Image Enhancement-Point Processing Operations

Aim:- To perform point processing operations like digital negative, Contrast stretching, Thresholding, Intensity level slicing on an image.

Theory:-

Image Operations

• Classification of Image Operations

- Spatial domain methods
* Point Processing Transformations
* Area/Mask Processing Transformations

Point Processing Methods

- The most primitive, yet essential, image processing operations.
- Intensity transformations that convert an old pixel into a new pixel based on some Pre-defined function.
- They operate on a pixel based solely on that pixel's value.
- Used primarily for *contrast enhancement*.

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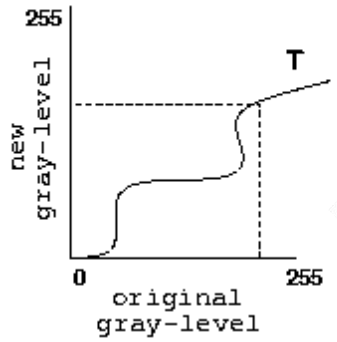
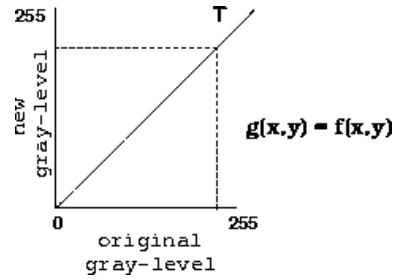
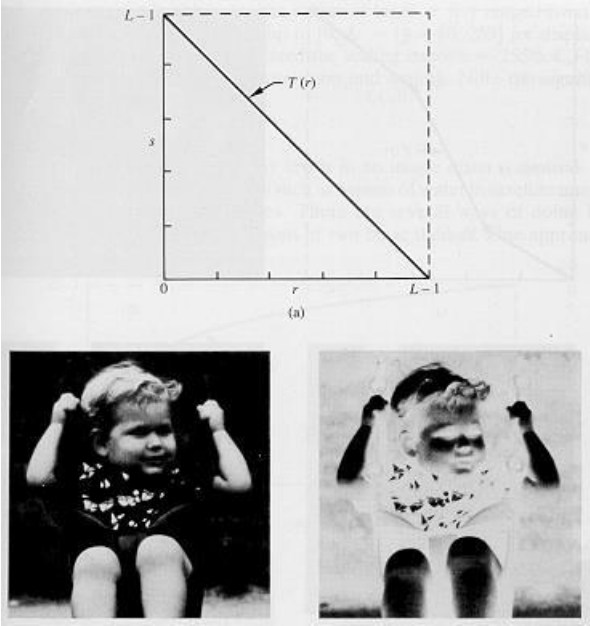


• Identity Transformation



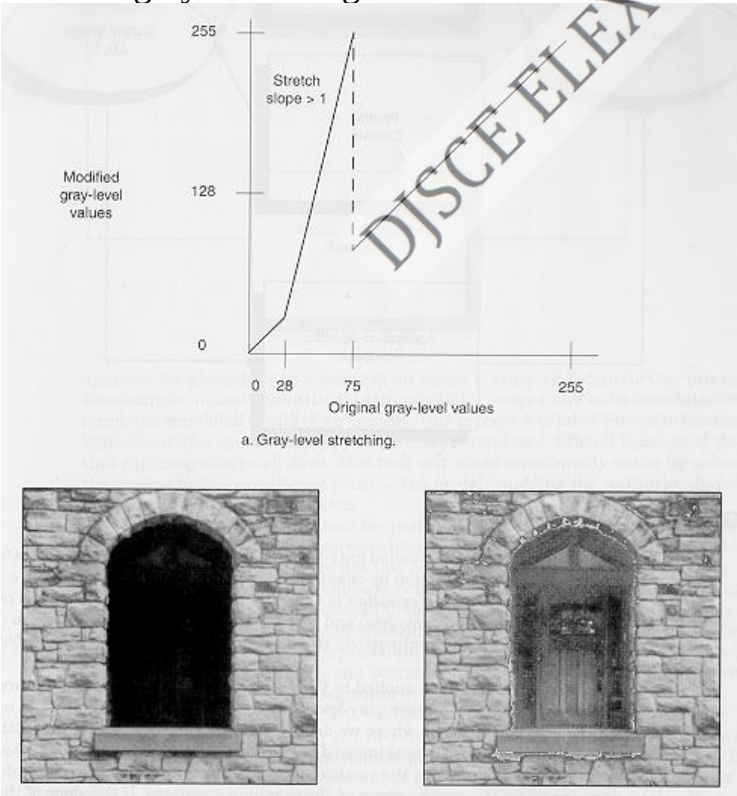
Negative Transformation

$O(r, c) = 255 - I(r, c)$



• Contrast Stretching/Compression

- Stretch gray-level ranges where we desire more information.



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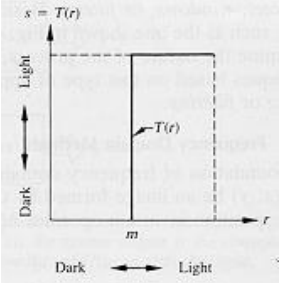
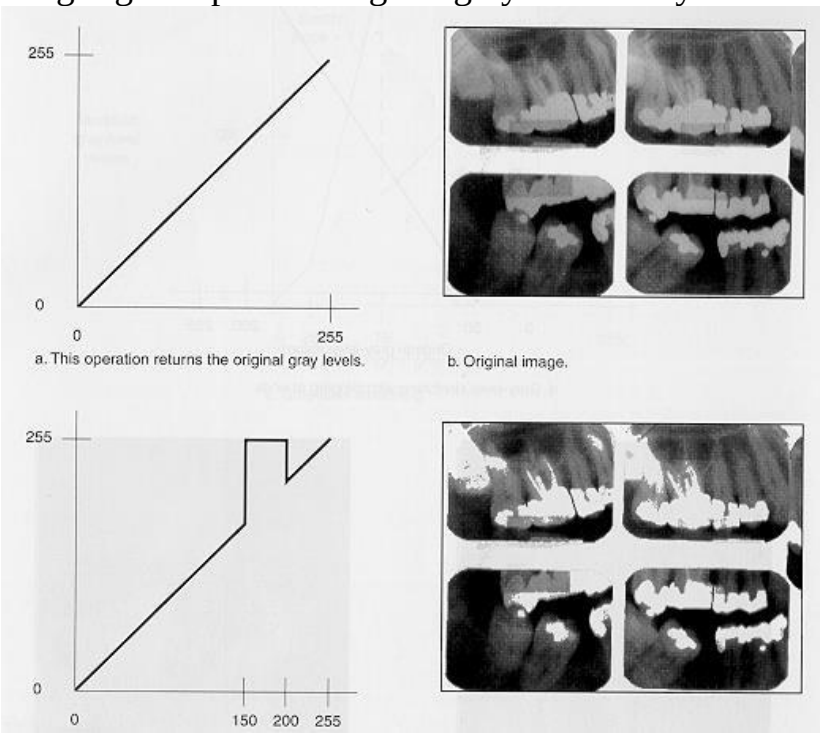
Thresholding



Intensity-Level Slicing

- Highlight a specific range of gray-levels only.



Implementation Instructions: -

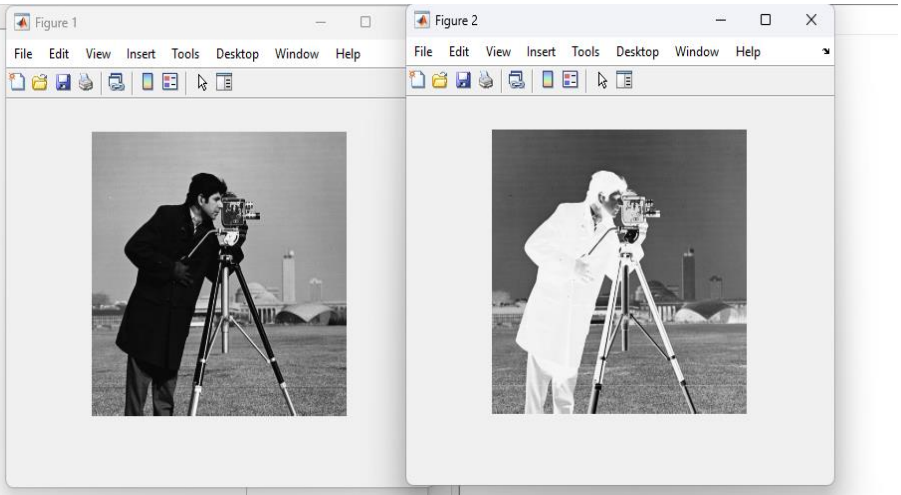
Read any gray scale image stored in computer & perform point processing operations on it like digital negative, contrast stretching, thresholding, intensity level slicing using corresponding transformation function & observe the enhanced image. (Do not use direct Matlab/Python functions).

CODE AND OUTPUT:

A) Negative Transformation

exp1a_dip.m

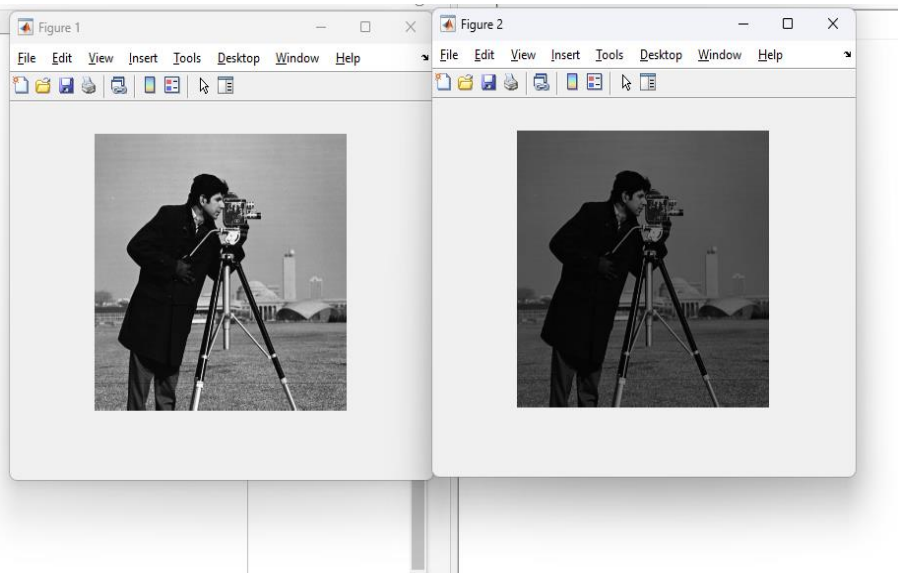
```
%point process(negative transofrmation)
%Shobha Gupta - 60001200094
%Krisha Lakhani- 60001200097
a = imread ('cameraman.tif');
[r c] = size(a);
figure(1);
imshow(a);
b = 255-a;
figure(2);
imshow(b);
```



B) Contrast Stretching

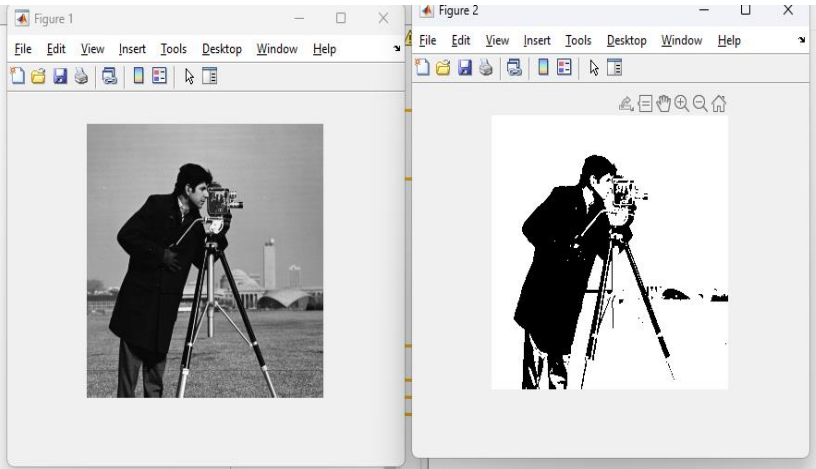
exp1a_dip.m exp1b_dip.m

```
%contrast stretching
%Shobha Gupta - 60001200094
%Krisha Lakhani- 60001200097
close all;
r = imread ('cameraman.tif');

r1 = 50;
r2 = 100;
s1 = 25;
s2 = 200;

m1 = s1/r1 ;
m2 = (s2-s1)/(r2 - r1);
m3 = (255-s2)/(255-r2);

if 0<r<r1
   s = m1*r;
elseif r1<r<r2
    s = m2(r-r1)+s1;
else r2<r<255
    s = m3(r-r2)+s2;
end

figure(1);
imshow(r);
figure(2);
imshow(s);
```



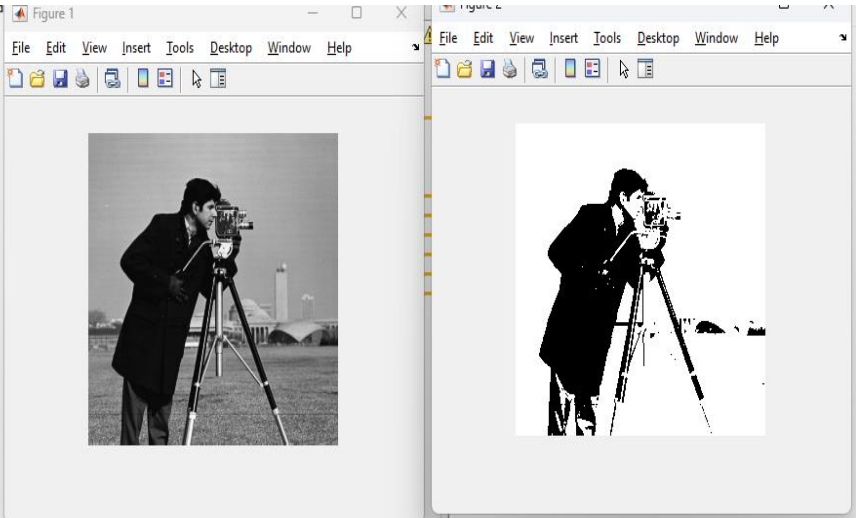
C) Clipping

```
%clipping(removing noise)
%Shobha Gupta - 60001200094
%Krisha Lakhani- 60001200097
clear all;
close all;
clc;
a = imread ('cameraman.tif');
[r c] = size(a);
r1 = 50;
r2 = 100;
s1 = 0;
s2 = 255;

m = 255/(r2 - r1);
 for i=1:r
     for j = 1:c
if 0<a(i,j) && a(i,j)<r1
   s(i,j) = 0;
elseif r1<a(i,j) && a(i,j)<r2
    s(i,j) = m*(a(i,j));
else r2<a(i,j)<255
    s(i,j) = 255;
end
     end
 end
figure(1);
imshow(a);
figure(2);
imshow(uint8(s));
```

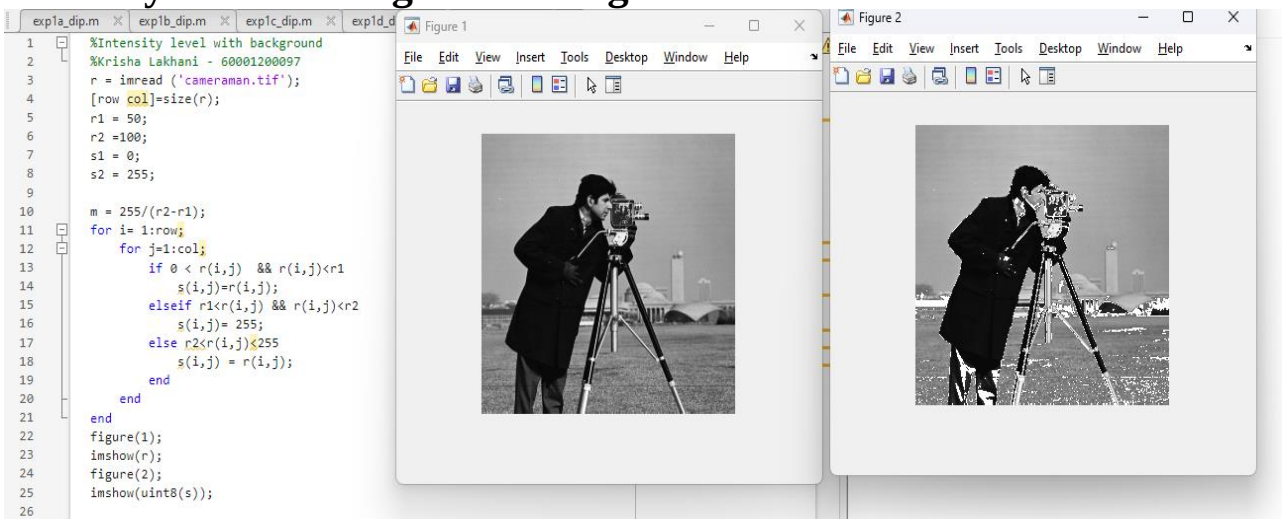


D) Thresholding

```
%thresholding(converts to binary)
%Krisha Lakhani-60001200097
r = imread ('cameraman.tif');
[row col]=size(r);
L=255;
rth=50;

for i= 1:row;
    for j=1:col;
        if r(i,j)<= rth;
            s(i,j)=0;
        else rth< r(i,j) && r(i,j)<255
            s(i,j)=L;

       end
    end
end

figure(1);
imshow(r);
figure(2);
imshow(s);
```

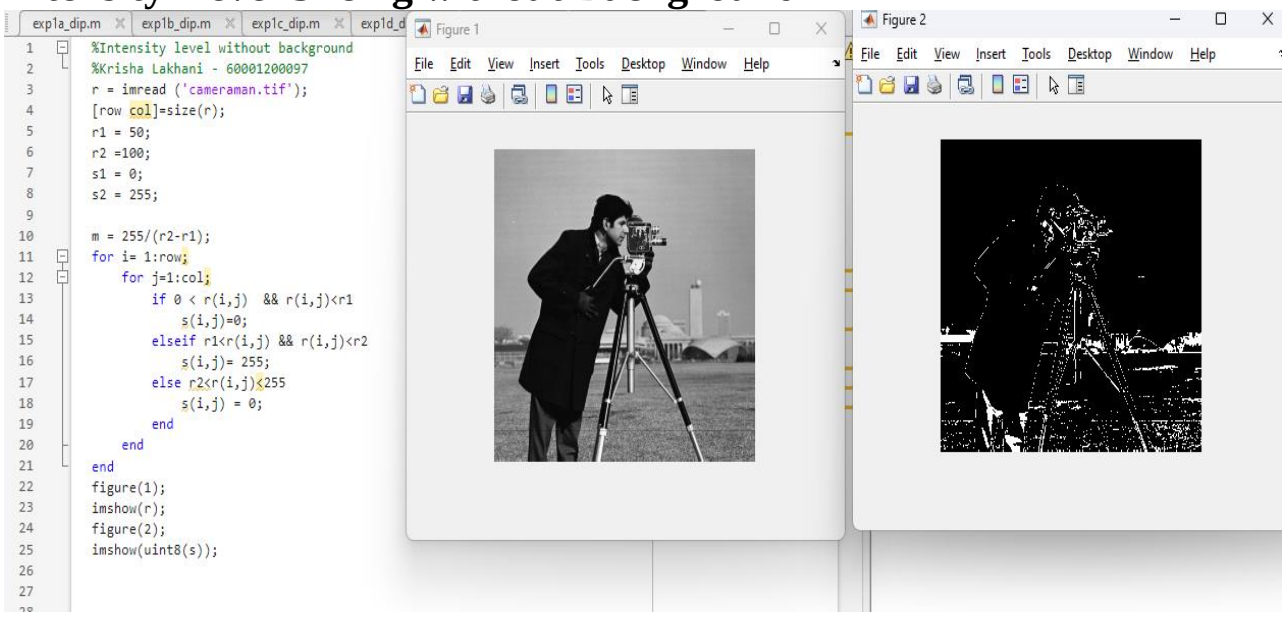


E) Intensity-Level Slicing with Background



```
%Intensity level with background
%Krisha Lakhani - 60001200097
r = imread ('cameraman.tif');
[row col]=size(r);
r1 = 50;
r2 =100;
s1 = 0;
s2 = 255;

m = 255/(r2-r1);
for i= 1:row;
    for j=1:col;
        if 0 < r(i,j)  && r(i,j)<r1
            s(i,j)=r(i,j);
        elseif r1<r(i,j) && r(i,j)<r2
            s(i,j)= 255;
        else r2<r(i,j)<255
            s(i,j) = r(i,j);
        end
    end
end
figure(1);
imshow(r);
figure(2);
imshow(uint8(s));
```

F) Intensity-Level Slicing without Background



```
%Intensity level without background
%Krisha Lakhani - 60001200097
r = imread ('cameraman.tif');
[row col]=size(r);
r1 = 50;
r2 =100;
s1 = 0;
s2 = 255;

m = 255/(r2-r1);
for i= 1:row;
    for j=1:col;
        if 0 < r(i,j)  && r(i,j)<r1
            s(i,j)=0;
        elseif r1<r(i,j) && r(i,j)<r2
            s(i,j)= 255;
        else r2<r(i,j)<255
            s(i,j) = 0;
        end
    end
end
figure(1);
imshow(r);
figure(2);
imshow(uint8(s));
```

Conclusion:

In conclusion, I have successfully applied various point processing operations to manipulate and enhance the image's visual characteristics and quality.