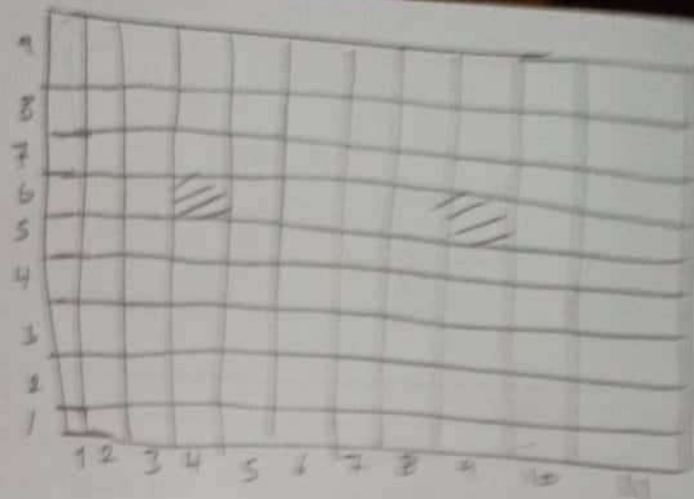


osion o/p



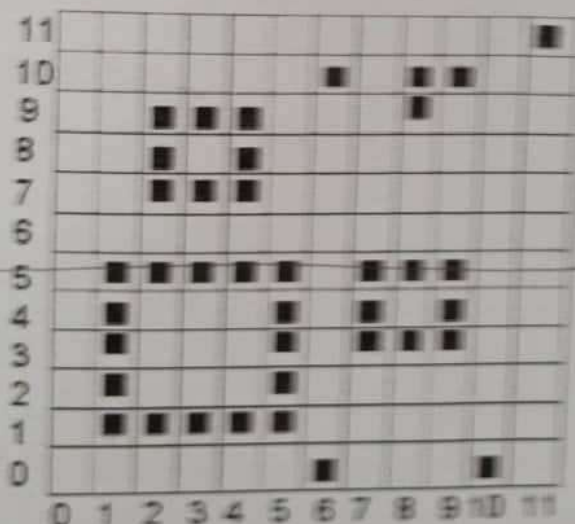
on o/p

is the desired image



3 points] If we apply the Hough transform on the image below, what would be the maximum value for the accumulator cell in the (ρ, θ) space? What is the correct (ρ, θ) value?

Each black square denotes a point and the numbers are the coordinates.



max value cell is $(5, 90^\circ)$ or $(5, \frac{\pi}{2})$

its value is 8



Propose a 3×3 filter that will shift an input image one pixel down.
 Apply your filter to the following image and draw the result image.

0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0
0	0	0	0	0

Assume
Zero

1	1	1
0	0	0
0	0	0

So round-

w

0	0	0	0	0
0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0

if pr
de
The

Mostafa Abdelgawad

17
20

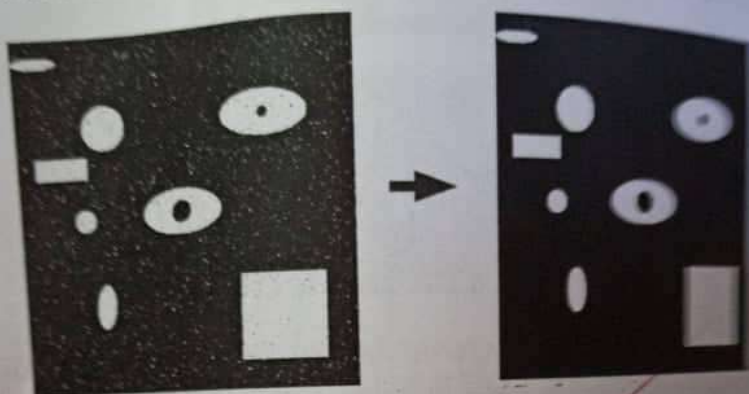


1155112

CMP6666
Image Processing and Computer Vision
Final Exam
Fall 2019

Answer ALL Questions (Full Mark 20 points)

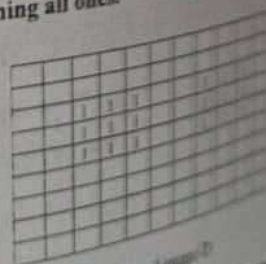
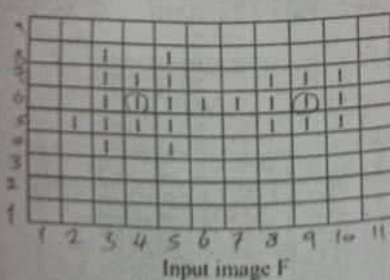
- 1- [2 points] Given the left image below, which is corrupted with impulsive noise, use different algorithms to remove correctly all the noise in the image to obtain a result like shown on the right.



impulsive noise so median filter.

② erosion with small structuring element & dilation with same element (opening)

- 2- [3 points] Let $H[u,v]$ be a 3×3 matrix containing all ones.



What are the operations sequence that can be used to produce the desired image from the input image F? Show the effect of each operation on the input image till you reach the desired image.

Erosion & dilation (opening)

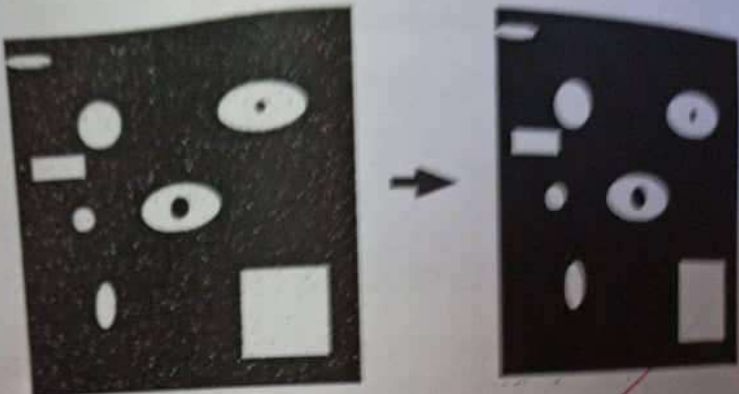
Martafa Abdelgawad

17
20



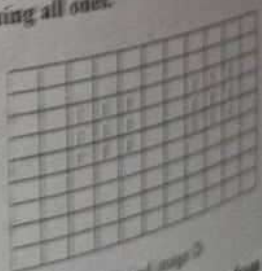
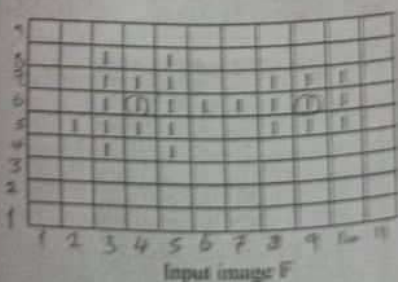
Answer ALL Questions (Full Mark 20 points)

1- [2 points] Given the left image below, which is corrupted with impulsive noise, state two different algorithms to remove correctly all the noise in the image to obtain a clean image like shown on the right.



① median filter
② erosion with small structuring element & dilation with same element (opening)

2- [3 points] Let $H[u,v]$ be a 3×3 matrix containing all ones.



What are the operations sequence that can be used to produce the desired image from input image F? Show the effect of each operation on the input image till you reach the desired image.

Erosion & dilation (opening)

7.8

[4 points] Apply local and global thresholding techniques to segment the image in the following figure into foreground (brighter) and background (darker). Is global or local thresholding more suitable for this task? Show your steps clearly and reason how you choose the threshold. (one last page)



region ①

region ②

region ③

15	15	8	8	7	7	6	6	5	5	5	5	4	4	4	4	3	3	3	2	2	1	1
9	8	8	7	7	6	6	6	5	13	13	4	4	4	4	4	3	3	3	2	2	1	1
8	8	8	15	14	14	14	13	5	13	13	12	12	12	11	3	3	3	10	9	9	9	1
8	8	15	15	7	6	6	5	5	12	12	4	4	3	11	11	3	3	2	2	1	8	1
8	7	14	14	6	6	5	5	5	12	12	4	3	3	11	10	3	2	9	8	8	8	1
7	7	14	14	6	6	5	5	5	12	12	4	3	3	10	10	3	10	9	2	1	7	2
7	7	7	14	13	13	13	13	5	4	12	11	11	11	10	3	3	2	9	8	7	6	1
7	7	6	6	6	6	5	5	5	4	4	4	4	3	3	3	2	2	1	1	1	1	2

global

$T=9$

Normal thresholding basic

1	1	1																				
2	1																					
3																						
4																						
5																						
6																						
7																						
8																						

→ Cut the image into three pieces to make each letter in one region

1	1	1																				
2																						
3																						
4																						
5																						
6																						
7																						
8																						

then apply Normal thresholding

For region ① object ≥ 10
background ≤ 6

For region ②
object ≥ 8
background ≤ 8

For region ③
object ≥ 10
background ≤ 8

