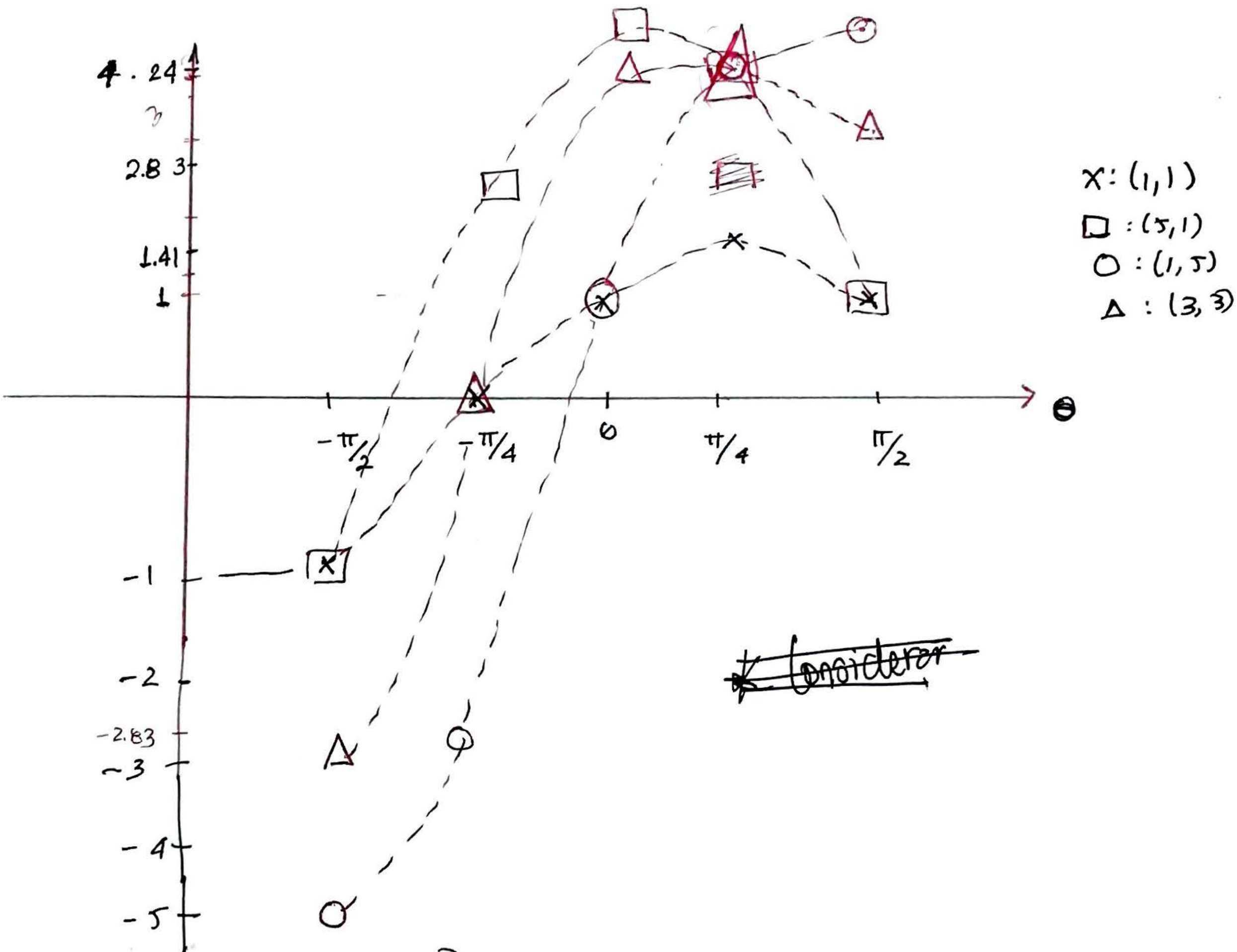
	$-\pi/2$	$-\pi/4$	0	$\pi/4$	$\pi/2$
(1,1)	-1	0	1	1.41	1
(5,1)	-1	2.83	5	4.24	1
(1,5)	-5	-2.83	1	4.24	5
(3,3)	-3	0	3	4.24	3



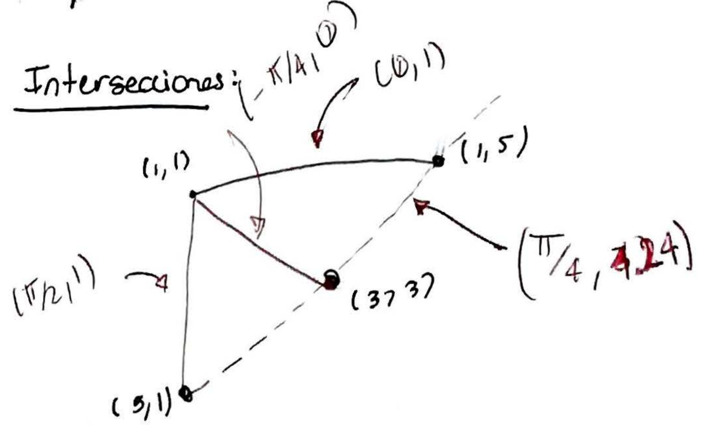
* Considerar tabulación para

$\Delta\theta = \pi/4 ; \theta \in [-\pi/2 ; \pi/2]$

* $\rho = x\cos(\theta) + y\,\text{sen}(\theta)$



Intersecciones:



B)

INTENSIDAD	B.P	B. Pmod	
0	0000	0000	
1	0001	0001	
2	0010	0010	
3	0011	0011	
4	0100	0000	0
5	0101	0001	1
6	0110	0010	2
7	0111	0011	3
8	1000	1000	
9	1001	1001	
10	1010	1010	
11	1011	1011	
12	1100	1000	8
13	1101	1001	9
14	1110	1010	10
15	1111	1011	11

$$\tilde{h}_K = \{ 9, 10, 11, 14, 0, 0, 0, 0, 9, 3, 2, 6, 0, 0, 0, 0 \}$$

c) $$g(x,y) = \begin{pmatrix} \underline{8} & 10 & 4 & 6 & \underline{13} \\ 1 & \underline{13} & \cancel{9} & \cancel{7} & 13 \\ \underline{11} & 4 & \underline{7} & 6 & 15 \\ 2 & \underline{5} & 15 & 4 & 6 \end{pmatrix}$$

PREGUNTA 3:

A) $$\text{DFT } \{ f(x,y) \} = F(u,v)$$

$M = 7$
$N = 7$

* DFT DE $f(x,y)$ PARA $M = N = 7$

REPRESENTA $f_p(x,y) =$

$$f_p(x,y) = A, \forall (x,y) \in \mathbb{Z}^{2 \times 1}$$

$\uparrow$

$$F(u,v) = M \cdot N \, \delta(u,v)$$

$$g(u,v) = \underbrace{F(u,v)}_{49 \, \delta(u,v)} \cdot W(u,v)$$

$$= 49\,\delta(\mu, \nu) \cdot W(0, 0)$$

$$W(0, 0) = \sum_{x=\langle M \rangle} \sum_{y=\langle N \rangle} W(x, y)\, \underbrace{e^{-j2\pi\left(\frac{\mu x}{M} + \frac{vy}{N}\right)}}_{1}$$

$$= 0$$

$$\therefore\; g(u, v) = 0\;,\; g(x, y) = 0$$