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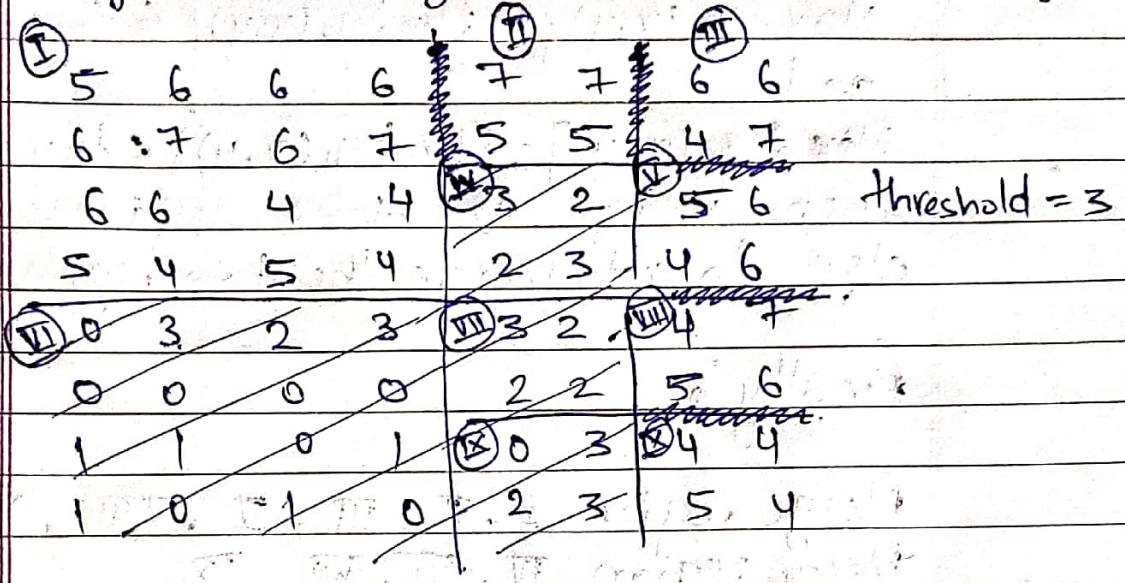
→ Region based segmentation (Split and Merge)



Step 1: Split operation

- Keep on splitting the region into equals quadrants till the ~~max~~ difference of max of the region and min of the region is greater than threshold.

if $Max\{g(x,y)\} - Min\{g(x,y)\} \leq$ threshold
then do not split the region
else split the region in four equal quadrants

Step 2: Merge operation

Now consider each pair of adjacent regions. If diff of max of first region and min of second region is less than or equal to threshold and diff of min of first region and max of second region is less than or equal to threshold, then merge the two regions.

If

$\text{Max}\{g_1(x,y)\} - \text{Min}\{g_2(x,y)\} \leq \text{threshold}$

and

$\text{Max}\{g_2(x,y)\} - \text{Min}\{g_1(x,y)\} \leq \text{threshold}$

then merge the two regions.

else do not merge the two regions.

Finally,

Merge region I, II, III, V, VIII, X

Merge region IV, VI, VII, IX

→ Region based Segmentation (Region Growing)

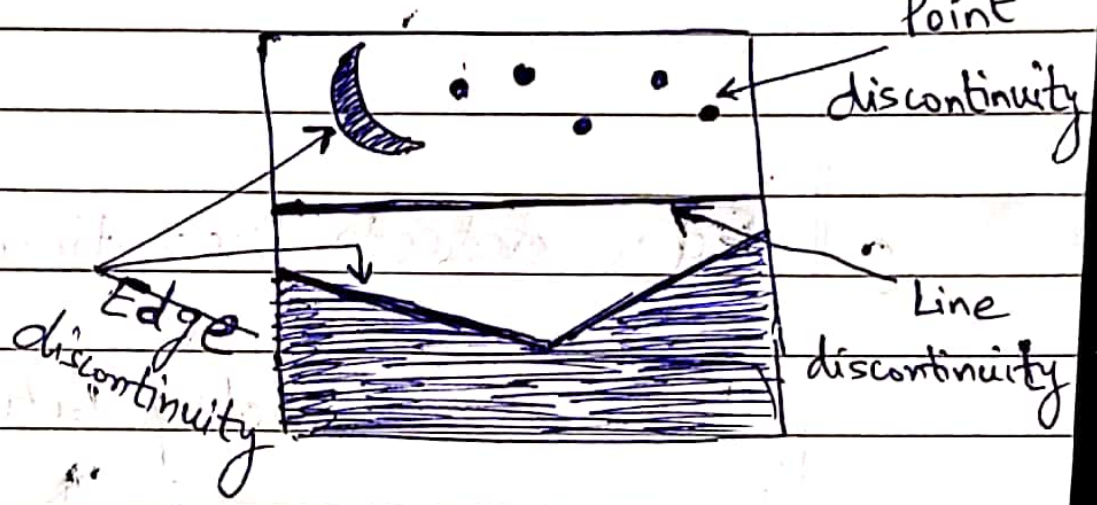
Step 1: Take a seed point. Take seed point as a value near extremes i.e. near maximum value or minimum value.

Step 2: Apply BFS and go to all eight adjacent pixels. If the difference in value of current pixel and seed pixel is less than or equal to threshold, consider it within the region, else do not consider it in the region.

Image Segmentation based on discontinuities.

* Discontinuities = Abrupt change in intensity
* When we go from one types of pixels to other types of pixels, that is called discontinuties.
* At discontinuities, intensity change occurs abruptly.

Point Line Edge.



* To find discontinuties, we use masks.

(a) Point Discontinuity

(b) Line Discontinuity

-1	-1	-1
2	2	2
-1	-1	-1

Horizontal Line

-1	2	-1
-1	2	-1
-1	2	-1

Vertical Line

2	-1	-1
-1	2	-1
-1	-1	2

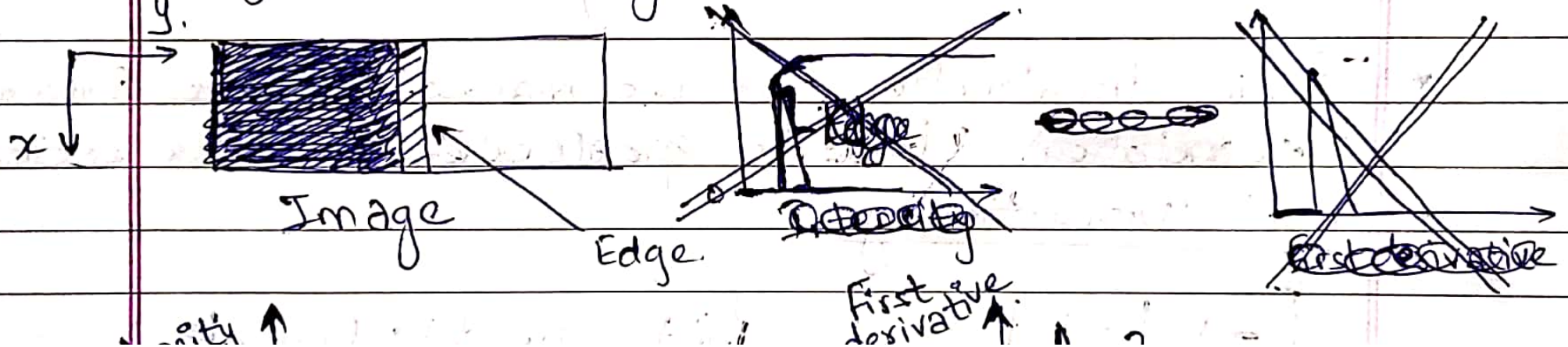
Line with negitive slope

-1	-1	2
-1	2	-1
2	-1	-1

Line with positive slope

(c) Edge ~~detecto~~ Discontinuity

Edge is a boundry between two different areas.



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	y	y+1	
31	32	33	
34	(35)	36	x
37	38	39	x+1

Image

$$\Delta F = \hat{i}(36-35) + \hat{j}(38-35)$$

$$|\Delta F| = \sqrt{(36-35)^2 + (38-35)^2}$$

$$\approx |36-35| + |38-35|$$

for above operation, we can used two filters,

-1	0
+1	0

-1	+1
0	0

In vertical direction

In horizontal direction

The ~~subtraction~~ addition of the magnitude of the output of both the mask helps to detect edge when compared to threshold

-1	-1	-1
0	0	0
1	1	1

-1	0	1
-1	0	1
-1	0	1

-1	-2	-1
0	0	0
1	2	1

-1	0	1
-2	0	2
-1	0	1