LAB 4

AIM: Implement following Image Enhancement Techniques –

- **Intensity Level Slicing**
- **Bit Plane Slicing & Reconstruction**
- **Histogram Equalization**

1. Take your own photo and separate out its bit planes.

a. Reconstruct your image using higher order 2 bit planes.

b. Reconstruct your image using higher order 4 bit planes.

c. Experiment with the bit planes and derive your conclusions.

lab41.m

```
clc;
A = imread('tiger.jpg');
subplot(3,3,1);
imshow(A);
title('Original Image');
A = double(A);
for i=1:1:8
 B=bitget(A,i);
 subplot(3,3,i+1);
 imshow(B);
 title(sprintf('Bit %d',i));
end
%reconstruct
R=bitget(A,8);
B=bitget(A,7);
R=power(2,7)*R+B;
figure,imshow(R);
title(sprintf('Reconstruct from bit 7 to 8'));
R=bitget(A,8);
for i=7:-1:4
 B=bitget(A,i);
 R=power(2,i-1)*R+B;
end
figure,imshow(R);
title(sprintf('Reconstruct from bit 4 to 8'));
```

Figure 1 × Figure 2 × Figure 3 ×

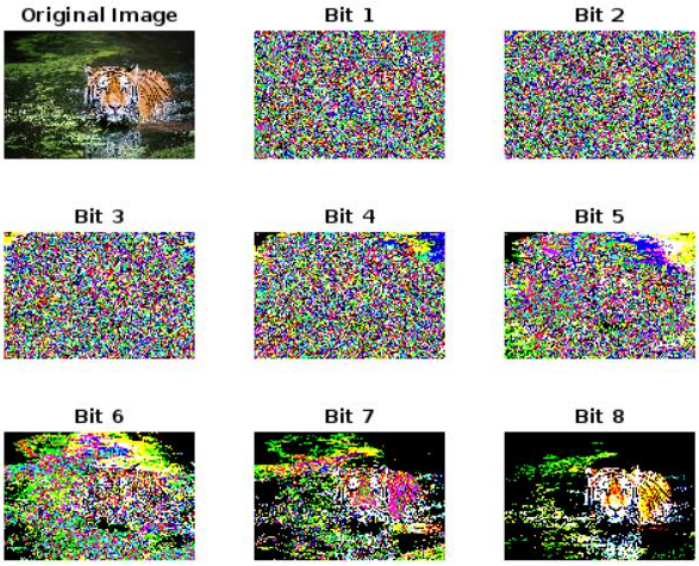


Figure 1 × Figure 2 × Figure 3 ×

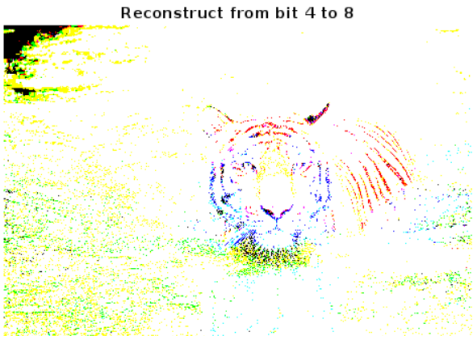


Figure 1 × Figure 2 × Figure 3 ×

2. Consider the image kidney.tif and perform intensity level slicing transformation within the range (150 – 230)

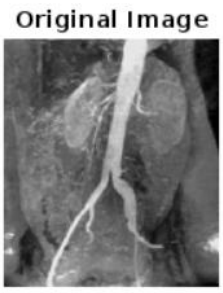
a. Highlight the given intensity range and keep all other intensities to a lower level.

b. Highlight the given intensity range and keep all other intensities as it is.

lab41.m | lab42.m

```
A=imread('kidney.tif');
subplot(2,1,1);
imshow(A);
title('Original Image');
[M,N]=size(A);
r1=150;
r2=230;
for i=1:1:M
 for j=1:1:N
 if(A(i,j)>=r1 && A(i,j)<=r2)
 B(i,j)=255;
 else
 B(i,j)=A(i,j);
 end
 end
end
subplot(2,1,2);
imshow(B);
title('Output Image');
```

Figure 1 | Figure 2 | Figure 3



4. Histogram Equalization:

a. Create a function that would be able to perform histogram equalization on a grayscale image.

b. Use this function to equalize a low contrast image ex_contrast.tif (from Lab 2)

c. Use the function histeq(image) on the same image ex_contrat.tif.

d. Compare the results of b) and c)

lab41.m | lab42.m | lab43.m | lab44.m

```
A=imread('cat.jpg');
A=rgb2gray(A);
subplot(3,2,1);
imshow(A);
subplot(3,2,2);
imhist(A);

X=histeq(A);
subplot(3,2,3);
imshow(X);

subplot(3,2,4);
imhist(X);

m=size(A,1);
n=size(A,2);
mn = m*n;
H = uint8(zeros(m,n));

freq=zeros(256,1);
maxnum=zeros(1,1);
for i=1:1:m
 for j=1:1:n
 val = A(i,j);
 freq(val+1) = freq(val+1)+1;
 if maxnum(1)<val
 maxnum(1)=val;
 end
 end
end
```

lab41.m | lab42.m | lab43.m | lab44.m

```
maxbits=log2(maxnum);
if maxbits(1)==floor(maxbits(1))
 maxbits(1)=maxbits(1)+1;
else
 maxbits(1)=ceil(maxbits);
end
% levels
L=(2^maxbits)-1;

probf=zeros(256,1);
for i=1:size(freq)
 probf(i) = freq(i)/mn;
end

sum=0;
cdf=zeros(256,1);
s=zeros(256,1);
for i=1:size(probf)
 sum=sum+(L-1)*probf(i);
 cdf(i)=sum;
 s(i)=round(cdf(i));
end
for i=1:m
 for j=1:n
 H(i,j)=s(A(i,j)+1);
 end
end
subplot(3,2,5);
imshow(H);

subplot(3,2,6);
imhist(H);
```

Figure 1 | Figure 2 | Figure 3