CVIP - 15 (04/11/24)

Lossy Compression

1) LZW ↳ interpixel ↳ Gif/Tiff/PDF

2) Bit Plane Code.

↳ drastic size reduction. ↳ no noise

↳ freq domain compression.

Discrete Cosine Transformation (DCT)

DCT → Quantizer → zigzag → Entropy Enc → Channel/Storage

IDCT ← dequantizer ← reverse zigzag ← Entropy Dec

- Gif/Tiff → LZW
- JPEG → DCT

CVIP - 16 (08/11/24)

Segmentation & edges:

↳ Detection of discontinuities.

↳ point detection mask

-1	-1	-1
-1	8	-1
-1	-1	-1

↳ Line detection mask

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

& Horizontal

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

Vertical

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

$+45^\circ$

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

-45°

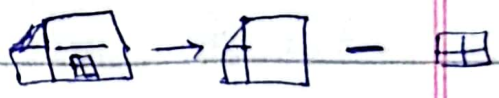
1) Apply filter.

2) threshold for clear results.

Task:

↳ Sample images of ___ book.

apply horizontal, vertical, 45°, -45° masks.

↳ disconnectivity 

↳ 1 pixel disconnectivity may not be inherent disconnectivity.

Morphological Image Processing:

real life: background → white, foreground → black

morphological: bg → black, foreground → white.

↳ Morph. forms or shapes

↳ Ology: study of something.

↳ Morphology: branch of biology that deal

↳ Morphological image processing works on binary image.

(strict) **fit:** Pixels in SE fit an pixel in an image.

(liniant) **hit:** Any pixels in SE covers pixel in an image.

miss: All are missed.

Dilation & Erosion SE

↳ Any size or shape and any value of co-efficient.

↳ usually odd size for center pixel value.

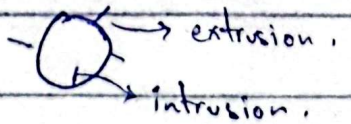
Erode: If SE fits

Dilate: If SE hits. (expands).

Erosion: $t \ominus s$

$$g(x,y) = \begin{cases} 1 & \text{if } s \text{ fits } t \\ 0 & \text{otherwise. (hit + miss)} \end{cases}$$

Input image → negative → morphological op → negative



↳ Erosion can strip away extrusions.

Dilation: $t \oplus s$

$$g(x,y) = \begin{cases} 1 & \text{if } s \text{ hits } t \\ 0 & \text{otherwise (miss only)} \end{cases}$$

When dilation? when there is thin & thick transition.

↳ eg doc image.

↳ thin lines may have disconnectivity, dilation can repair it.

↳ repair intrusions.

↳ enlarge the objects.

Opening:

$$t \circ s = (t \ominus s) \oplus s$$

Closing:

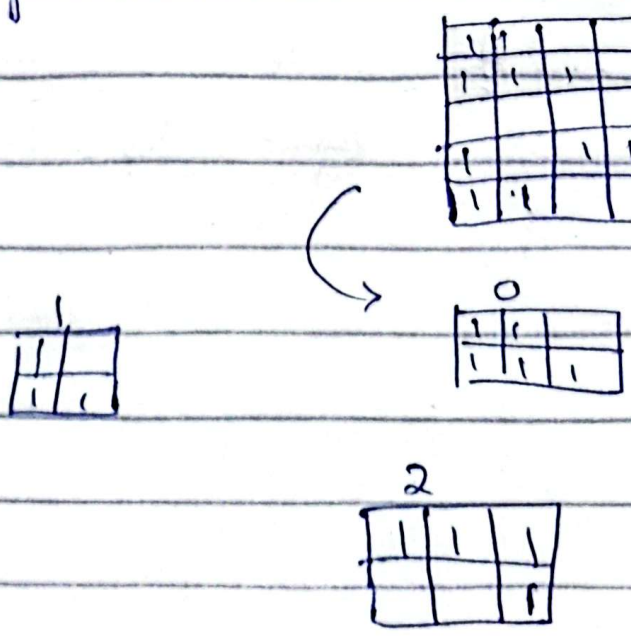
$$t \bullet s = (t \oplus s) \ominus s$$

task:

foreground = 1 bg = 0

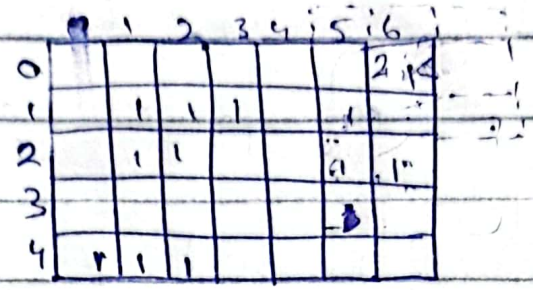
↳ object detection

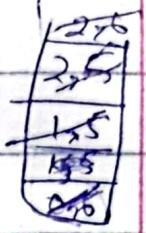
↳ edge detection.



CVIP-17 (11/11/24)

Connected Component Extraction:





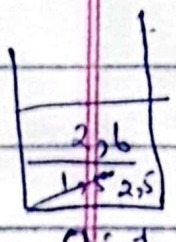
↳ Apply padding to boundary pixel.

1) find first pixel of object.
2) Apply 3x3 window.
3) find all pixels having intensity and position stack. in clockwise or anticlockwise direction.
4) Change color of pixel on which window is applied.
5) put that pixel in point array.
6) if (Stack Not Empty)
7) p = pop from stack.
   if (p color == 1)
   Repeat step 2-6.
}

Struct Point{
int x;
int y;
}
Points = {(3,6)

Raster scan

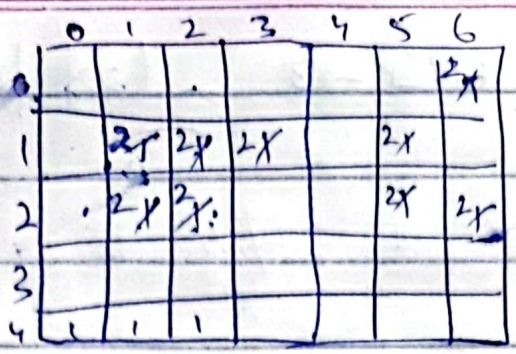
↳ Use points array to form sub image

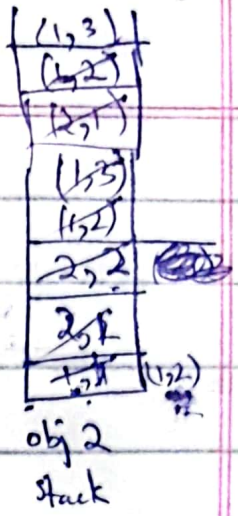


Obj 1 stack

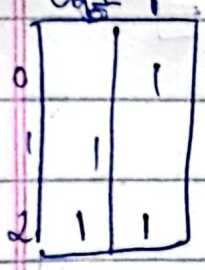
Obj 1 Points = {(0,6),(1,5),(3,6),(2,5)}

(color change after adding neighbours to stack)





Obj2 Points = {(1,1), (2,2), (2,1), (1,2), (1,3)}



(0,6) → (0,1)
(1,5) → (1,0)
(2,6) → (2,6)
(2,5) → (2,1)

MinX = 0
MinY = 5
MaxX = 2
MaxY = 6

Size of sub image:

W = MaxY − MinY + 1
= 6 − 5 + 1
= 2.

H = MaxX − MinX + 1
= 2 − 0 + 1.

Add 1 cause of 0 indexing

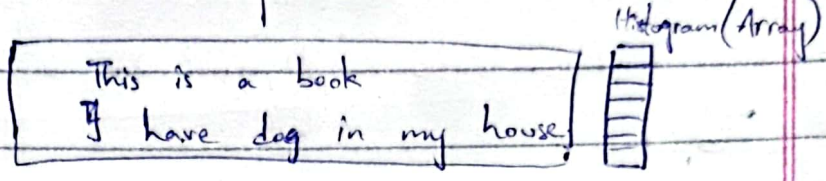
(0,6) (MinX, MinY) → (0,1)

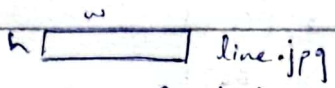
↳ Extract chars from image.

CVIP -18 (22/11/24)

Assignment:

↳ use hand written text/ss to extract cc, lines & words in 3 separate folders.





~~h = end - start + 1~~

```
for (r = s to e)
    for (c = 0 to w)
        line[r-s][c] = I[r][c]
```

⇒ col histogram for separating words.

CNN

Grayscale ⇒ 1D , RGB ⇒ 3D.

CNN models ⇒ Resnet, inception net, image net, mobile net etc.

⇒ CNN also works on text (one hot encoding).

(convolution + pooling) ⇒ pair.

⇒ highest prob is on top of output layer

↳ 'cat' in top 3 also used for acc.

Input → conv+relu → padding → conv+relu → pooling
softmax ← fc layer ← flatten

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

$*$

1	0	1
0	1	0
1	0	1

Feature Map:

4	3	4
2	4	3
2	3	4

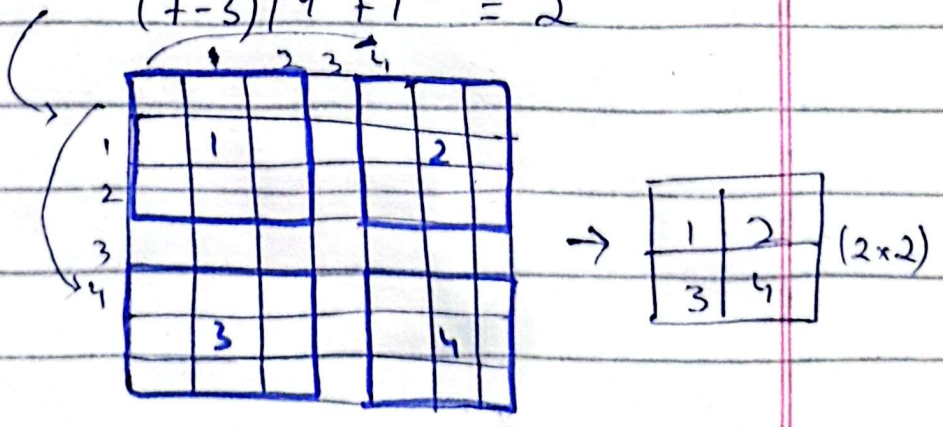
Stride:

↳ sliding window (n-pixels moved).

Feature Map Dimension: $(N-F)/\text{stride} + 1$

$(7-3)/3 + 1 = 2.33$ (not possible)

$(7-3)/4 + 1 = 2$



→

1	2
3	4

(2×2)

Padding:

↳ Artificial padding ⇒ synthetic info.

↳ CNN has valid padding