IUP Lec 3

Image Enhancement

This will enable to enhance certain features in the image so that the result is more suitable than the original image for specific condition

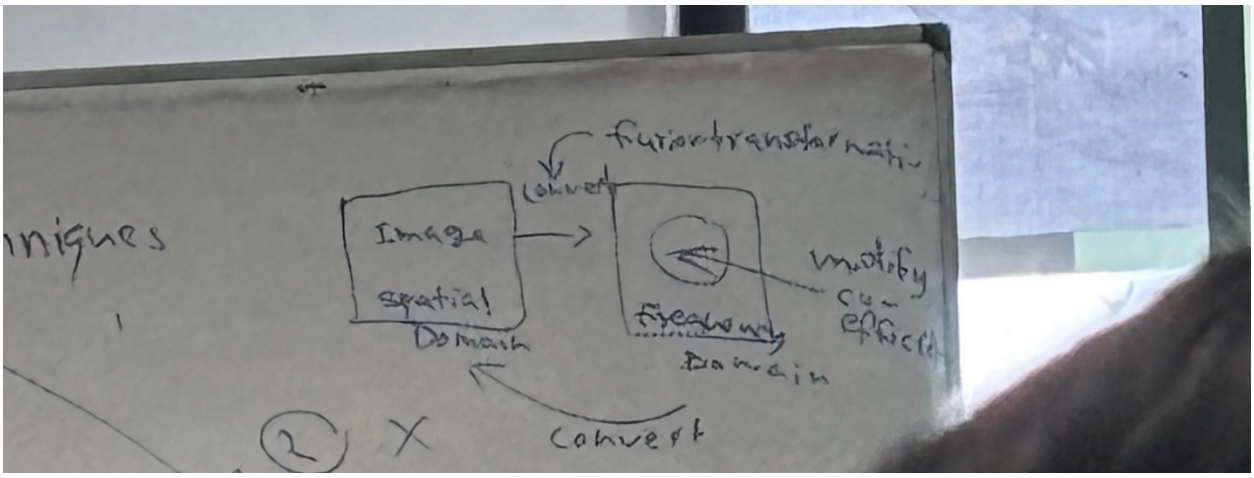
Ex:

- if the noise is there need to use a noise filter
- If the image is dark need to use the contrast enhancement technique

These techniques are problem oriented
Ex
The technique for x ray images may not be suitable for microscope images

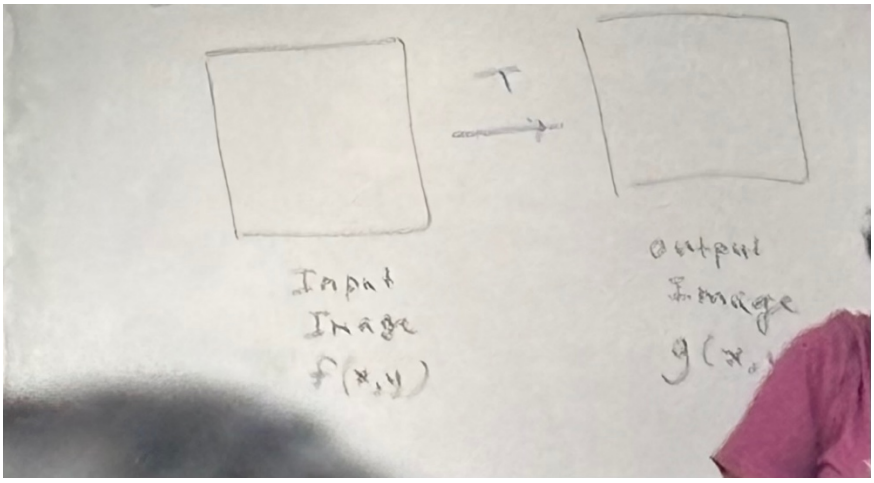
Enhancement technique fall under two categories
spatial domain technique
Frequency domain technique

spatial domain technique	**Frequency domain technique**
Direct manipulation of the pixels.	No direct manipulating instead modifies core values
Works on the. Image plane	



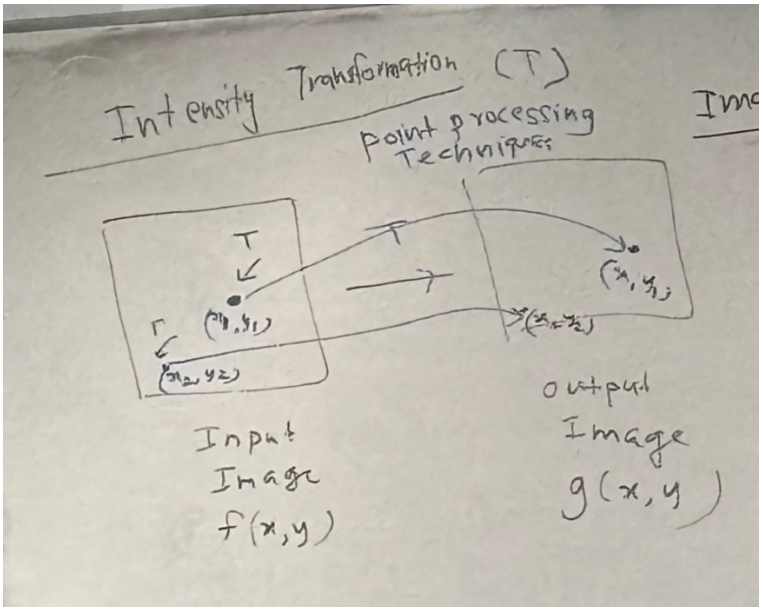
Insensitive transformation [T]

After applying the transformation function for the input image we can get the output image



We track the location using (x,y) and if we apply a change to the relevant x,y it will automatically apply for the output image's same location . we change single point at a time

As a example if we apply for the (x1,y1) location and the output will be converted and it will apply the change to the output's (x1,y1) location.



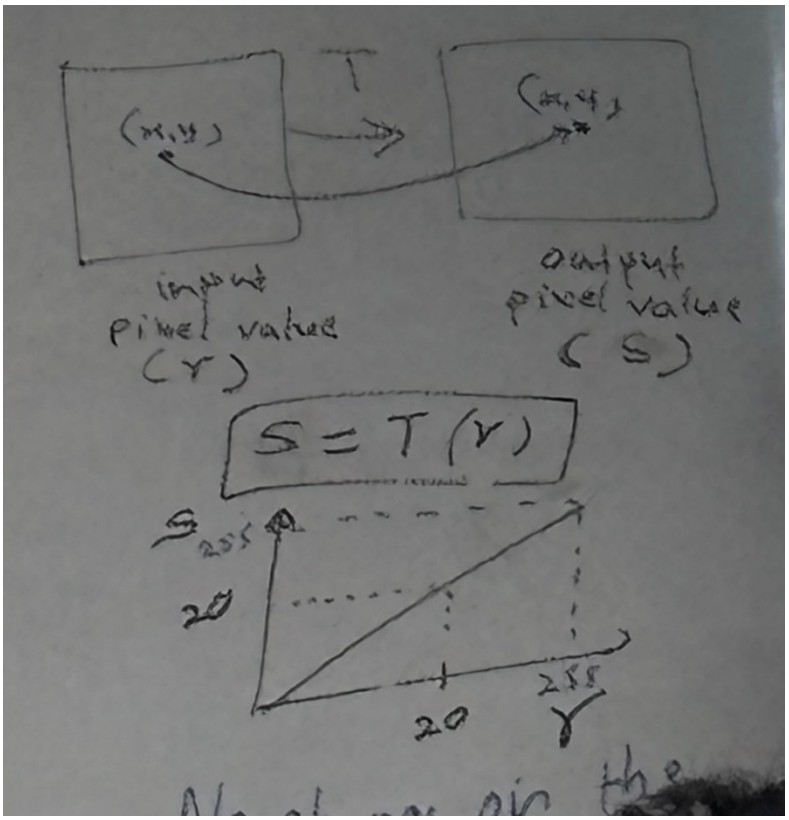
Transformation function types

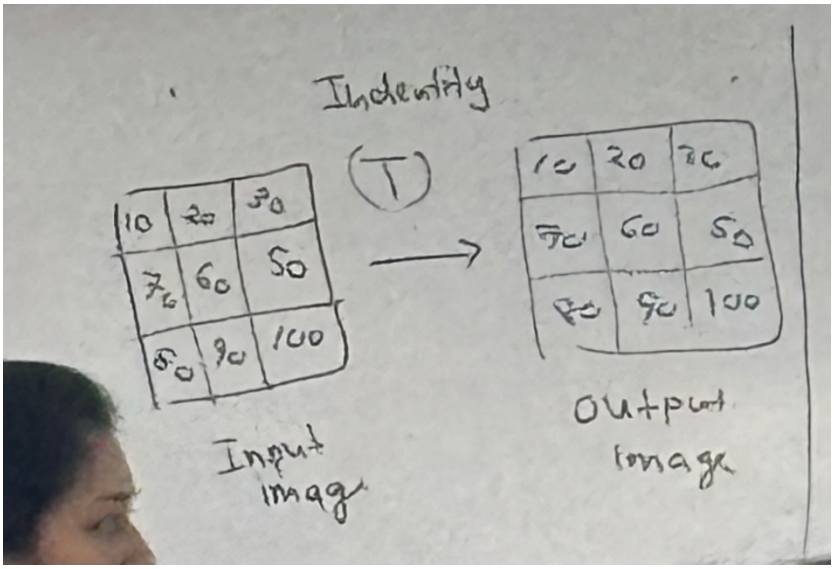
1. Identity Transformation

No changes on the intensity values input and output values will be the same

The graph is like y=mx

S = T(r)

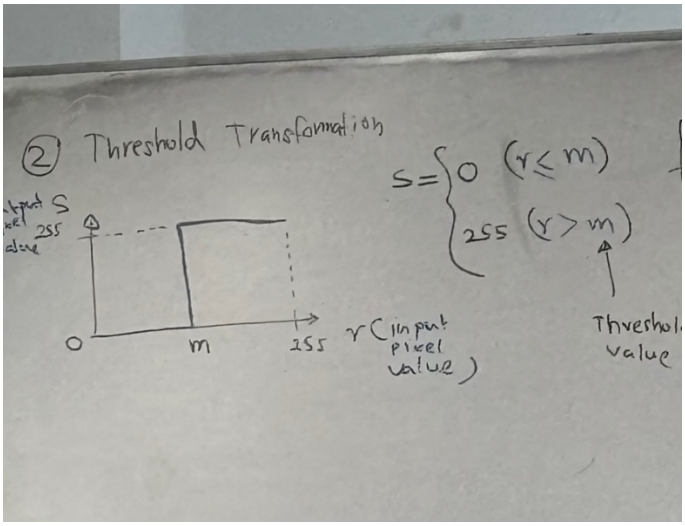


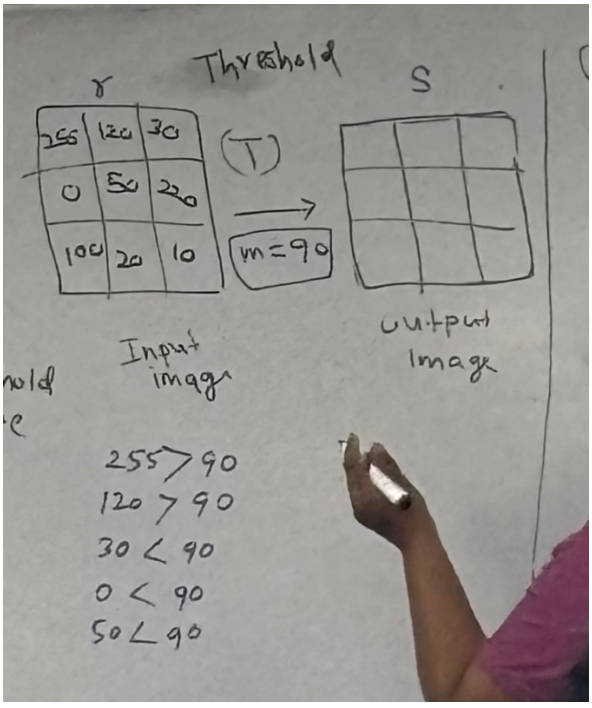


2. Threshold Transformation

we determine the r value according to the given threshold value (m)

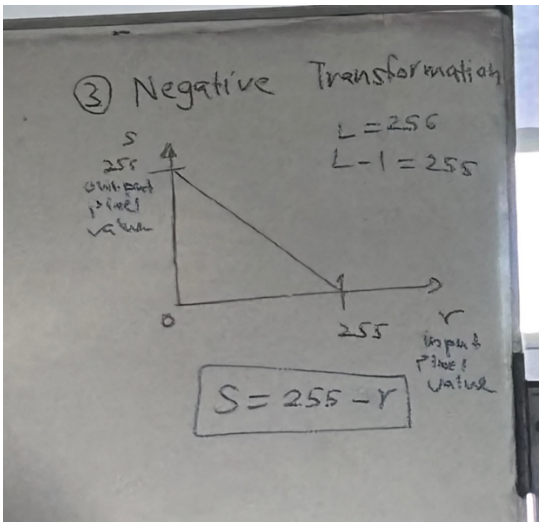
if m is greater than or equal to r the s is 0 . if the m is less than r the s value is 255





So finally we get a binary (black and white) image

3. Negative Transformation

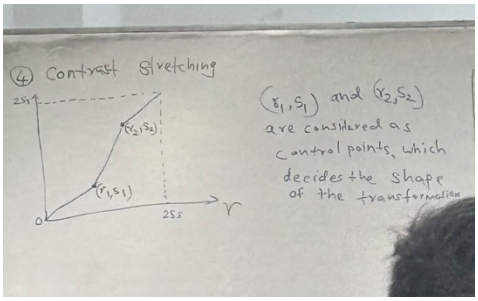


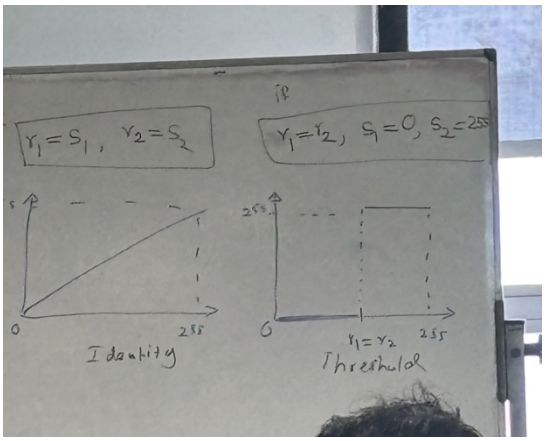
If r = 255, s = 0
If r = 240, s = 15
If r = 230, s = 25
If the intensity values are high, after converting they will be low intensity

If r = 0, s = 255
If r = 20, = 235
If r = 30, = 225
If the intensity values are low, after converting they will be high intensity

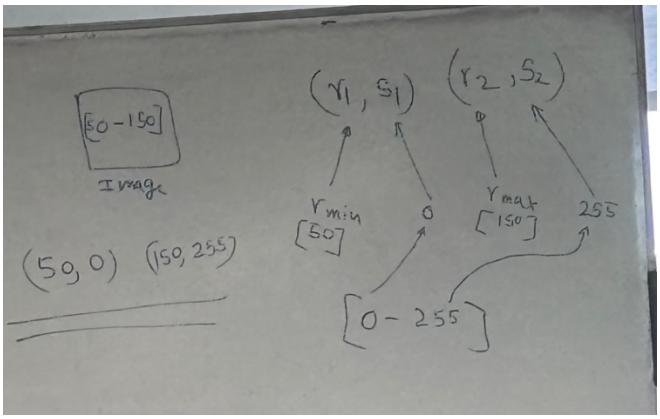
This one is most popular in medical images.

4. Contrast stretching
(video – 1.39)

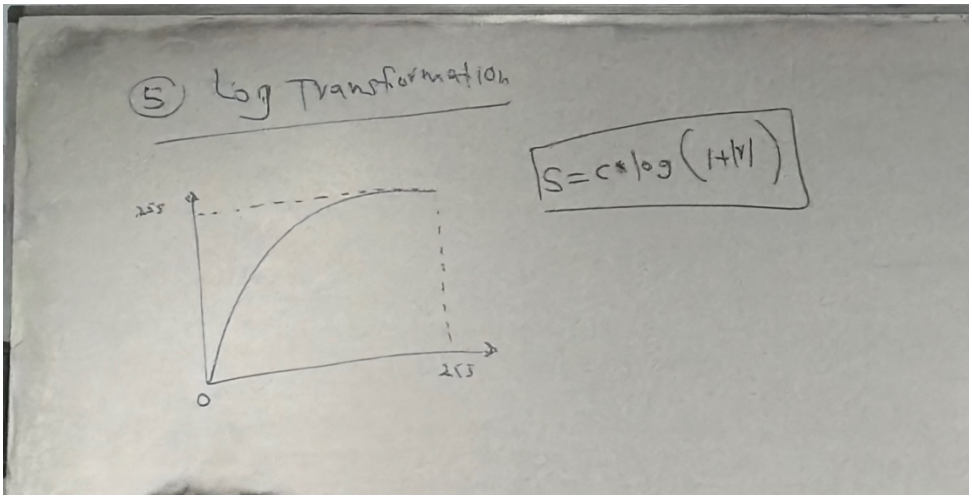




Q - For image with intensity range [50-150] what should (r1, r2) be to increase the dynamic range of the image to [0-255]



5. Log Transformation

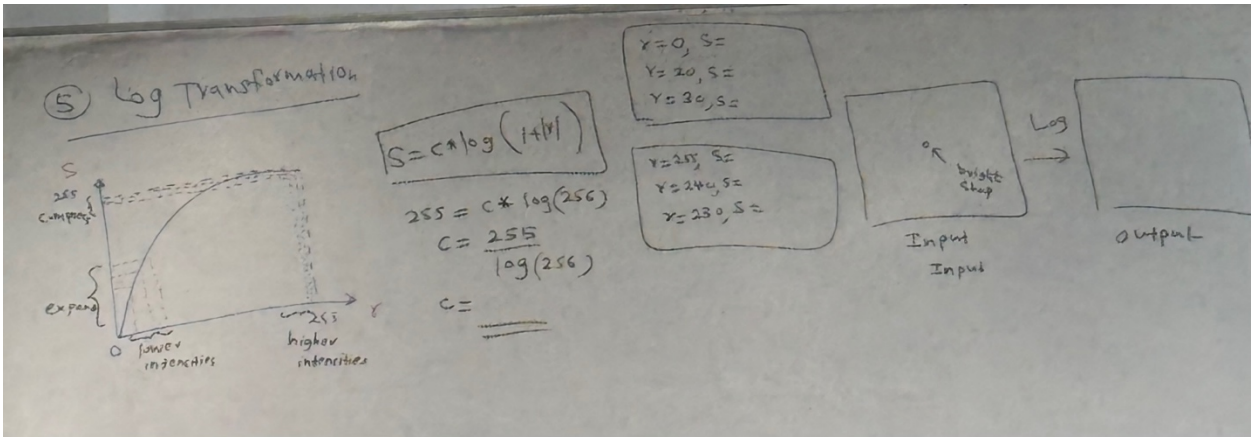


S = c log (1+|r|) c is a constant

Lower intensities will be expanded, intensities will be mapped as a form of expand. (values near 0)

Higher intensities will be mapped a s a form of compressing (values near 255)

True bright will be reduced and the dark details will be not too dark

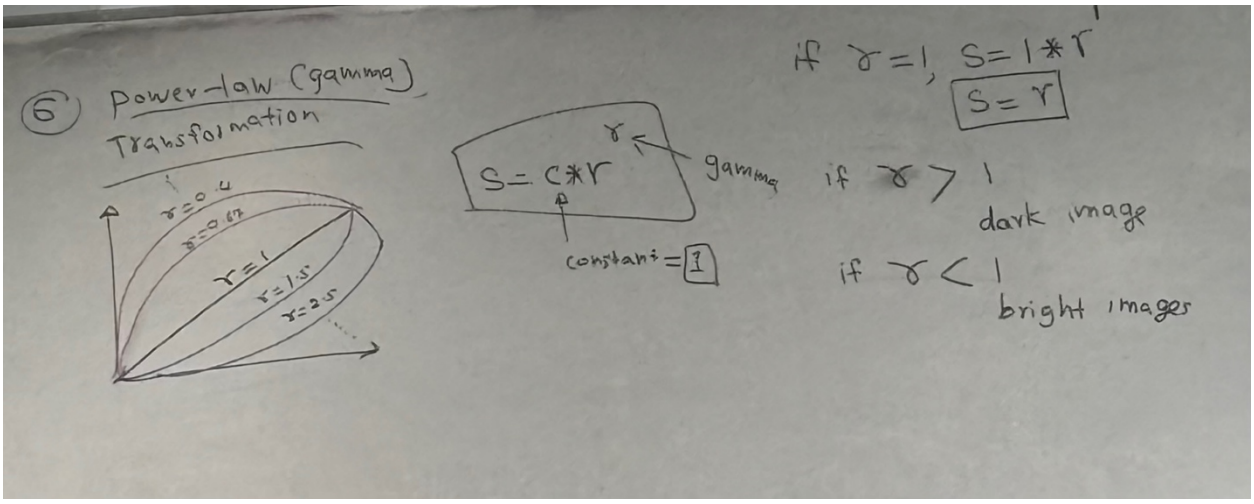


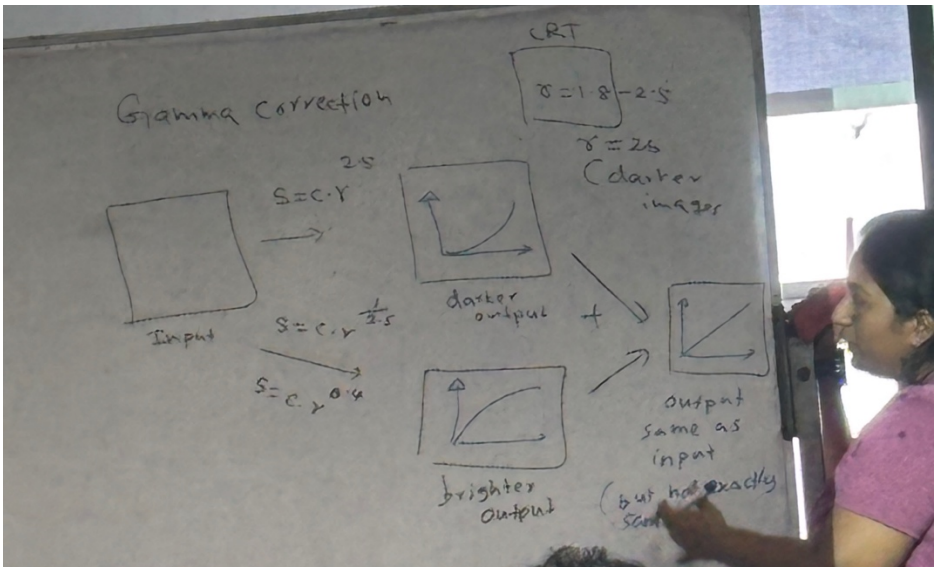
R = 0, S = c log (1+0) = 1
R = 20, s = 140
R = 30, s = 158
Dark details will be brighter

R = 255, s =
R = 240, s =
Bright won't be too dark.

6. power – low (gamma) transformation

We need to consider the gamma value as well. If gamma is greater than 1 it's a dark image . otherwise to obtain bright image gamma must be less than 1.

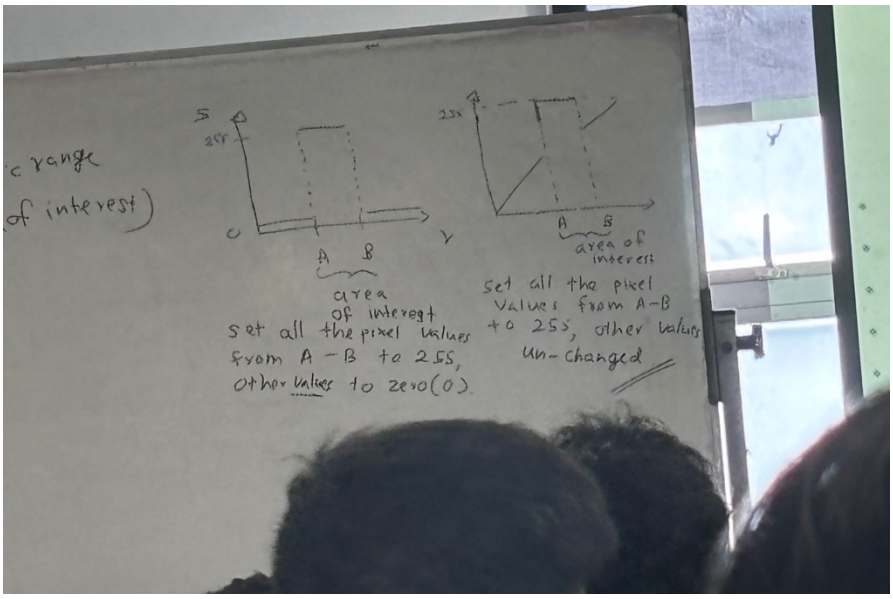




To get more brighter image we combine dark and the light output .

7. Gray – level slicing

Used to highlight specific range of intensity value (area of intereset)


range
of interest)
255
0
A
B
area
of interest
Set all the pixel values
from A - B to 255,
Other values to zero(0).
255
A
B
area of
interest
Set all the pixel
values from A-B
to 255, other values
un-changed