

IP Lab02

Jainil Trivedi(B4) (CE171)

AIM: Implement basic intensity transformation functions –

- ⇒ Image Negatives
- ⇒ Log Transformations
- ⇒ Power-Law (Gamma) Transformations
- ⇒ Contrast Stretching (Piecewise Linear transformation)

1. Take your own grayscale photo and apply negative transformation.

```
me = imread('me.png');  
subplot(1,3,1)  
imshow(me);
```

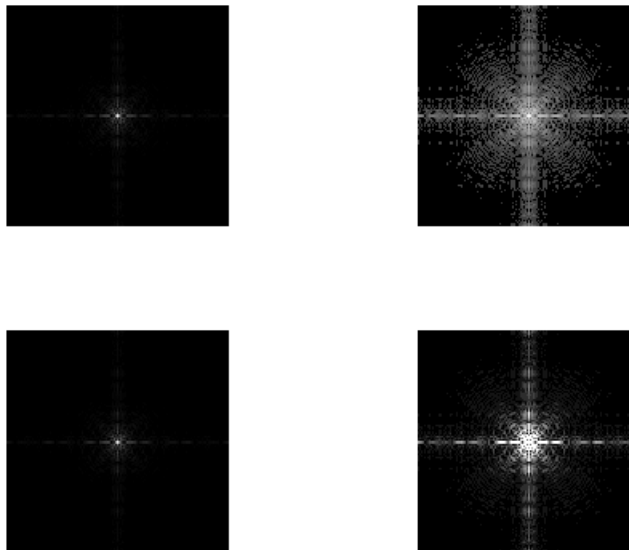
```
me_gray = rgb2gray(me);  
subplot(1,3,2);  
imshow(me_gray);
```

```
negative  
negative = 255-me_gray;  
subplot(1,3,3);  
imshow(negative);
```



2. Consider image `ex_log.tif`. Enhance the image by applying log transformation.

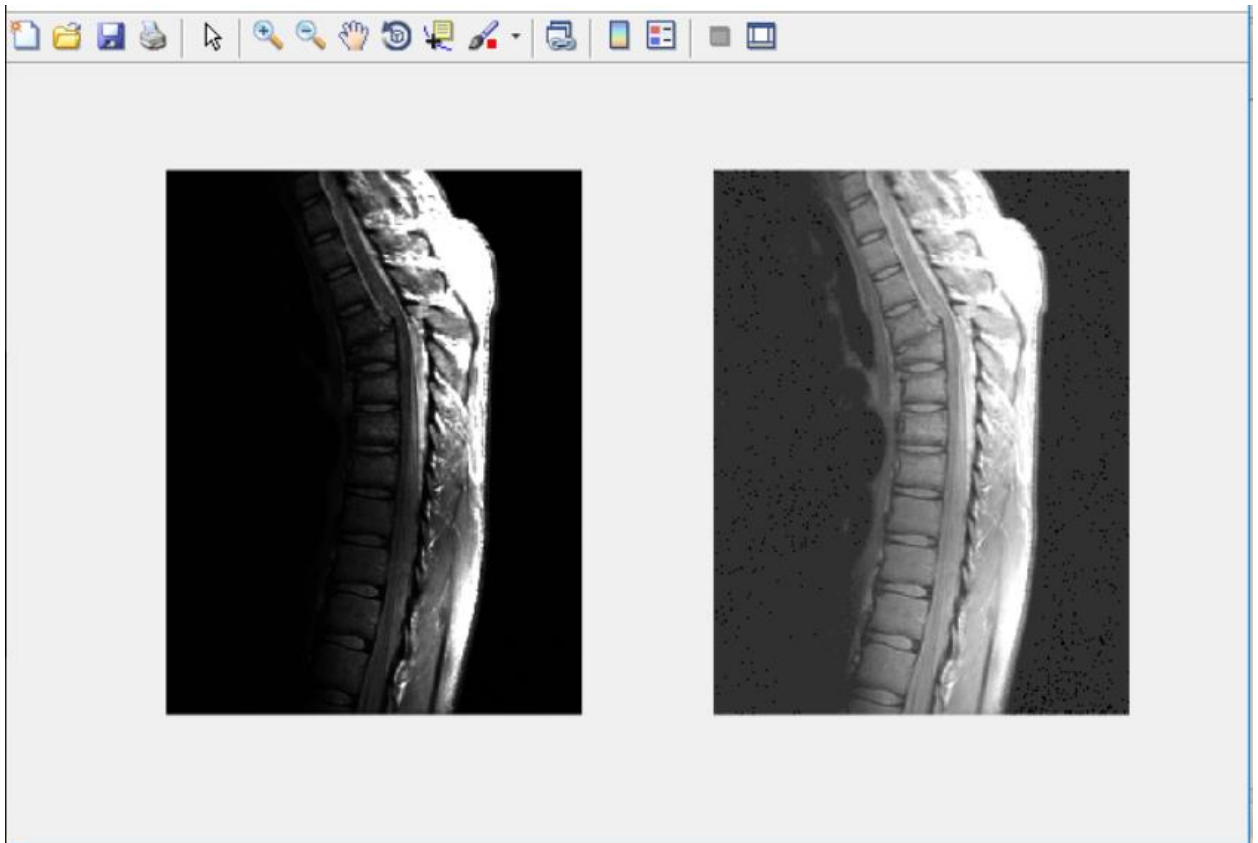
```
img = imread('ex_log.tif');  
subplot(2,2,1);  
imshow(img);  
double_img = double(img);  
double_log_transform = log(1+double_img);  
subplot(2,2,2);  
imshow(double_log_transform,[]);  
img2 = im2double(img);  
subplot(2,2,3);  
imshow(img2);  
log_transform = 8*log(img2+1);  
subplot(2,2,4);  
imshow(log_transform);
```



3. Consider images `ex_power1.tif` and `ex_power2.tif` and enhance them with power law transformation.

```
to_brighten = imread('ex_power1.tif');  
subplot(1,2,1);  
imshow(to_brighten);
```

```
to_brighten_double = double(to_brighten);  
to_brighten_power_law = power(to_brighten_double,0.3);  
subplot(1,2,2);  
imshow(to_brighten_power_law,[]);
```



```
img_p2 = imread('ex_power2.tif');  
subplot(1,2,1);  
imshow(img_p2);
```

```
img_p2_d = double(img_p2);  
img_p2_dark = power(img_p2_d,3);  
subplot(1,2,2);  
imshow(img_p2_dark,[]);
```



4. Consider your over exposed photo (that you generated for assignment 1) and enhance it by power law transformation. Specify the value of gamma which is suitable for this enhancement.

```
subplot(1,3,1);
imshow(me_gray);
me_oe = me_gray-100;
subplot(1,3,2);
imshow(me_oe);
```

```
me_oe_d = double(me_oe);
me_oe_power_law = power(me_oe_d,0.25);
subplot(1,3,3);
imshow(me_oe_power_law,[]);
```

$\gamma = 0.25$



5. Consider your under exposed photo (that you generated for assignment 1) and enhance it by power law transformation. Specify the value of gamma which is suitable for this enhancement.

```
subplot(1,3,1);
imshow(me_gray);
me_ue = me_gray+100;
subplot(1,3,2);
imshow(me_ue);

me_ue_d = double(me_ue);
me_ue_power_law = power(me_ue_d,2.3);
subplot(1,3,3);
imshow(me_ue_power_law,[]);
```

Gamma = 2.3



6.

Contrast Stretching (Example) : A 3×3 8 bits/pixel image is given by

7	12	8
16	9	6
10	15	1

Apply contrast stretch to the image so that the new image has a dynamic range of $[0, 255]$. Also show the output image. Sketch the transformation you used for contrast stretching.

```

A = [
    7,12,8;
    16,9,6;
    10,15,1;
    ];
rmax = max(max(A));
rmin= min(min(A));
smax=255;
smin=0;
S = ((smax-smin)/(rmax-rmin))*(A-rmin)+smin;
A
S

```

```

A =

     7     12     8
    16     9     6
    10     15     1

S =

   102   187   119
   255   136    85
   153   238     0

```

7. Do contrast stretching for the image ex_contrast.tif. Obtain contrast stretched image from low contrast image and apply thresholding.

```

img = imread('ex_contrast.tif');
subplot(1,3,1);
imshow(img);

%contrast stretching
rmax=max(max(img));
rmin=min(min(img));
rmin = double(rmin);

smax=255;
smin=70;
S = double(((smax-smin)/(rmax-rmin))*((img-rmin))+smin;
subplot(1,3,2);
imshow(S);

```

```

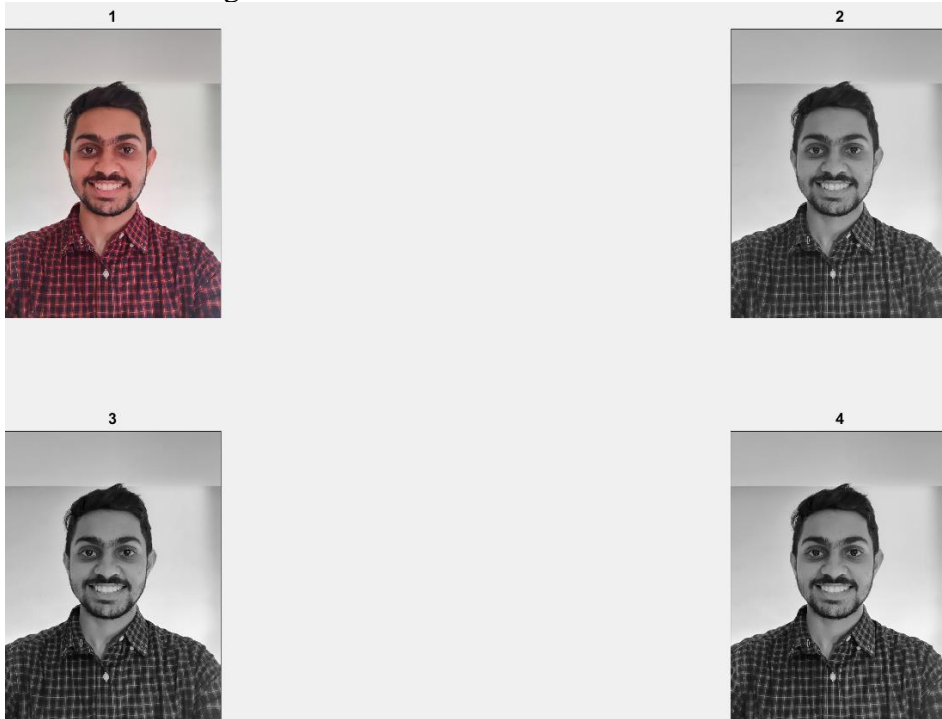
%thresholding if >=mean 1 else 0
s=double(S);
threshold = mean(mean(s));
[r,c] = size(s);
img2 = zeros(r,c);
for i=1:r
    for j=1:c
        if(s(i,j) >= threshold)
            img2(i,j)=1;
        else
            img2(i,j)=0;
        end
    end
end

subplot(1,3,3);
imshow(img2);

```



8. Take any photo of yours –
- convert it to gray scale,
 - create a function that would decrease the contrast of this image.
 - enhance the contrast of that image using piecewise linear operation for contrast stretching.



- 1) Original
- 2) Gray scale
- 3) Contrast stretching
- 4) Piecewise linear

```
me = imread('ME.png');  
subplot(2,2,1);  
imshow(me);  
title('1');  
meg = rgb2gray(me);  
subplot(2,2,2);  
imshow(meg);  
title('2');
```

% function defination at the end of the file/script

```
s = decreaseContrast(meg);  
subplot(2,2,3);  
imshow(s,[]);  
title('3');  
%piece wise linear operation  
m1=[];  
m2=[];
```



```
m3=[];
```

```
smin2=0;  
smax2=110;  
smin3=111;  
smax3=160;  
smin4=161;  
smax4=255;
```

```
s=double(s);  
[r,c]=size(s);  
for i=1:r  
    for j=1:c  
        if s(i,j) <=smax2  
            m1(end+1)=s(i,j);  
        elseif s(i,j)>smax2 && s(i,j) <=smax3  
            m2(end+1)=s(i,j);  
        else  
            m3(end+1)=s(i,j);  
        end  
    end  
end
```

```
rmin1=min(min(m1));  
rmax1=max(max(m1));
```

```
rmin2=min(min(m2));  
rmax2=max(max(m2));
```

```
rmin3 =min(min(m3));  
rmax3=max(max(m3));
```

```
final = [];
```

```
for i=1:r  
    for j=1:c  
        if s(i,j)<=smax2  
            final(i,j)=((smax2-smin2)/(rmax1-rmin1))*((s(i,j))-rmin1)+smin2;  
%            if 1==1 && j==1  
%                s(i,j)  
%            end  
        elseif s(i,j)>smax2 && s(i,j)<=smax3  
            final(i,j)= ((smax3-smin3)/(rmax2-rmin2))*((s(i,j))-rmin2)+smin3;  
        else  
            final(i,j)= ((smax4-smin4)/(rmax3-rmin3))*((s(i,j))-rmin3)+smin4;
```

```
    end  
  end  
end
```

```
subplot(2,2,4);  
imshow(final,[]);  
title('4');  
function s = decreaseContrast(meg)  
%     smax=255;  
%     smin=70;  
    rmax=max(max(meg));  
    rmin=min(min(meg));  
    smax = max(max(meg));  
    smin=min(min(meg));  
  
    s = double(((smax-smin)/(rmax-rmin))*((meg-rmin))+smin;  
end
```