JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

JECRC Foundation

Lab Record

Digital Image Processing Lab (6IT4-21)

III Year – VI Semester:

B.Tech. (Information Technology Engineering)

Submitted By:

Name: ……

RTU Roll No.: ……...

PROGRAM: 1

AIM: Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)

Software: MATLAB

```
% Red Blue and Green and Gray Components
 i=imread('cancercell.jpg');
subplot(3,2,1); imshow(i); title('Original Image');

%Red Component
r=i(:,:,1);
subplot(3,2,2); imshow(r);title('Red Component');

%Green Component
g=i(:,:,2);
subplot(3,2,3); imshow(g); title('Green Component');

%Blue Component
b=i(:,:,3);
subplot(3,2,4); imshow(b); title('Blue Component');

%Color to Gray Image
rg=rgb2gray(i);
subplot(3,2,5); imshow(rg); title('Gray Image');
```

Original Image

Red Component

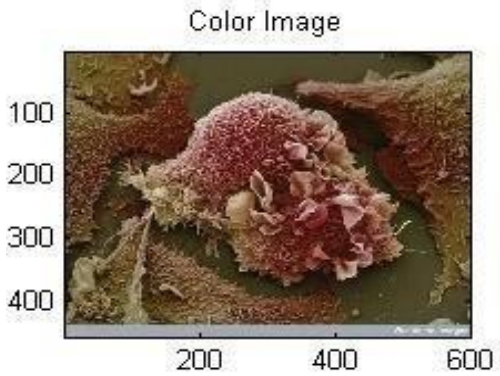
Green Component

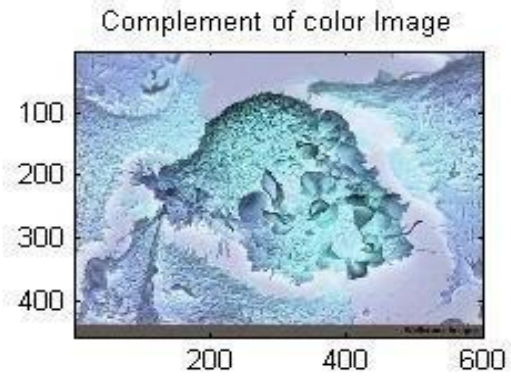
Blue Component

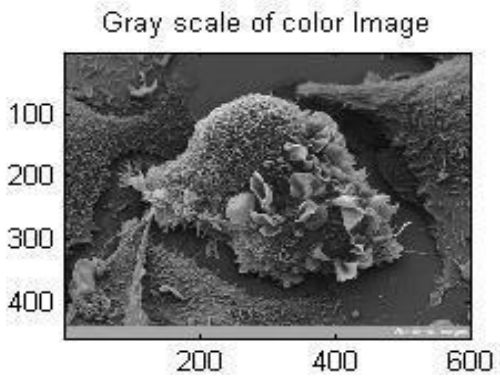
Gray Image

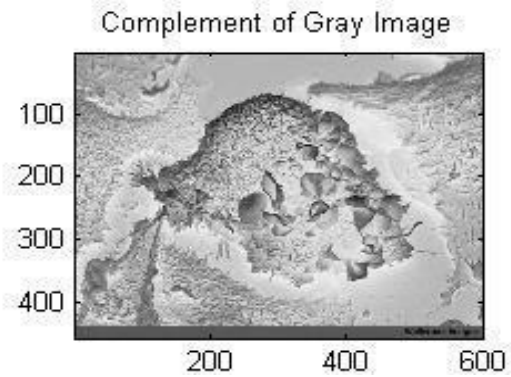
Complement, Converting and Simulation of an Image

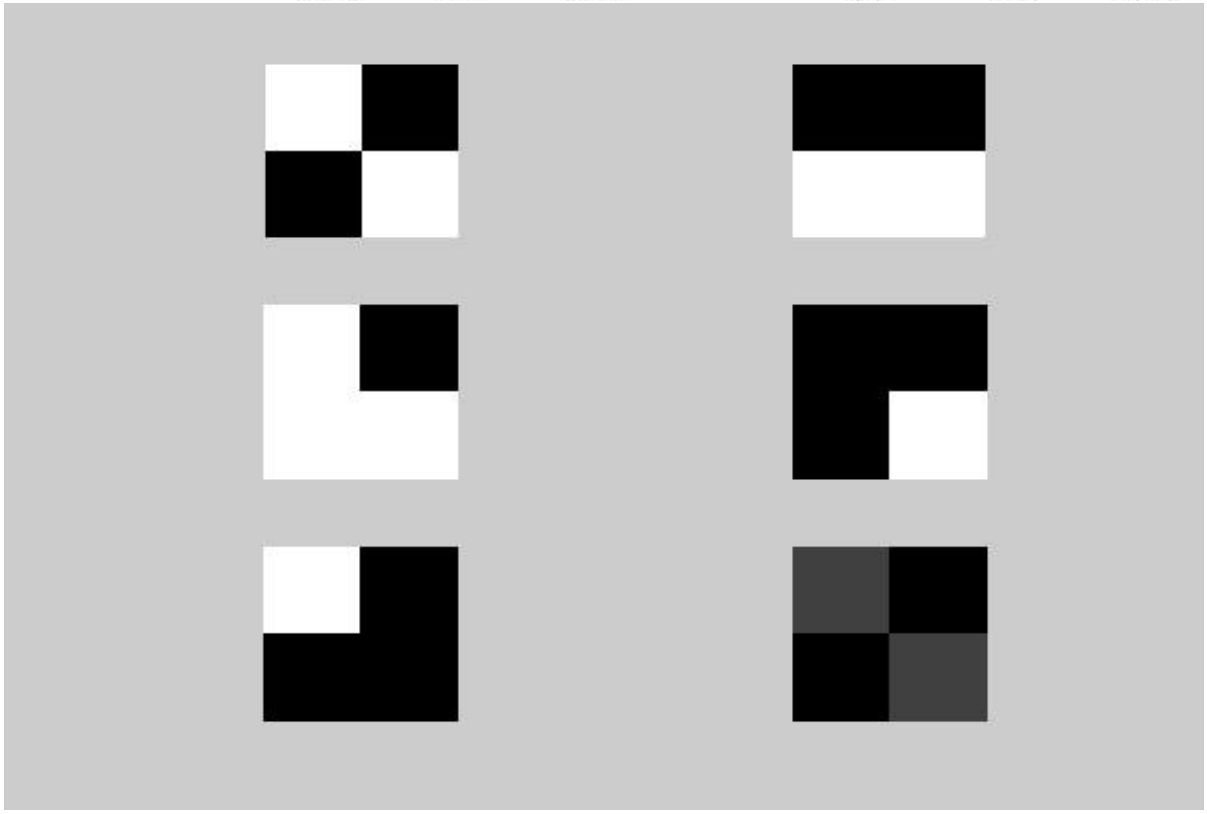
```
% Display color Image, find its complement and convert to gray
  scale I=imread('cancercell.jpg'); subplot(2,2,1); imshow(I);
  subimage(I); title('Color Image');

  c=imcomplement(I); subplot(2,2,2); imshow(c); subimage(c);
  title('Complement of color Image');

  r=rgb2gray(I); subplot(2,2,3); imshow(r); subimage(r); title('Gray scale
  of color Image');

%Complement of Gray Image b=imcomplement(r); subplot(2,2,4);
  imshow(b); subimage(b); title('Complement of Gray Image');

%Simulation of an Image( Arithmetic & Logic Operation)
  a=ones(40); b=zeros(40);
  c=[a b;b a]; d=[b b;a a];
  A=10*(c+d);
  M=c.*d
  ;  S=c-d;  D=c/4;  figure;
  subplot(3,2,1);  imshow(c);
  subplot(3,2,2);  imshow(d);
  subplot(3,2,3);  imshow(A);
  subplot(3,2,4);  imshow(M);
  subplot(3,2,5);  imshow(S);
  subplot(3,2,6); imshow(D);
```


Color Image
100
200
300
400
200
400
600


Complement of color Image
100
200
300
400
200
400
600


Gray scale of color Image
100
200
300
400
200
400
600


Complement of Gray Image
100
200
300
400
200
400
600



PROGRAM: 2

AIM: Implementation of Relationships between Pixels

Neighbour of 4,8 and Diagonal point

Software: MATLAB

```
% To find Neighbour of a given Pixel

  a=magic(5); disp('a='); disp(a);
  b=input('Enter the row < size of the Matrix');
  c=input(' Enter the Column < size of matrix');
  disp('Element'); disp(a(b,c));

% 4 Point Neighbour
  N4=[a(b+1,c), a(b-1,c), a(b,c+1), a(b,c-1)];
  disp('N4='); disp(N4);

%8 Point Neighbour
  N8=[a(b+1,c), a(b-1,c), a(b,c+1), a(b,c-1), a(b+1,c+1), a(b+1,c-1), a(b-1,c-1), a(b-1,c+1)];
  disp('N8='); disp(N8);

%Diagonal Neighbour
  ND=[ a(b+1,c+1), a(b+1,c-1), a(b-1,c-1), a(b-1,c+1)];
  disp('ND='); disp(ND);
```

Output a=

```
   17 24 1 8 15 23 5 7
   14 16
    4      6 13 20 22
   10    12   19   21 3
   11    18   25 2       9

  Enter the row < size of the Matrix 3
  Enter the Column < size of matrix 3
  Element =
```

13

N4=

19 7 20 6

N8=

19 7 20 6 21 12 5 14

ND

=

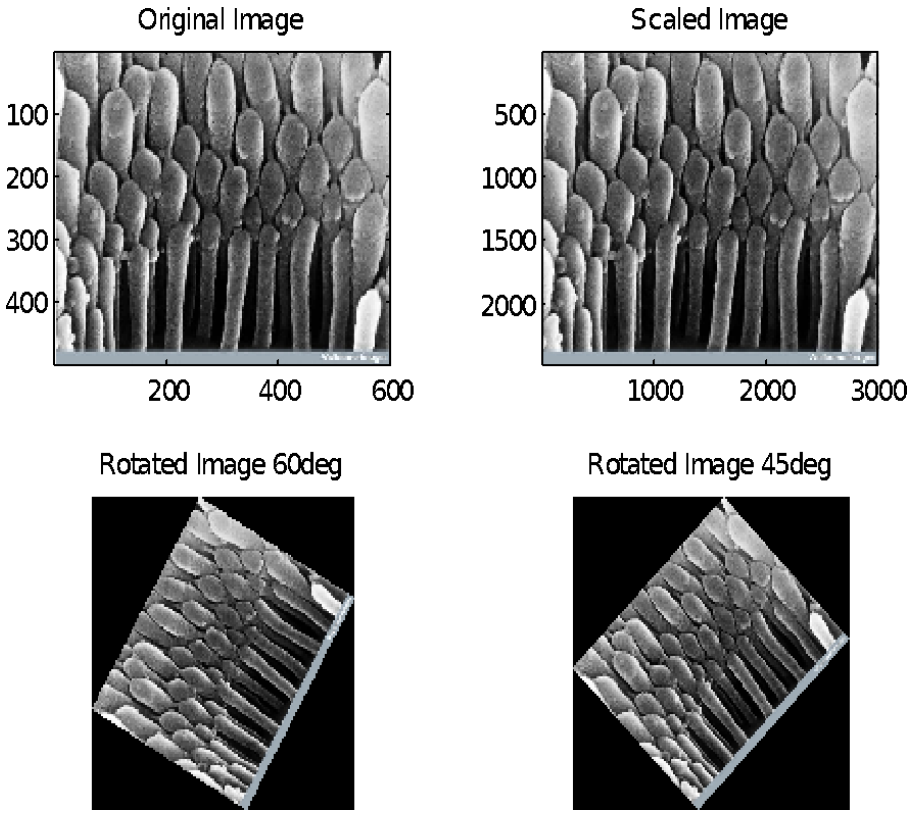
21 12 5 14

PROGRAM: 3

AIM: Implementation of Transformations of an Image
%Scaling & Rotation

Software: MATLAB

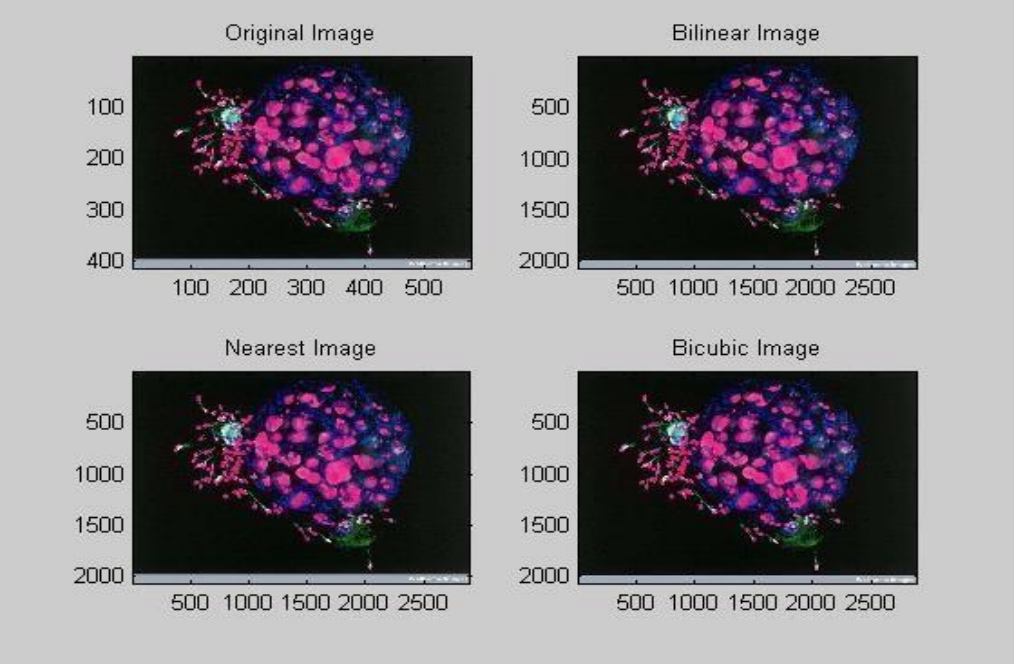
```
% Scaling (Resize) I=imread('earcell.jpg');
subplot(2,2,1); subimage(I); title('Original Image');

s=input('Enter Scaling Factor');
j=imresize(I,s);
subplot(2,2,2); subimage(j); title('Scaled Image');

% Rotation
K=imrotate(j,60);
subplot(2,2,3); imshow(K); title('Rotated Image 60deg');

R=imrotate(j,45);
subplot(2,2,4); imshow(R); title('Rotated Image 45deg');
```



%Display the color image and its Resized images by different methods

```
%Display the color image
I=imread('embryo.jpg');
figure, subplot(2,2,1);
subimage(I);
title('Original
Image');

%Display Resized image by Bilinear method
B=imresize(I,5);
subplot(2,2,2);
subimage(B);
title('Bilinear Image');

%Display Resized image by Nearest method
```

```
C=imresize(I,5,'nearest');
subplot(2,2,3);
subimage(C);
title('Nearest Image');

%Display Resized image by Bicubic method
D=imresize(I,5,'Bicubic'); subplot(2,2,4);
subimage(D); title('Bicubic Image');
```

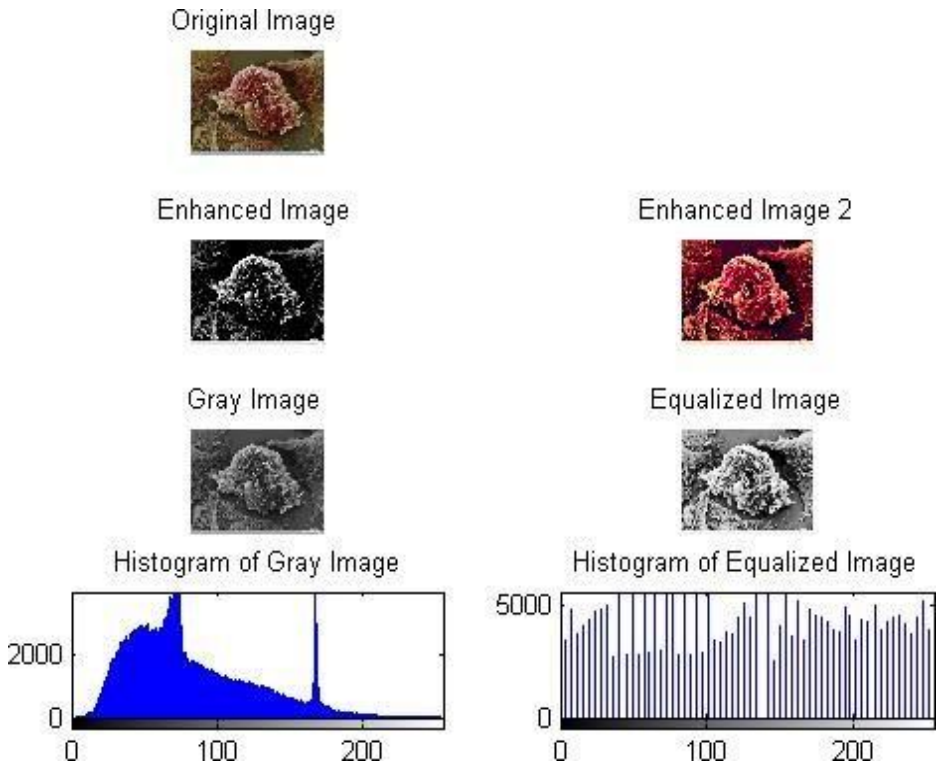


PROGRAM: 4

AIM: Contrast stretching of a low contrast image, Histogram, and Histogram Equalization

Software: MATLAB

```
% Image Enhancement
  I=imread('cancercell.jpg');
  subplot(4,2,1); imshow(I); title('Original Image');

  g=rgb2gray(I);
  subplot(4,2,5); imshow(g); title('Gray Image');

  J=imadjust(g,[0.3 0.7],[]);
  subplot(4,2,3); imshow(J); title('Enhanced Image');

  D= imadjust(I,[0.2 0.3 0; 0.6 0.7 1],[]);
  subplot(4,2,4);imshow(D);title('Enhanced Image 2');

% Histogram and Histogram Equalization subplot(4,2,7);
  imhist(g); title('Histogram of Gray Image');

  m=histeq(g);
  subplot(4,2,6); imshow(m); title('Equalized Image');
  subplot(4,2,8); imhist(m); title('Histogram of Equalized Image');
```

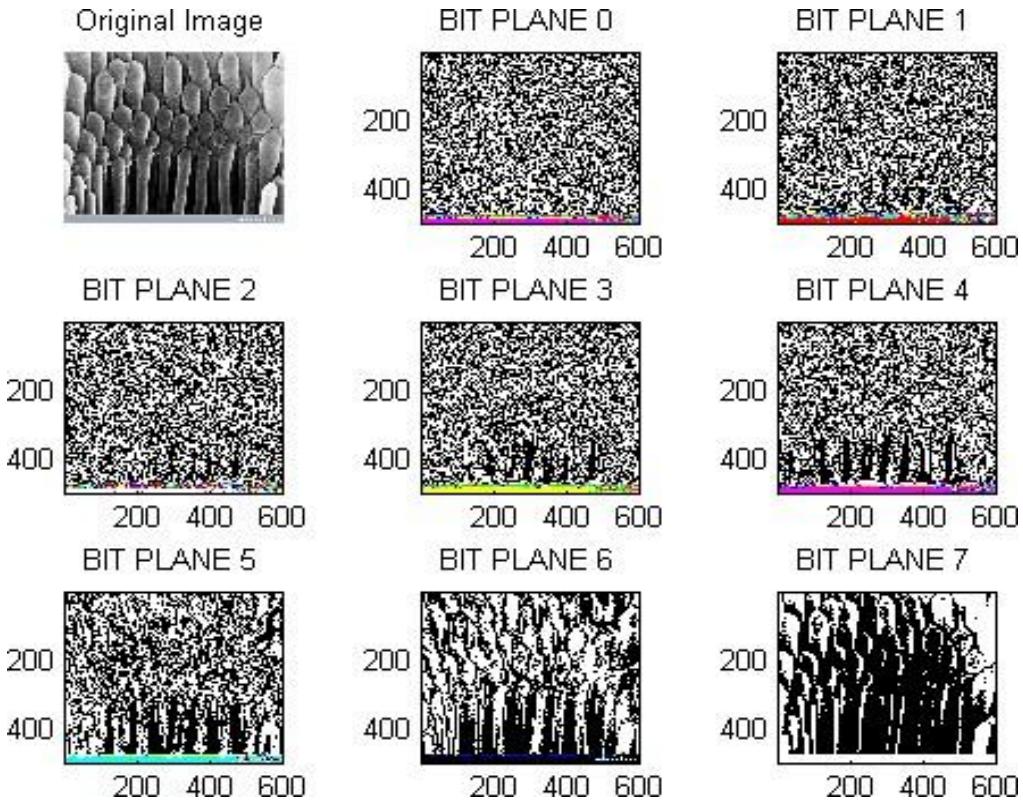

Original Image
Enhanced Image
Enhanced Image 2
Gray Image
Equalized Image
Histogram of Gray Image
2000
0
0
100
200
Histogram of Equalized Image
5000
0
0
100
200

PROGRAM: 5

AIM: Display of bit planes of an Image

Software: MATLAB

```
i=imread('earcell.jpg');
b0=double(bitget(i,1));
b1=double(bitget(i,2));
b2=double(bitget(i,3));
b3=double(bitget(i,4));
b4=double(bitget(i,5));
b5=double(bitget(i,6));
b6=double(bitget(i,7));
b7=double(bitget(i,8));

subplot(3,3,1);imshow(i);title('Original Image'); subplot(3,3,2);subimage(b0);title('BIT
PLANE 0'); subplot(3,3,3);subimage(b1);title('BIT PLANE 1');
subplot(3,3,4);subimage(b2);title('BIT PLANE 2');
subplot(3,3,5);subimage(b3);title('BIT PLANE 3');
subplot(3,3,6);subimage(b4);title('BIT PLANE 4');
subplot(3,3,7);subimage(b5);title('BIT PLANE 5');
subplot(3,3,8);subimage(b6);title('BIT PLANE 6');
subplot(3,3,9);subimage(b7);title('BIT PLANE 7');
```

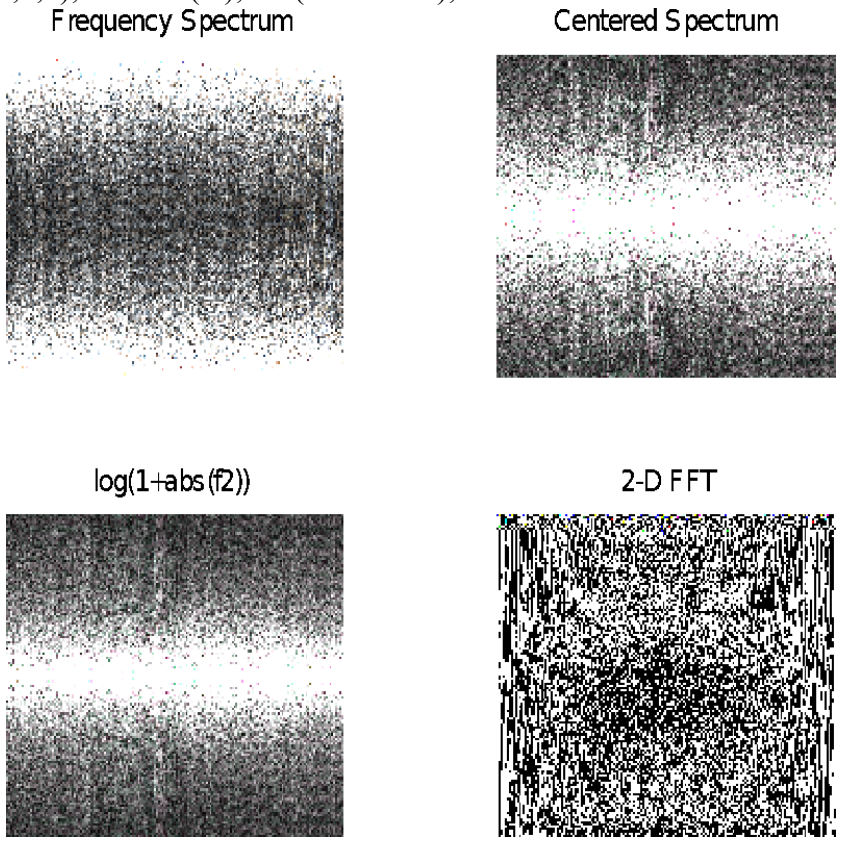

Original Image
BIT PLANE 0
BIT PLANE 1
BIT PLANE 2
BIT PLANE 3
BIT PLANE 4
BIT PLANE 5
BIT PLANE 6
BIT PLANE 7
200
400
200 400 600

PROGRAM: 6

AIM: Display of FFT(1-D & 2-D) of an image

Software: MATLAB

```
l=im2double(imread('cancercell.jpg'));
f1=fft(l); f2=fftshift(f1); subplot(2,2,1); imshow(abs(f1));
title('Frequency Spectrum'); subplot(2,2,2);
imshow(abs(f2)); title('Centered Spectrum');

f3=log(1+abs(f2));
subplot(2,2,3); imshow(f3);
title('log(1+abs(f2))');
l=fft2(f1); l1=real(l);
subplot(2,2,4); imshow(l1);title(' 2-D FFT');
```



PROGRAM: 7

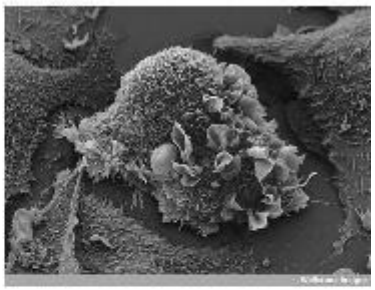
AIM: Computation of mean, Standard Deviation, Correlation coefficient of the given Image

Software: MATLAB

```
i=imread('cancercell.jpg');
subplot(2,2,1); imshow(i);title('Original Image');

g=rgb2gray(i);
subplot(2,2,2); imshow(g);title('Gray Image');

c=imcrop(g);
subplot(2,2,3); imshow(c);title('Cropped Image');

m=mean2(c);disp('m'); disp(m);
s=std2(c); disp('s'); disp(s);

figure,
k=(checkerboard>0.8);
subplot(2,1,1); imshow(k); title('Image1');

k1=(checkerboard>0.5);
subplot(2,1,2); imshow(k1); title('Image2');

r=corr2(k,k1); disp('r');disp(r);
```

```
m
   74.5173

s
   44.2327
r
    0.5774
```

Original Image



Cropped Image

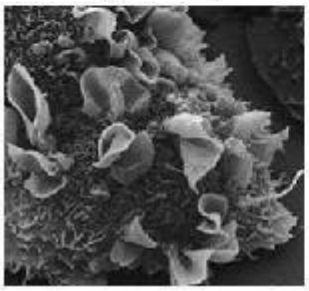


Image1

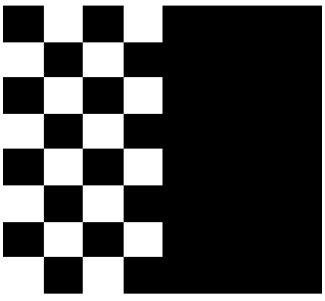
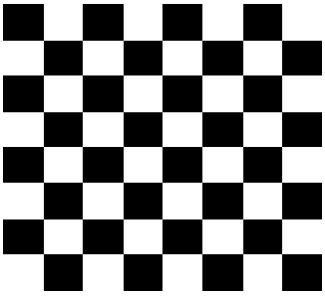


Image2



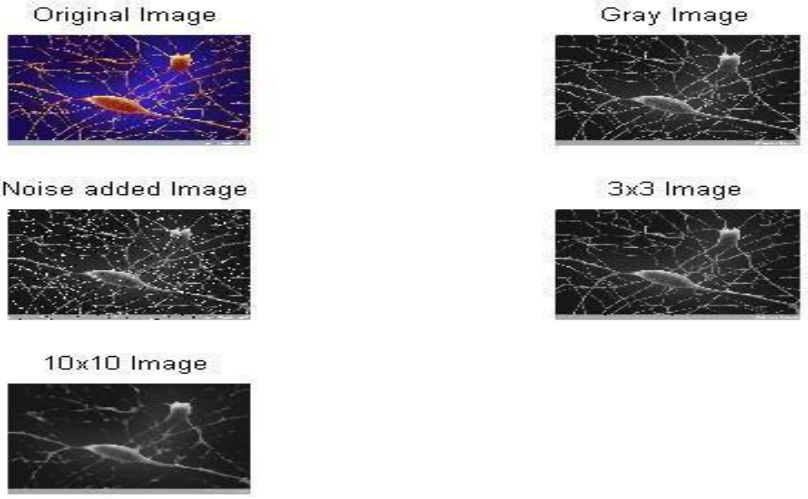
PROGRAM: 8

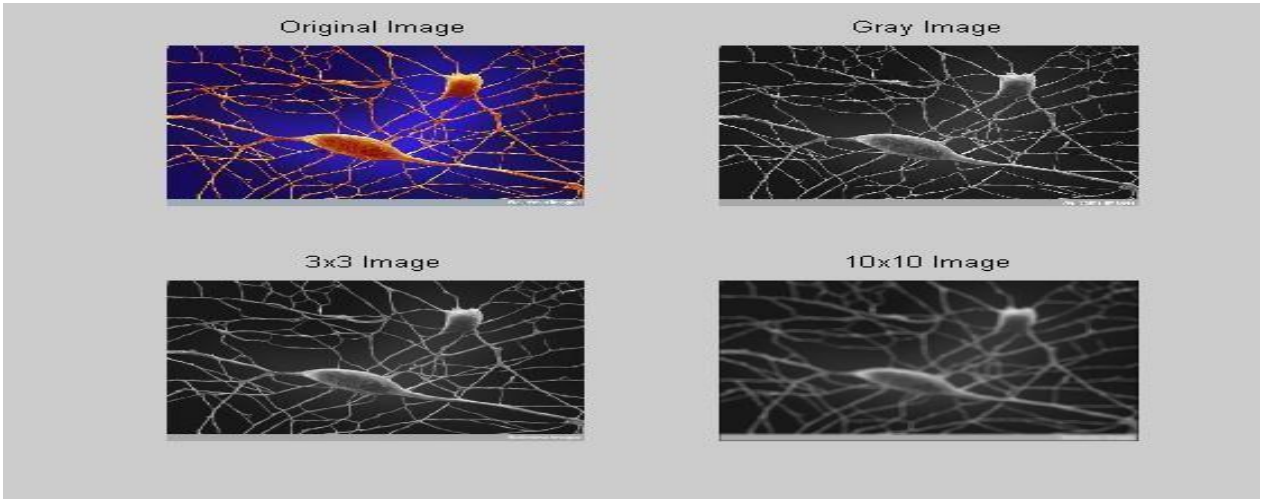
AIM: Implementation of Image Smoothening Filters(Mean and Median filtering of an Image)

Software: MATLAB

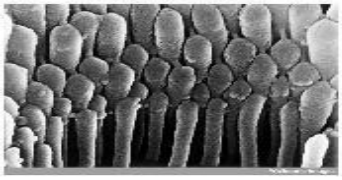
```
% Median Filters
I=imread('nuron.jpg');
K = rgb2gray(I); J= imnoise(K
,'salt & pepper',0.05); f=
medfilt2(J,[3,3]);
f1=medfilt2(J,[10,10]);

subplot(3,2,1); imshow(I); title('Original Image');
subplot(3,2,2); imshow(K); title('Gray Image');
subplot(3,2,3); imshow(J); title('Noise added Image');
subplot(3,2,4); imshow(f); title('3x3 Image');
subplot(3,2,5); imshow(f1); title('10x10 Image');


%Mean Filter and Average Filter
figure;
i=imread('nuron.jpg');
g=rgb2gray(i);
g1=fspecial('average',[3 3]); b1 = imfilter(g,g1);
subplot(2,2,1); imshow(i); title('Original Image');
subplot(2,2,2); imshow(g); title('Gray Image');
subplot(2,2,3); imshow(b1); title('3x3 Image');
g2= fspecial('average',[10 10]);
b2=imfilter(g,g2); subplot(2,2,4); imshow(b2);
title('10x10 Image');

%Implementation of filter using Convolution
figure;
I= imread('earcell.jpg');
I=I(:,:,1); subplot(2,2,1); imshow(I); title('Original Image');

a=[0.001 0.001 0.001; 0.001 0.001 0.001; 0.001 0.001 0.001];
R=conv2(a,I);
subplot(2,2,2); imshow(R); title('Filtered Image');
```

```
b=[0.005 0.005 0.005; 0.005 0.005 0.005; 0.005 0.005 0.005];
R1=conv2(b,I);
subplot(2,2,3); imshow(R1); title('Filtered Image 2');
```

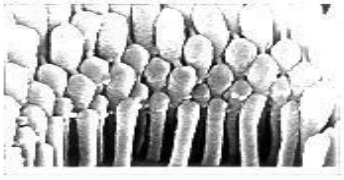




Original Image



Filtered Image



Filtered Image 2

PROGRAM: 9

AIM: Implementation of image sharpening filters and Edge Detection using Gradient Filters

Software: MATLAB

```
i=imread('cancercell.jpg');
subplot(4,2,1);  imshow(i);
title('Original Image');

g=rgb2gray(i);
subplot(4,2,2); imshow(g); title('Gray Image');

f=fspecial('laplacian',0.05);
im=imfilter(g,f);
subplot(4,2,3); imshow(im); title('Laplacian ');

s=edge(g, 'sobel');
subplot(4,2,4); imshow(s); title('Sobel');

p=edge(g, 'prewitt');
subplot(4,2,5); imshow(p); title('Prewitt');

r=edge(g, 'roberts');
subplot(4,2,6); imshow(r); title('Roberts');

[BW,thresh,gv,gh]=edge(g,'sobel',[],'horizontal');
[BW1,thresh1,gv1,gh1]=edge(g,'sobel',[],'vertical');

subplot(4,2,7); imshow(BW); title('Sobel Horizontal');
subplot(4,2,8);
imshow(BW); title('Sobel Vertical');
```

Original Image

Gray Image

Laplacian

Sobel

Prewitt

Roberts

Sobel Horizontal

Sobel Vertical

Original Image

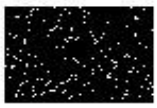
Gray Image

Laplacian

Sobel

Prewitt

Roberts



Sobel Horizontal

Sobel Vertical

PROGRAM: 10

AIM: Implementation of Image Intensity slicing technique for image enhancement

Software: MATLAB

```
i=imread('earcell.jpg');
subplot(3,2,1);imshow(i); title(‘Original Image’);
l=im2double(i);

level=graythresh(l);  BW
= im2bw(l,level);
subplot(3,2,2); imshow(BW); title('Image graythresh');

level1=0.2*BW;
subplot(3,2,3); imshow(level1); title('0.2 Slice');

level2=0.4*BW;
subplot(3,2,4); imshow(level2);title('0.4 Slice');

level3=0.6*BW;
subplot(3,2,5); imshow(level3);title('0.6 Slice');

level4=0.8*BW;
subplot(3,2,6); imshow(level4); title('0.8 Slice');
```

Original Image

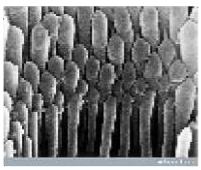


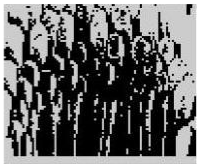
Image graythresh

0.2 Slice

0.4 Slice

0.6 Slice

0.8 Slice

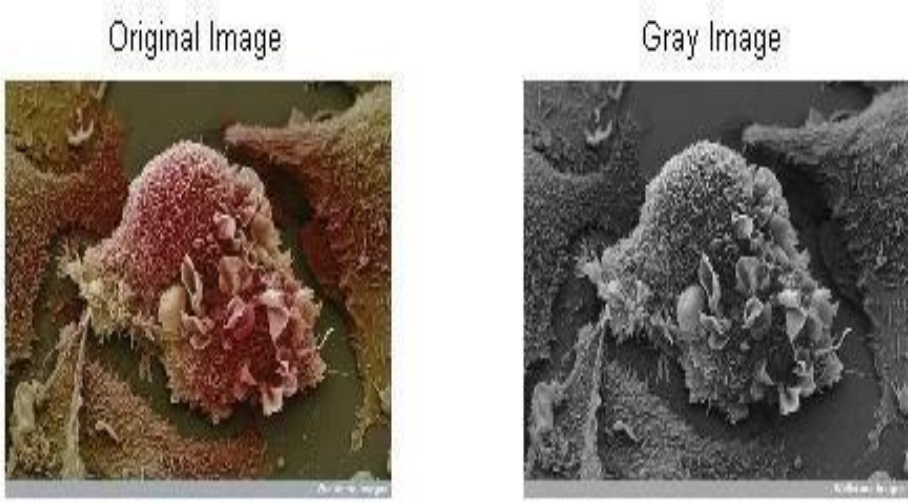


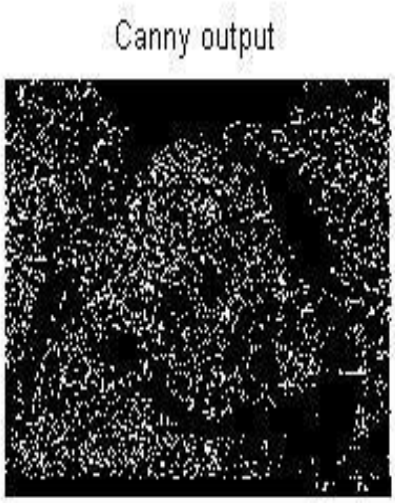
PROGRAM: 11

AIM: Canny edge detection Algorithm

Software: MATLAB

```
i= imread('cancercell.jpg'); g=rgb2gray(i);
subplot(2,2,1); imshow(i); title('Original
Image'); subplot(2,2,2); imshow(g); title('Gray
Image'); c=edge(g,'canny');
subplot(2,2,3); imshow(c); title('Canny output');
```





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PROGRAM: 12

AIM: To count the number of connected object in a given image using morphological operations.

SOFTWARE REQUIRED- MATLAB

THEORY- Connected-component labeling (alternatively connected-component analysis, blob extraction, region labeling, blob discovery, or region extraction) is an algorithmic application of graph theory, where subsets of connected components are uniquely labeled based on a given heuristic. Connected-component labeling is not to be confused withsegmentation.

Connected-component labeling is used in computer vision to detect connected regions in binary digital images, although color images and data with higher dimensionality can also be processed.[1][2] When integrated into an image recognition system or human-computer interaction interface, connected component labeling can operate on a variety of information.[3][4] Blob extraction is generally performed on the resulting binary image from a thresholding step. Blobs may be counted, filtered, and tracked. Blob extraction is related to but distinct from blob detection.

MATLAB CODE-

```
clc; clear all; close all;
 i=imread('coins.png');
i=im2bw(i);
%   i=[0 0 1 0 1;1 1 1 0 0;0 0 0 1 1;1 1 1 1 0;1 0 0 1 0;0 1 0 1 0];
 [m n]=size(i);  b=[0
1 0;1 1 1;0 1 0];
label=zeros(m, n);
a=i;  p=find(a==1);
p=p(1);   N=0;
 while(~isempty(p))
N=N+1;      p=p(1);
x=false([m, n]);
x(p)=1;
    y=a&(imdilate(x,b));
while(~isequal(x,y))

x=y;
       y=a&imdilate(x,b);
    end
pos=find(y==1);
a(pos)=0;
label(pos)=N;
p=find(a==1);  end
%  imtool(label);
 K=label(1:m,1:n);
K=label2rgb(K);
figure; imshow(K);
display(N);
```

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RESULT

N=16