



Department of Computer Engineering
Academic Year 2022-2023

Experiment No. 5

Aim: To implement Image negative, Gray level Slicing and Thresholding

Objective:

1. Convert an Image from RGB to Gray Level Image
2. Apply Image Negative
3. Apply Gray level Slicing(with and without preserving background)
4. Apply Thresholding

Input Specifications:

- Image of size MxN

Theory:

Image Negative

The negative of an image with grey levels in the range $[0, L-1]$ is obtained by the negative transformation given below.

$$s = L - 1 - r.$$

This expression results in reversing of the gray level intensities of the image thereby producing a negative like image. In negative transformation, each value of the input image is subtracted from the $L-1$ and mapped onto the output image. This is particularly useful for enhancing white or gray details embedded in dark regions of an image.

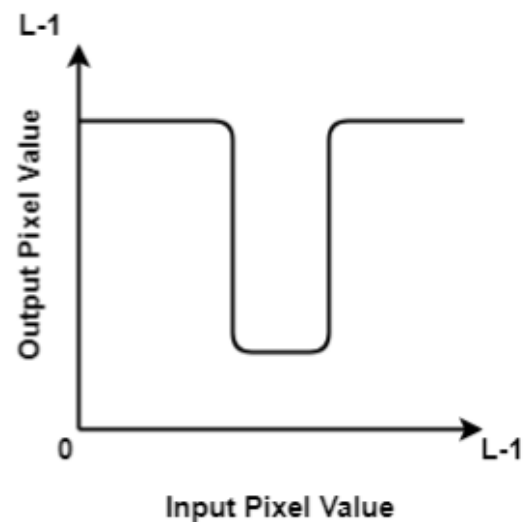
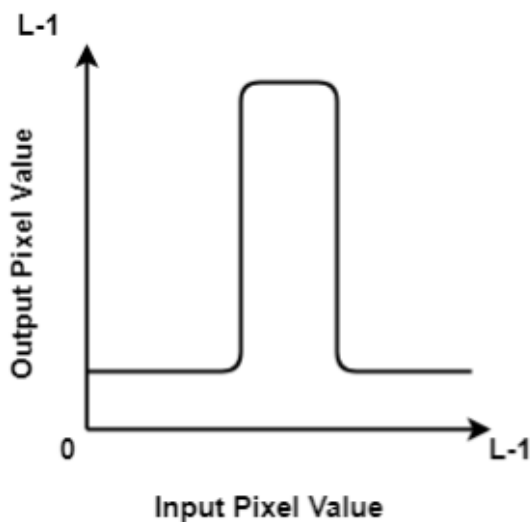
Gray Level Slicing (Intensity Level Slicing)



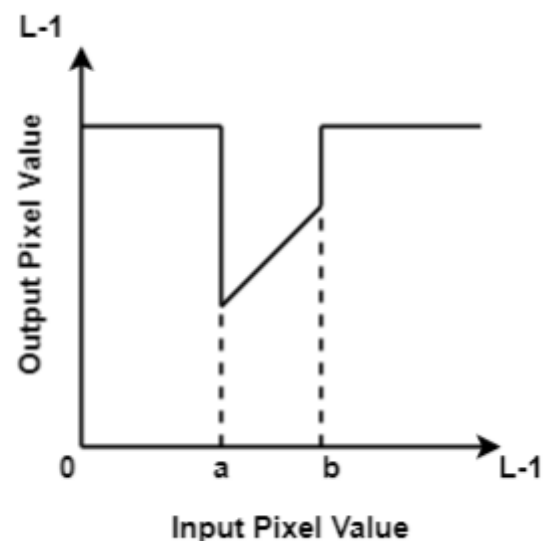
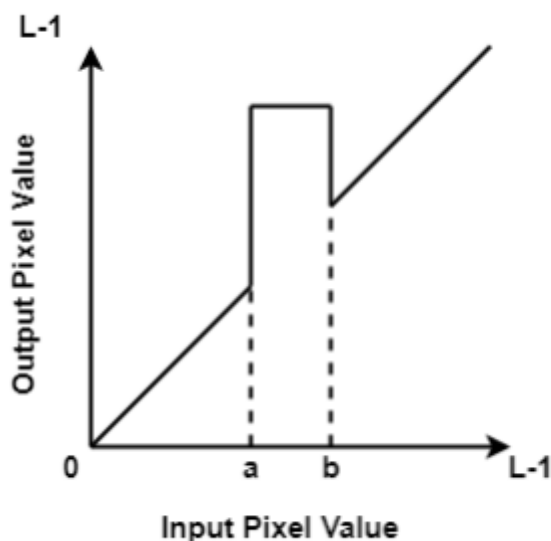
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Intensity level slicing means highlighting a specific range of intensities in an image. In other words, we segment certain gray level regions from the rest of the image.

In the first type, we display the desired range of intensities in white and suppress all other intensities to black or vice versa. This results in a binary image. The transformation function for both the cases is shown below.



In the second type, we brighten or darken the desired range of intensities (a to b as shown below) and leave other intensities unchanged or vice versa. The transformation function for both the cases, first where the desired range is changed and second where it is unchanged, is shown below.





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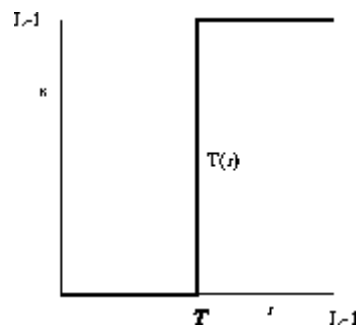
Thresholding

The simplest approach to segment an image is using thresholding.

A simple mapping function is defined by the thresholding operator:

$$s = \begin{cases} 0 & \text{if } r < T \\ L - 1 & \text{if } r > T \end{cases}$$

The corresponding graph is shown below



Problem Definition:

- 1) Take a color image of size MxN
- 2) Convert Color image to Gray Scale Image
- 3) Find the highest range(L-1) of gray level in the range [0, L-1] from the image
- 4) Perform Image Negative.
- 5) Take Threshold values a and b as input.
- 6) Apply gray level slicing with and without preserving the background
- 7) Take Threshold value 'T as input.
- 8) Apply thresholding on input image.



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- 9) Conclude by specifying the applications where these operations can be used

Code:

```
clc;
positiveImage = imread('CameraMan.tif');
negativeImage = 255 - positiveImage;
subplot(2,4,1), imshow(positiveImage)
title('Original Image')
subplot(2,4,5), imshow(negativeImage)
title('Negetive Image')
ThresholdImage = imread('CameraMan.tif');
[row , col] = size(ThresholdImage);
t1 = 50;
for i=1:row-1
    for j=1:col-1
        if ThresholdImage(i,j)<t1
            ThresholdImage(i,j) = 0;
        else
            ThresholdImage(i,j) = 255;
        end
    end
end
subplot(2,4,2), imshow(ThresholdImage)
title(['Threshold of ' , num2str(t1) , ' on Original'])
ThresholdImage2 = imread('CameraMan.tif');
t2 = 180;
for i=1:row-1
    for j=1:col-1
        if ThresholdImage2(i,j)<t2
            ThresholdImage2(i,j) = 0;
        else
            ThresholdImage2(i,j) = 255;
        end
    end
end
subplot(2,4, 6), imshow(ThresholdImage2)
```



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```
title(['Threshold of ' , num2str(t2) , ' on Original'])
% GREY SLICING
g_slice = positiveImage;
[row, col] = size(positiveImage);
a1 = 100;
a2 = 255;
for i=1:row-1
    for j=1:col-1
        if g_slice(i,j)>a1 && g_slice(i,j)<a2
            g_slice(i,j) = 255;
        else
            g_slice(i,j) = 0;
        end
    end
end
subplot(2,4,3)
imshow(g_slice)
title(['Gray Slicing of ', num2str(a1), '-', num2str(a2), ' without
background'])
neg_gslice = negativeImage;
for i=1:row-1
    for j=1:col-1
        if neg_gslice(i,j)>a1 && neg_gslice(i,j)<a2
            neg_gslice(i,j) = 255;
        else
            neg_gslice(i,j) = 0;
        end
    end
end
subplot(2,4,7)
imshow(neg_gslice)
title(['Neg Gray Slicing of ', num2str(a1), '-', num2str(a2), ' without
bg'])
% GRAY SCLICING WITH BACKGROUND
g_slice2 = positiveImage;
a3=120;
a4=150;
```



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```
for i=1:row-1
    for j=1:col-1
        if g_slice2(i,j)>a3 && g_slice2(i,j)<a4
            g_slice2(i,j) = 255;
        else
            g_slice2(i,j) = positiveImage(i,j);
        end
    end
end
subplot(2,4,4)
imshow(g_slice2)
title(['Gray Slicing of ', num2str(a3), '-', num2str(a4), ' with
background'])
neg_g2 = negativeImage;
for i=1:row-1
    for j=1:col-1
        if neg_g2(i,j)>a3 && neg_g2(i,j)<a4
            neg_g2(i,j) = 255;
        else
            neg_g2(i,j) = negativeImage(i,j);
        end
    end
end
subplot(2,4,8)
imshow(neg_g2)
title(['Neg Gray Slicing of ', num2str(a3), '-', num2str(a4), ' with bg'])
```



Shri Vile Parle Kelavani Mandal's

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(Autonomous College Affiliated to the University of Mumbai)

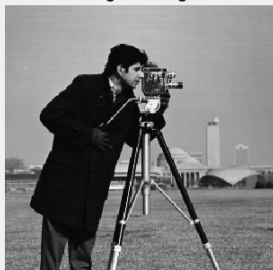
NAAC Accredited with "A" Grade (CGPA : 3.18)



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Output:

Original Image



Threshold of 50 on Original



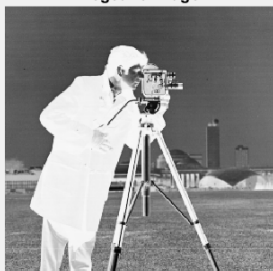
Gray Slicing of 100-255 without background



Gray Slicing of 120-150 with background



Negative Image



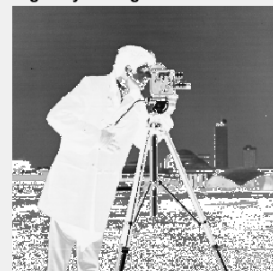
Threshold of 180 on Original



Neg Gray Slicing of 100-255 without bg



Neg Gray Slicing of 120-150 with bg



Conclusion:

In this experiment, we explored image processing in matlab. We converted images to negative versions, modified pixels based on a threshold, and performed gray slicing of images based on a user-defined threshold.

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