Sri Indu
College of Engineering & Technology
UGC Autonomous Institution
Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH
Estd.2001

INSTITUTION'S
INNOVATION
COUNCIL
(Ministry of Education Initiative)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDS ON TRAINING COURSE ON IMPLEMENTATION OF IMAGE PROCESSING CONCEPTS FOR REALTIME APPLICATIONS USING MATLAB

STARTS ON September 19, 2021

SLOT-I REGISTRATION OPEN

Registration : Rs.150
Course Duration : 24 Hours
Weekend Course (Saturday)
Invited Participants: Third Year ECE, EEE, CSE
Restricted to 25 Participants/Slot
Resource Persons: In-house Trainers

Coordinators	Convener	Principal
Dr.N.C.Sendhilkumar	Prof.k.Ashok Babu	Dr.G.Suresh
Dr.P.Mukunthan		

Contact: 9443968958,9894145701

SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDS ON TRAINING COURSE

ON

IMPLEMENTATION OF IMAGE PROCESSING CONCEPTS FOR REALTIME APPLICATIONS USING MATLAB

Date: From 19.09.2021 (6 Week Course, Only on Saturdays)

COURSE CONTENTS

MODULE -1		
Durations	Topics	Resource Person
Week 1	Basics on Image Processing	Dr.G.Suresh
	Introduction to Image Processing Tools	
	Types of Image Representation	
	Waveform and Amplitude Spectrum	
	False Contouring	
	Circular correlation between two signals	
	Assignment-1	
Week 2	Program to Interchange phase between two images	Dr.N.C.Sendhilkumar
	Program to adjust brightness and contrast level of an image	
	Histogram Analysis of an Image	
	Types of noises and removal	
	Assignment-2	
Week 3	Bit-plane slicing of an Image	Dr.G.Suresh
	Analysis of Zoom Factors	
	Image blending	
	Assignment-3	
MODULE -2		
Durations	Topics	Resource Person
	Program to compute the edges	

Week 4	watershed transform	Dr.N.C.Sendhilkumar
	Program for erosion and dilation then edge detection	
	Program to separate R-G-B from RGB	
	Program to separate Missing R-G-B from RGB	
	Code that runs conversion of color image to YCbCr	
	Assignment-4	
MODULE -3		
Durations	Topics	Resource Person
Week 5	DWT based compression	Dr. G. Suresh
	Implementation of Arithmetic Coding	
	Implementation of Wavelet Transform	
	Assessment -1	
	Assignment-5	
Week 6	Implementation of Image Retrieval Schemes	Dr.G.Suresh Dr.N.C.Sendhilkumar
	Implementation of Image Segmentation Schemes	
	Assessment -2	
	Conclusion	

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NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

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DEMONSTRATIVE MODE

SIGNAL AND IMAGE PROCESSING

Fourier Transforms

Every signal can be written as a sum of sinusoids with di®erent amplitudes and frequencies. The MATLAB command to compute the Fourier Transform and its inverse are respectively fft and ifft, for example:

```
>> x = rand(1,10); % suppose 10 samples of a random signal
>> y = fft(x); % Fourier transform of the signal
>> iy = ifft(y); % inverse Fourier transform
>> x2 = real(iy); % chop off tiny imaginary parts
>> norm(x-x2); % compare original with inverse of transformed
```

The fft is the abbreviation of Fast Fourier Transform. This algorithm implements the discrete Fourier transform to transform data from time into the frequency domain. The study of this algorithm is normally covered in a good linear algebra course. First we give an example of the meaning of the Fourier transform before showing how Fourier transforms can be used to filter noise from signals.

Waveform and Amplitude Spectrum

Suppose we sample a signal during 4 seconds, at a sampling rate of 0.01:

```
>> dt = 1/100; % sampling rate
>> et = 4; % end of the interval
>> t = 0:dt:et; % sampling range
>> y = 3*sin(4*2*pi*t) + 5*sin(2*2*pi*t); % sample the signal
```

A natural plot is that of amplitude versus time:

```
>> subplot(2,1,1); % first of two plots
>> plot(t,y); grid on % plot with grid
>> axis([0 et -8 8]); % adjust scaling
>> xlabel('Time (s)'); % time expressed in seconds
>> ylabel('Amplitude'); % amplitude as function of time
```

With the Fourier Transform we can visualize what characterizes this signal the most. From the Fourier transform we compute the amplitude spectrum:

```
>> Y = fft(y); % compute Fourier transform
>> n = size(y,2)/2; % 2nd half are complex conjugates
>> amp_spec = abs(Y)/n; % absolute value and normalize
```

To visualize the amplitude spectrum, we execute the following commands

```
>> subplot(2,1,2); % second of two plots
>> freq = (0:79)/(2*n*dt); % abscissa viewing window
>> plot(freq,amp_spec(1:80)); grid on % plot amplitude spectrum
>> xlabel('Frequency (Hz)'); % 1 Herz = number of cycles/second
>> ylabel('Amplitude'); % amplitude as function of frequency
```

On the amplitude spectrum we see two peaks: at 2 and 4. The location of the peaks occurs at the two frequencies in the signal. The heights of the peaks (5 and 3) are the amplitudes of the sines in the signal.

```
%Program:

x = rand(1,10);         % suppose 10 samples of a random signal
y = fft(x);              % Fourier transform of the signal
iy = ifft(y);           % inverse Fourier transform
x2 = real(iy);          % chop off tiny imaginary parts
norm(x-x2);             % compare original with inverse of transformed
dt = 1/100;             % sampling rate
et = 4;                 % end of the interval
t = 0:dt:et;            % sampling range
y = 3*sin(4*2*pi*t) + 5*sin(2*2*pi*t);   % sample the signal
subplot(2,1,1);                          % first of two plots
plot(t,y); grid on                       % plot with grid
axis([0 et -8 8]);                       % adjust scaling
xlabel('Time (s)');                      % time expressed in seconds
ylabel('Amplitude');                     % amplitude as function of time
Y = fft(y);                              % compute Fourier transform
n = size(y,2)/2;                         % 2nd half are complex conjugates
amp_spec = abs(Y)/n;                     % absolute value and normalize
subplot(2,1,2);                          % second of two plots
freq = (0:79)/(2*n*dt);                  % abscissa viewing window
plot(freq,amp_spec(1:80)); grid on       % plot amplitude spectrum
xlabel('Frequency (Hz)');                % 1 Herz = number of cycles/second
ylabel('Amplitude');                     % amplitude as function of frequency
% Filtering Noise from Signals
noise = randn(1,size(y,2)); % random noise
ey = y + noise;             % samples with noise
eY = fft(ey);               % Fourier transform of noisy signal
n = size(ey,2)/2;           % use size for scaling
amp_spec = abs(eY)/n;       % compute amplitude spectrum
figure                      % plots in new window
subplot(2,1,1);             % first of two plots
plot(t,ey); grid on         % plot noisy signal with grid
axis([0 et -8 8]);          % scale axes for viewing
xlabel('Time (s)');         % time expressed in seconds
```

```
ylabel('Amplitude');            % amplitude as function of time
subplot(2,1,2);                 % second of two plots
freq = (0:79)/(2*n*dt);                         % abscissa viewing window
plot(freq,amp_spec(1:80)); grid on          % plot amplitude spectrum
xlabel('Frequency (Hz)');    % 1 Herz = number of cycles per second
ylabel('Amplitude');             % amplitude as function of frequency
figure                      % new window for plot
plot(Y/n,'r+')              % Fourier transform of original
hold on                     % put more on same plot
plot(eY/n,'bx')                     % Fourier transform of noisy signal
fY = fix(eY/100)*100;       % set numbers < 100 to zero
ifY = ifft(fY);                 % inverse Fourier transform of fixed data
cy = real(ifY);
figure                      % new window for plot
plot(t,cy); grid on      % plot corrected signal
axis([0 et -8 8]);        % adjust scale for viewing
xlabel('Time (s)');     % time expressed in seconds
ylabel('Amplitude');
```

```
% Matlab code for White Gaussian Noise
clc;
clear all;
close all;
randn('state',0);
x=randn(100,1);
subplot(2,1,1)
plot(x)
xlabel('n')
ylabel('x[n]')
grid
subplot(2,1,2)
hist(x)
xlabel('x')
ylabel('no of outcome out of 100')
title('white gaussian noise')
figure
N=100;
nbins=10;
xmin=-3;
xmax=3;
ymax=1;
```

```
[y,xx]=hist(x(1:N),nbins);
delx=xx(2)-xx(1);
bar(xx,y/(N*delx))
grid
axis([xmin xmax 0 ymax]);
xlabel('x')
ylabel('PDF,p(x)')
title('white gaussian noise')
```

1. Consider the following sequence of instructions:

```
>> t = 0:0.1:10;
>> y1 = sin(2*pi*t);
>> y2 = sin(20*pi*t);
>> plot(t,y1);
>> hold on;
>> plot(t,y2);
```

   Why is the output of the second plot like this? Find a better range for `t` to plot `sin(20*pi*t)` right. Can you find a good lower bound for the sampling interval in terms of the frequency?

2. Give the MATLAB commands to plot the amplitude spectrum for the signal

$$f(t) = \sum_{k=10}^{20} (20 - k) \sin(2\pi k t).$$

   In addition, plot the waveform spectrum of this signal.

3. Make a function to plot waveform and amplitude spectrum of a signal. The function has prototype:

```
function specplot ( t, dt, et, y )
%
% Opens a new figure window with two plots:
% the waveform and amplitude spectrum of a signal.
%
% On entry :
%   t          sampling range of the signal;
%   dt         sampling rate;
%   et         end of the range;
%   y          samples of the signal over the range t.
%
```

   So `specplot` computes the amplitude spectrum of the signal. For the abscissa viewing window you may take half of the range of t.

   Test your `specplot` with the signal of the previous assignment.

4. With fft we can decompose a signal in low and high frequencies. Take the example signal from page 1. As noise we now add a sine of amplitude 4 and with frequency 50. Plot the waveform and amplitude spectrum of the new signal. Use fft and ifft to remove this high frequency noise.

Example 1:

```
%this program illustrates false contouring
clc
clear all
close all
a=imread('boat.jpg');
subplot(3,2,1);
imshow(a)
title('original image')
%using 128 gray level
%figure,
subplot(3,2,2);
imshow(grayslice(a,128),gray(128)),
title('image with 128 gray level')
%using 64 gray level
subplot(3,2,3);
imshow(grayslice(a,64),gray(64)),
title('image with 64 gray level')
%using 32 gray level
%figure,
subplot(3,2,4);
imshow(grayslice(a,32),gray(32)),
title('image with 32 gray level')
%using 16 gray level
%figure,
 subplot(3,2,5);
imshow(grayslice(a,16),gray(16)),
title('image with 16 gray level')
%using 8 gray level
%figure,
subplot(3,2,6);
imshow(grayslice(a,8),gray(8)),
title('image with 8 gray level')
```

Output:

Example 2:

```
%frequency response
clc
clear all
close all
[x y]=meshgrid(-pi:0.09:pi);
z=2*cos(x)+2*cos(y);
surf(x,y,z)
axis([-4 4,-4 4,-4 3])
```

Example 3:

```
%frequency response
clc
clear all
close all
[x y]=meshgrid(-pi:0.05:pi);
z=2-cos(x)-cos(y);
surf(x,y,z)
axis([-4 4,-4 4,-0.5 4])
```

Example 4:

```
%application of circular convolution
x=[1 0;0 0]
h=[1 1;1 1]
x1=fft2(x)
h1=fft2(h)
y1=x1.*h1
res=ifft2(y1)
```

Example 5:%circular correlation between two signals

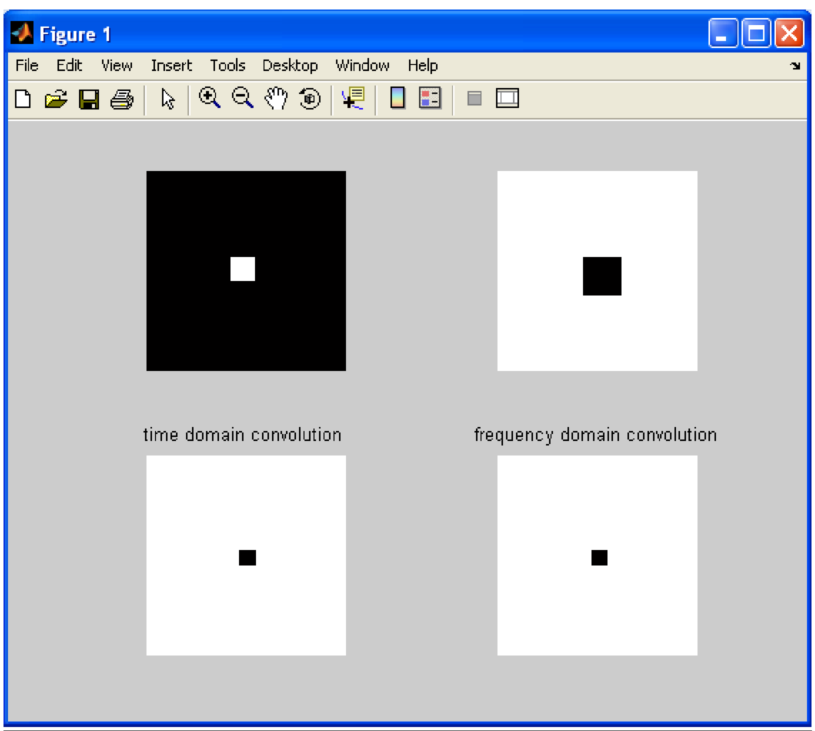
```
clc
clear all
close all
x=[5 10;15 20]
h=[3 6;9 12]
h1=fliplr(h)%fold signal along column-wise
h2=flipud(h1)%fold signal along row-wise
x1=fft2(x);
h3=fft2(h2);
y1=x1.*h3
y2=ifft2(y1)
```

Example 6:

```
clc
clear all
close all
%generation of first image A
a=zeros(256);
[m n]=size(a);
for i=110:140
    for j=110:140
        a(i,j)=255;
    end
end
subplot(2,2,1)
imshow(a)
%generation of second  image B
b=ones(256);
[m n]=size(b);
for i=110:160
    for j=110:160
        b(i,j)=0;
    end
```

```
end
subplot(2,2,2)
imshow(b)
%convolution in time domain
c=conv2(a,b,'same');
%multiplication in frequency domain
a1=fft2(a);
b1=fft2(b);
c1=a1.*b1;
d1=fftshift(ifft2(c1));
subplot(2,2,3)
imshow(c)
title('time domain convolution')
subplot(2,2,4)
imshow(d1)
title('frequency domain convolution')
```

output:

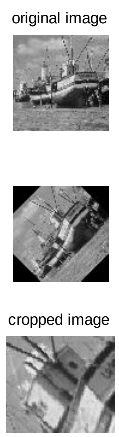


Example 8:

```
clc
clear all
close all
%generation of first image A
a=imread('boat.jpg');
```

```
subplot(3,1,1);
imshow(a)
title('original image')
b=imrotate(a,45,'bilinear','crop');
subplot(3,1,2);
imshow(b)
title('45 degree rotational image')
c=imcrop(b);
%figure;
subplot(3,1,3);
imshow(c)
title('cropped image')
```

<u>Output:</u>

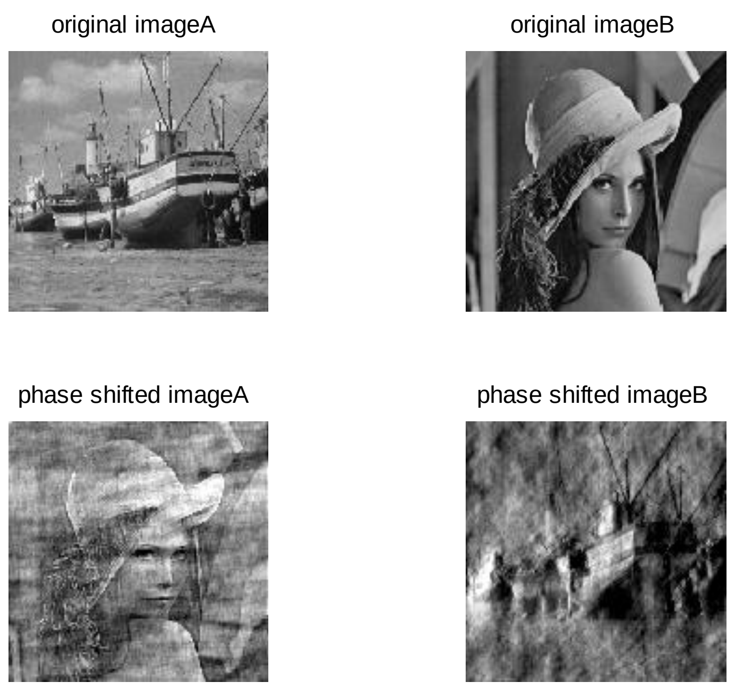


<u>Example 8:</u>

```
%program to interchage phase between two images
clc
clear all
close all
%generation of first image A
a=imread('boat.jpg');
b=imread('lena.jpg');
ffta=fft2(double(a));
fftb=fft2(double(b));
%get the magnitude and phase components
mag_a=abs(ffta);
ph_a=angle(ffta);
mag_b=abs(fftb);
ph_b=angle(fftb);
```

```
%determine new FFT by interchanging the phase
newfft_a=mag_a.*(exp(i*ph_b));
newfft_b=mag_b.*(exp(i*ph_a));
%reconstruct the original image using inverse FFT
rec_a=ifft2(newfft_a);
rec_b=ifft2(newfft_b);
subplot(2,2,1)
imshow(a)
title('original imageA');
subplot(2,2,2)
imshow(b)
title('original imageB');
subplot(2,2,3)
imshow(uint8(rec_a))
title('phase shifted imageA');
subplot(2,2,4)
imshow(uint8(rec_b))
title('phase shifted imageB');
```

Output:

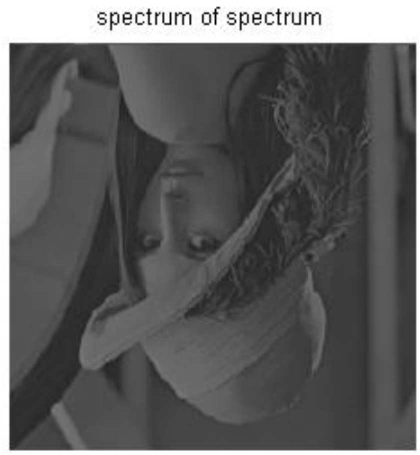


Example 9:

```
% Fourier transform of Fourier Transform
clc
clear all
```

```
close all
%generation of first image A
%a=imread('boat.jpg');
a=imread('lena.jpg');
[m n]=size(a);
b=fft2(a);
%spectrum of spectrum
c=(1/(m*n))*fft2(b);
subplot(2,2,1),imshow(a),title('input image');
subplot(2,2,2),imshow(uint8(c)+40),title('spectrum of spectrum');
```

Output:



Example 10

%program to adjust brightness and contrast level of an image

```
clc
clear all
close all
a=imread('lena.jpg');
[m n]=size(a);
b=double(a)+50;
c=double(a)-70;
subplot(3,2,1);
imshow(a)
title('original image');
subplot(3,2,2);
imshow(uint8(b))
title('brightness enhanced image');
subplot(3,2,3);
```

```
imshow(uint8(c))
title('brightness supressed image');
d=a*.5;
e=a*20;
subplot(3,2,4);
imshow(uint8(d))
title('contrast increased image');
subplot(3,2,5);
imshow(uint8(e))
title('contrast decreased image');
```

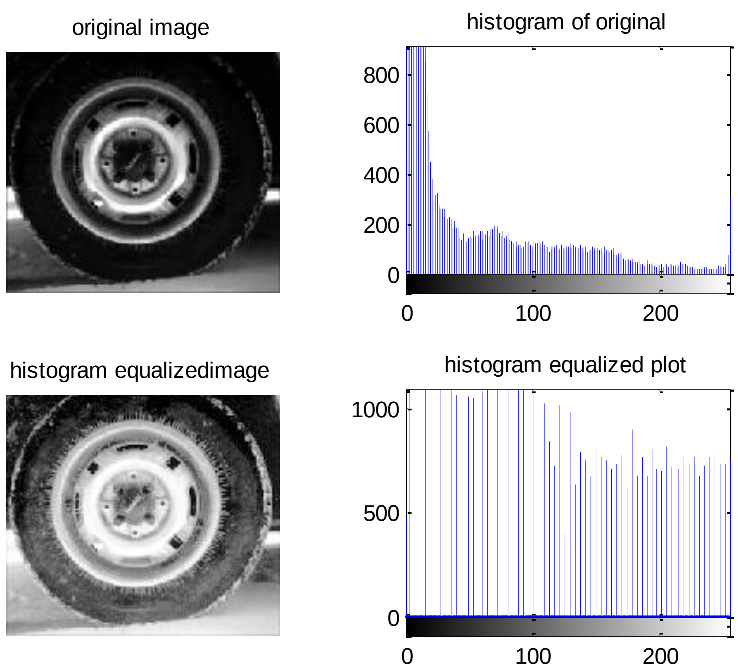
output:

Example 11:

```
clc
clear all
close all
I = imread('tire.tif');
K = histeq(I);
subplot(2,2,1);
imshow(I)
title('original image');
subplot(2,2,2);
imhist(I)
title('histogram of original');
subplot(2,2,3);
```

```
imshow(K)
title('histogram equalizedimage');
subplot(2,2,4);
imhist(K)
title('histogram equalized plot');
```

<u>output;</u>

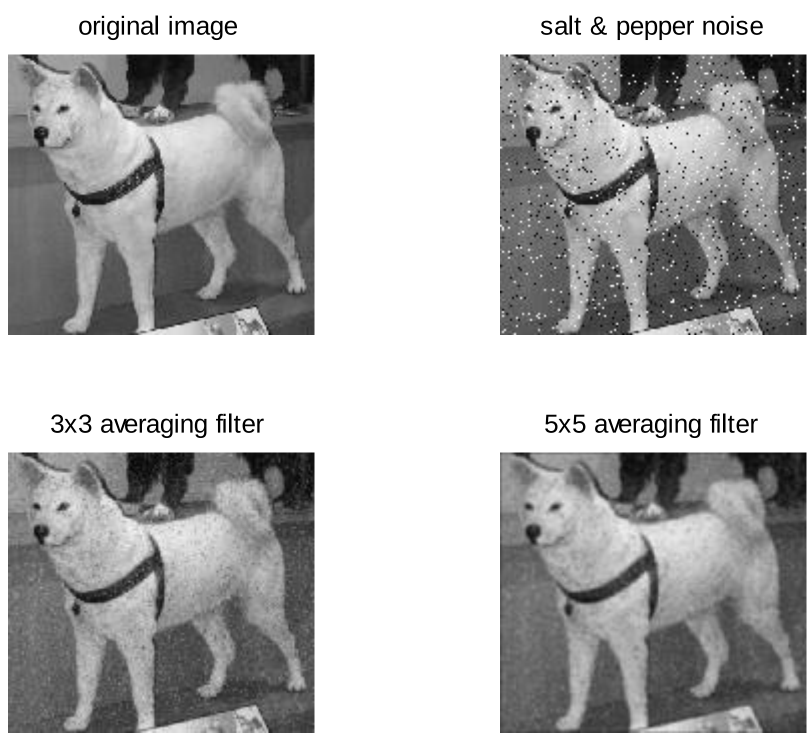


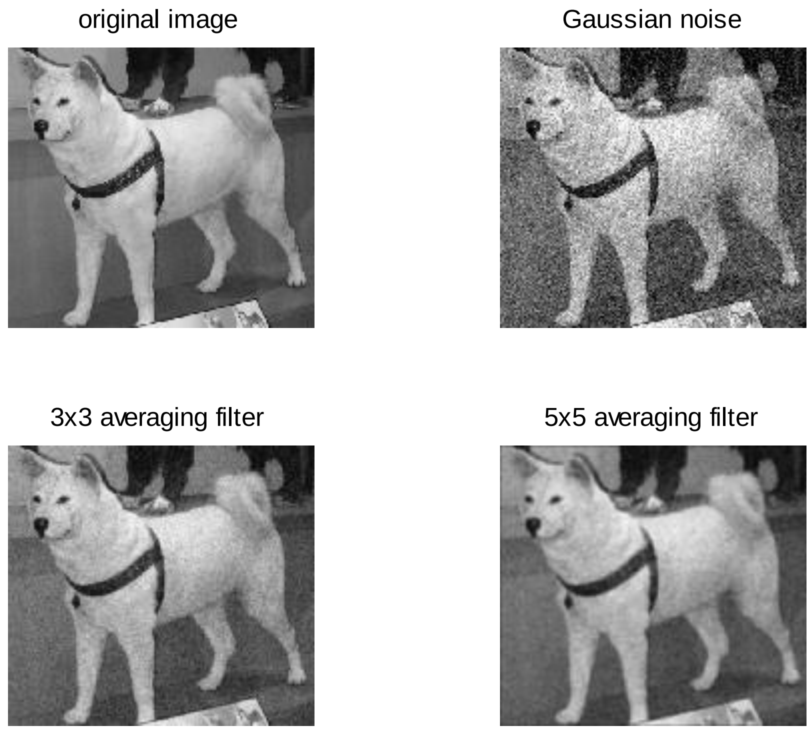
<u>Example 12:</u>

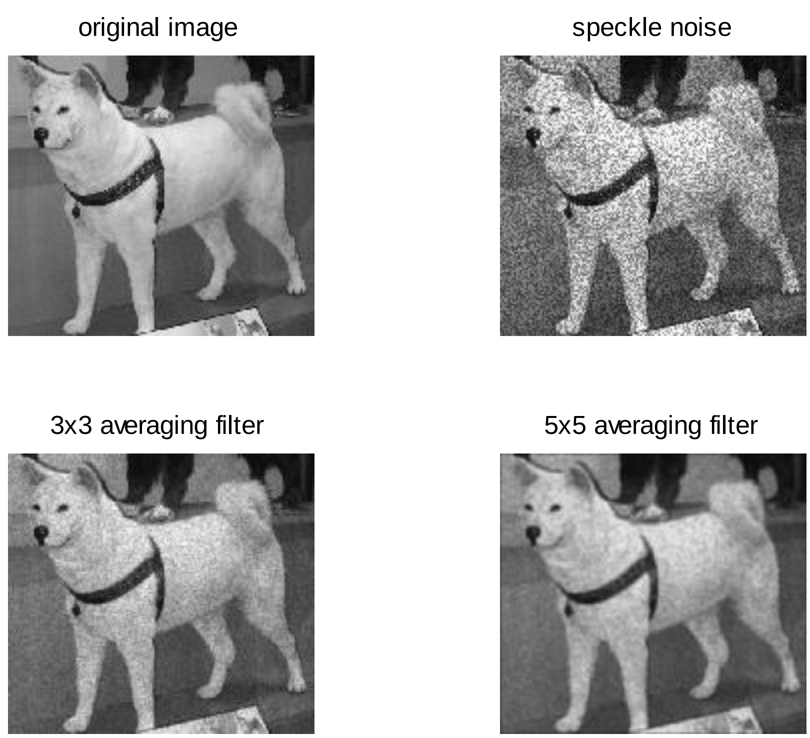
```
% Types of noises and removal
a=imread('dog.jpg');
a=rgb2gray(a);
b=imnoise(a,'salt & pepper');
c=imnoise(a,'gaussian');
d=imnoise(a,'speckle');
%defining 3x3 and 5x5 kernal
h1=1/9*ones(3,3);
h2=1/25*ones(5,5);
%attempt to recover the image
b1=conv2(b,h1,'same');
b2=conv2(b,h2,'same');
c1=conv2(c,h1,'same');
c2=conv2(c,h2,'same');
d1=conv2(d,h1,'same');
d2=conv2(d,h2,'same');
```

```
figure,subplot(2,2,1),imshow(a),title('original image'),
subplot(2,2,2),imshow(b),title('salt & pepper noise'),
subplot(2,2,3),imshow(uint8(b1)),title('3x3 averaging filter'),
subplot(2,2,4),imshow(uint8(b2)),title('5x5 averaging filter')
%-----------------------------------------------------------
figure,subplot(2,2,1),imshow(a),title('original image'),
subplot(2,2,2),imshow(c),title('Gaussian noise'),
subplot(2,2,3),imshow(uint8(c1)),title('3x3 averaging filter'),
subplot(2,2,4),imshow(uint8(c2)),title('5x5 averaging filter')
%-----------------------------------------------------------
figure,subplot(2,2,1),imshow(a),title('original image'),
subplot(2,2,2),imshow(d),title('speckle noise'),
subplot(2,2,3),imshow(uint8(d1)),title('3x3 averaging filter'),
subplot(2,2,4),imshow(uint8(d2)),title('5x5 averaging filter')
```

<u>output:</u>




original image
Gaussian noise
3x3 averaging filter
5x5 averaging filter


original image
speckle noise
3x3 averaging filter
5x5 averaging filter

Example 13:

```
% bitplane slicing
clc
clear all
close all
a=imread('dog.jpg');
a=rgb2gray(a);
subplot(2,2,1)
imshow(a);
title('original image')
[m n]=size(a);
n1=input('enter the bit plane number (8 to 1 that to be removed:');
s=255-(2^(n1-1));
for i=1:m,
   for j=1:n,
      out_I(i,j)=bitand(a(i,j),s);
   end
end
subplot(2,2,2)
imshow(uint8(out_I));title(sprintf(' plane eliminated is %g',n1))
n1=input('enter the bit plane number (8 to 1 that to be removed:');
s=255-(2^(n1-1));
for i=1:m,
   for j=1:n,
      out_I(i,j)=bitand(a(i,j),s);
   end
end
subplot(2,2,3)
imshow(uint8(out_I));title( sprintf('plane eliminated is %g',n1));
n1=input('enter the bit plane number (8 to 1 that to be removed:');
s=255-(2^(n1-1));
for i=1:m,
   for j=1:n,
      out_I(i,j)=bitand(a(i,j),s);
   end
end
subplot(2,2,4)
imshow(uint8(out_I));title(sprint(' plane eliminated is %g',n1));
```

Output:

original image

6th plane eliminated

7th plane eliminated

8th plane eliminated

Example 14:

```
clc;
clear all;
close all;
a=imread('boat.jpg');a=imresize(a,[32 32]);
[m n]=size(a);
p=input('Enter the size you want: ');
for i=1:m %loop to extract every row
  for j=1:n %loop to extract every column
    for k=1:p %loop to control the number of replication
        b(i,(j-1)*p+k)=a(i,j); %replication of pixels in row wise
    end
  end
end
c=b;
[m n]=size(c);
for i=1:n %loop to extract every column
  for j=1:m %loop to extract every row
    for k=1:p %loop to control the number of replication
        b((j-1)*p+k,i)=c(j,i); %replication of pixels in column wise
```

```
    end
  end
end
imshow(a),title('original image')
figure,imshow(b),title('zoomed image')
xlabel(sprintf('zooming factor is %g',p))
```

Output:

Example 15:

```
a=imread('lena.jpg');%a=imresize(a,[64 64]);
zooming_factor=input('enter the zooming facttor:');
num=zooming_factor;den=1;
while(num-floor(num)~=0)
    num=num*2;den=den*2;
end
[m n]=size(a);s1=num*m;
re=zeros(s1,num*n);
for i=1:m,
    for j=1:n,
        k=num*(i-1);
        l=num*(j-1);
        re(k+1,l+1)=a(i,j);
    end
end
    i=1;
    while(i<=(s1))
        j=1;
        while(j<=(num*n))
```

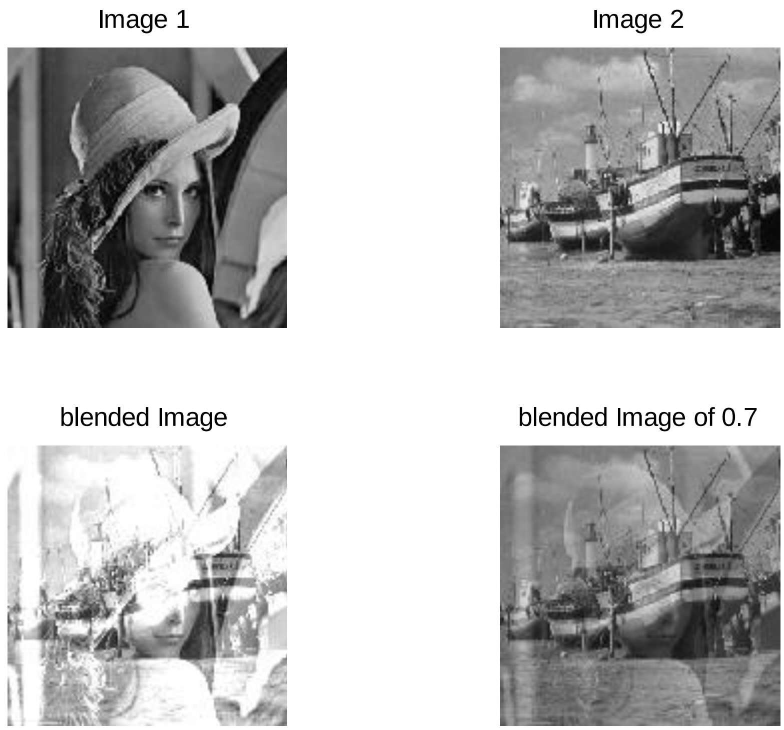
```
        x=ones(num,num);
        for p=1:num,
            for q=1:num,
                c(p,q)=re(i,j);
                j=j+1;
            end
            i=i+1;j=j-num;
        end
        z=ifft2(fft2(c).*fft2(x));
        i=i-num;
        for p=1:num,
            for q=1:num,
                re(i,j)=z(p,q);
                j=j+1;end
            i=i+1;j=j-num;end
        i=i-num;j=j+num;end
    i=i+num;end
if(den>1)
    m=den;[p q]=size(re);
    a=double(re);
    for i=1:ceil(p/m),
        for j=1:ceil(q/m),
            if(((m*i)<p)&((m*j)<q))
                b(i,j)=re(m*i,m*j);
            else b(i,j)=0;
            end
        end
    end
else b=re;end
figure,imshow(uint8(b));
```

Output:

Example 16:

```
% Image blending
clc
clear all
close all
%c=(1-x)a+xb
a=imread('lena.jpg');
a=rgb2gray(a);subplot(2,2,1);
imshow(a)
[m n]=size(a);
title('Image 1');
b=imread('boat.jpg');
b=rgb2gray(b);
b1=imresize(b,[256 256]);subplot(2,2,2);
imshow(b1)
title('Image 2');
c1=a+b1;
subplot(2,2,3);
imshow(c1)
title('blended Image');
x=input('enter x value:')
for i=1:m,
   for j=1:n,
      c2(i,j)=(1-x)*a(i,j)+x*b1(i,j);
   end
end
subplot(2,2,4);
imshow(c2)
title(sprintf('blended Image of %g',x));
```

output:

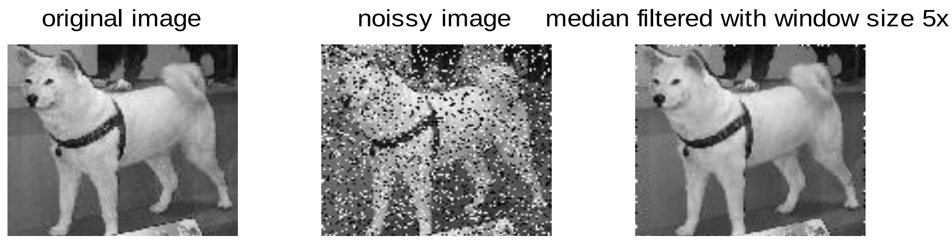


Example 17:

```
%this program is to perform median filtering of the image
clc
clear all
close all
a=imread('dog.jpg');
a=rgb2gray(a);
b=imnoise(a,'salt & pepper',0.2);
b=double(b);
[m n]=size(b);
N=input('enter the window size:');
out_img=b;
if(mod(N,2)==1)
   Start=(N+1)/2;
   End=Start;
else
   Start=N/2;
End=Start+1;
end
if(mod(N,2)==1)
   limit1=(N-1)/2;
```

```
    limit2=limit1;
else
    limit1=(N/2)-1;
    limit2=limit1+1;
end
for i=Start:(m-End+1),
    for j=Start:(n-End+1),
        I=1;
        for k=-limit1:limit2,
            for l=-limit1:limit2,
                mat(I)=a(i+k,j+1);
                I=I+1;
            end
        end
        mat=sort(mat);
        if(mod(N,2)==1)
            out_img(i,j)=(mat(((N^2)+1)/2));
        else
            out_img(i,j)=(mat((N^2)/2)+mat(((N^2)/2)+1))/2;
        end
    end
end
subplot(1,3,1)
imshow(a)
title('original image');
subplot(1,3,2)
imshow(uint8(b))
title('noissy image')
subplot(1,3,3)
imshow(uint8(out_img))
title(sprintf('median filtered with window size %gx%g',N));
```

<u>Output:</u>

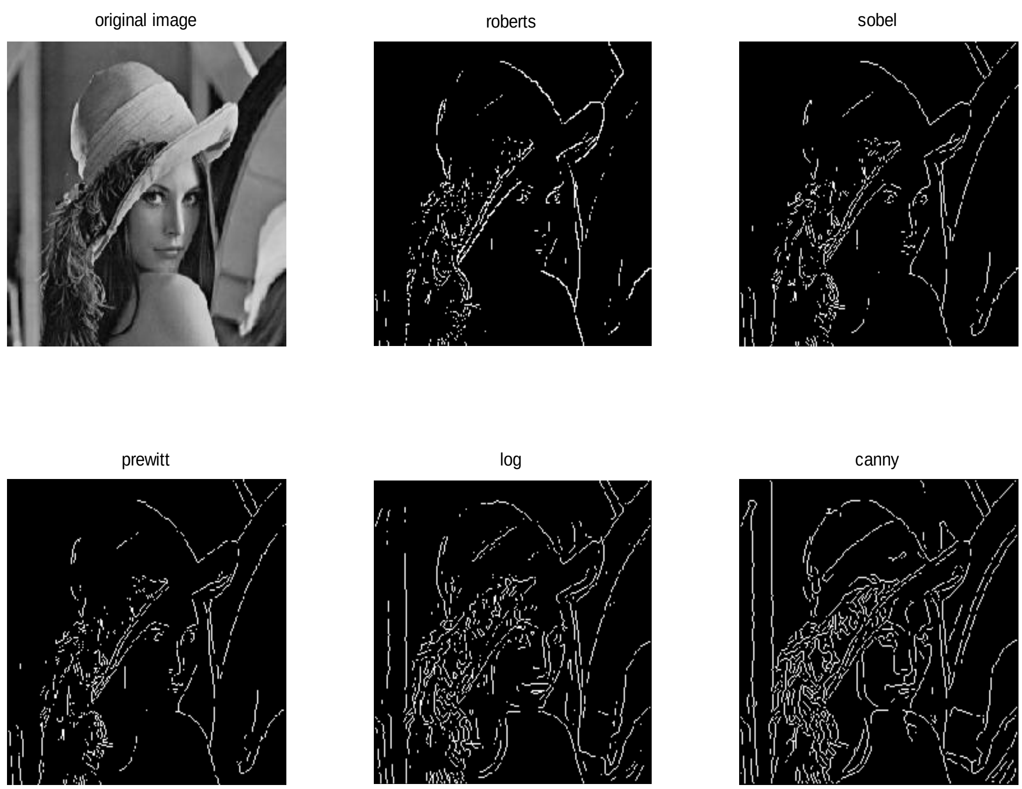


Example 18:

```
%program to compute the edges
clc
clear all
close all
a=imread('lena.jpg');
a=rgb2gray(a);
b=edge(a,'roberts');
c=edge(a,'sobel');
d=edge(a,'prewitt');
e=edge(a,'log');
f=edge(a,'canny');
%b=edge(a,'roberts');
subplot(2,3,1)
imshow(a)
title('original image')
subplot(2,3,2)
imshow(b)
title('roberts')
subplot(2,3,3)
imshow(c)
title('sobel')
subplot(2,3,4)
imshow(d)
```

```
title('prewitt')
subplot(2,3,5)
imshow(e)
title('log')
subplot(2,3,6)
imshow(f)
title('canny')
```

Output:

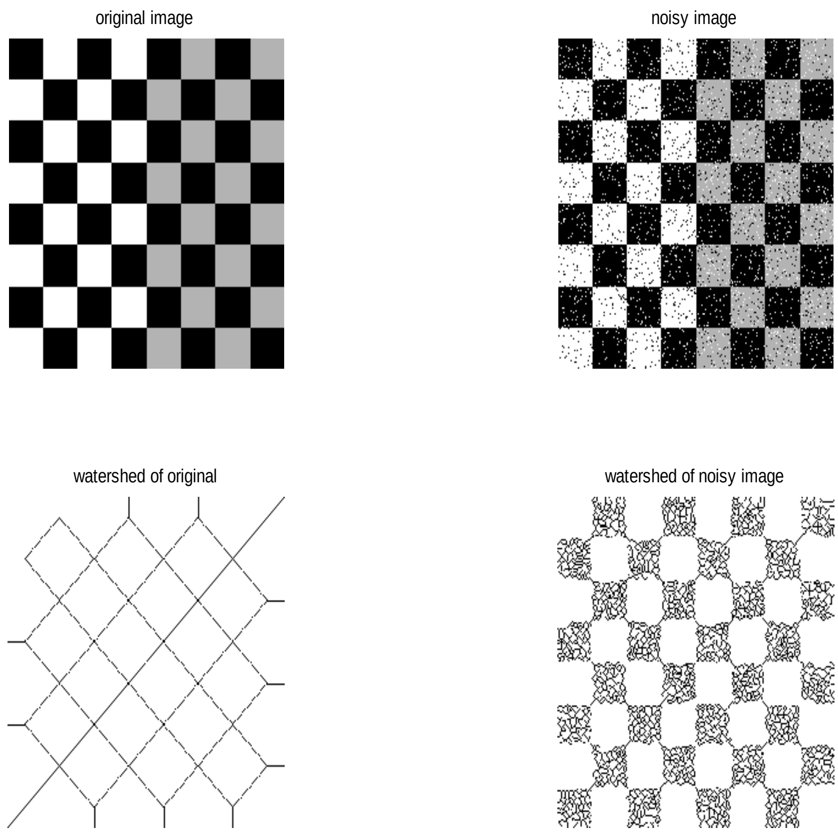


Example 19:

```
%watershed transform
clc
clear all
close all
a=checkerboard(32);
a1=imnoise(a,'salt & pepper',0.1);
b=watershed(a,4);
b1=watershed(a1,4);
subplot(2,2,1)
```

```
imshow(a),title('original image');
subplot(2,2,2);
imshow(a1),title('noisy image');
subplot(2,2,3);
imshow(b),title('watershed of original');
subplot(2,2,4);
imshow(b1),title('watershed of noisy image');
```

Output:



Example 20:

```
%program for erosion and dilation then edge detection
clc
clear all
close all
a=imread('sur.jpg');
b=[1 1 1;1 1 1;1 1 1];;
a1=imdilate(a,b);
a2=imerode(a,b);
```

```
subplot(1,3,1)
imshow(a),title('original image');
subplot(1,3,2)
imshow(a1),title('erode -thining image');
subplot(1,3,3)
imshow(a2),title('dilate-thickening image');
a3=a-a2;
a4=a1-a;
a5=a1-a2;
figure
subplot(1,3,1)
imshow(a3),%title('');
subplot(1,3,2)
imshow(a4),%title('erode -thining image');
subplot(1,3,3)
imshow(a5),%title('dilate-thickening image');
```

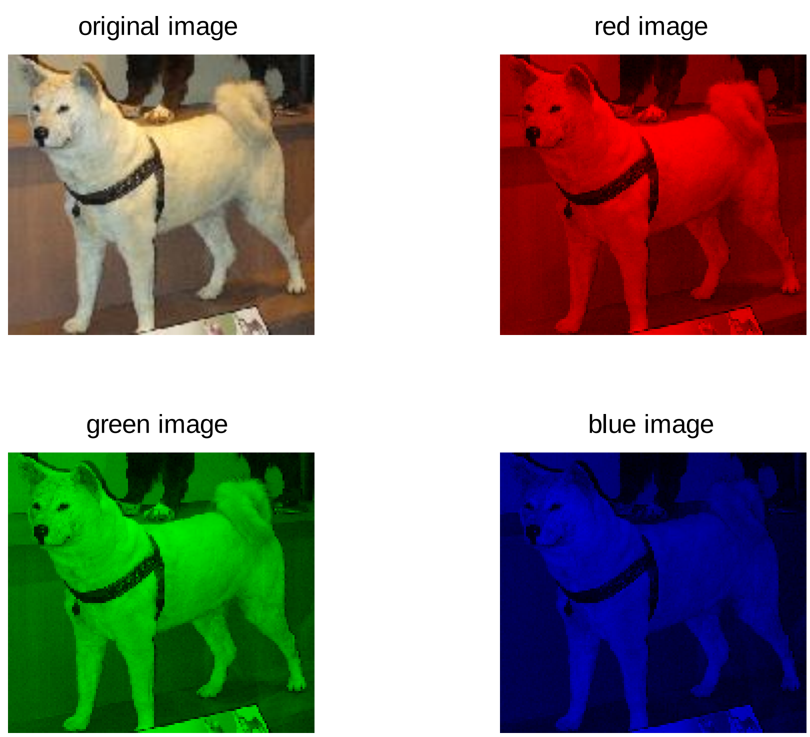
Output:

Example 21:

```
%program to separate R-G-B from RGB
RGB=imread('dog.jpg');
R=RGB;
G=RGB;
B=RGB;
R(:,:,2)=0;
R(:,:,3)=0;
G(:,:,1)=0;
```

```
G(:,:,3)=0;
B(:,:,1)=0;
B(:,:,2)=0;
subplot(2,2,1),imshow(RGB),title('original image')
subplot(2,2,2),imshow(R),title('red image')
subplot(2,2,3),imshow(G),title('green image')
subplot(2,2,4),imshow(B),title('blue image')
```

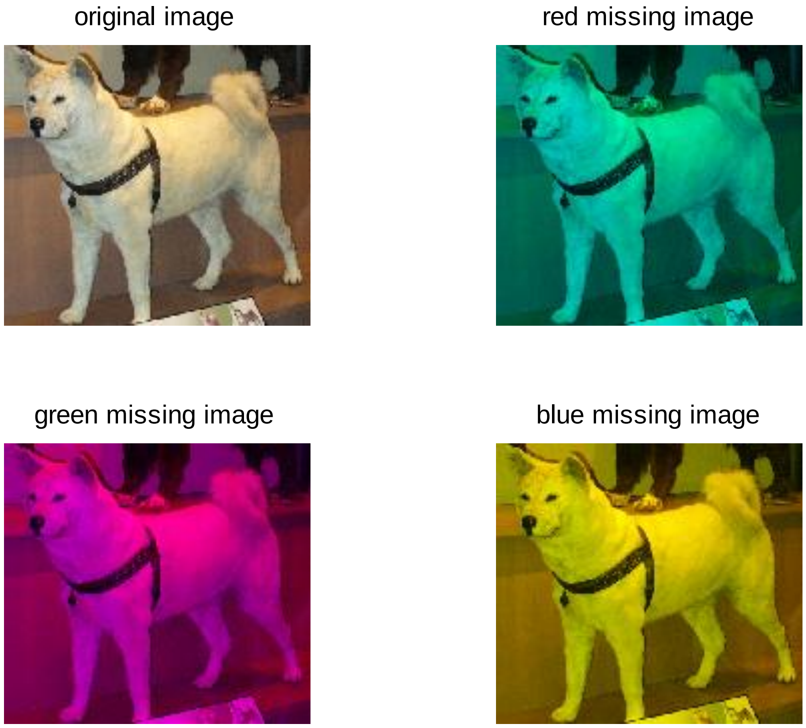
<u>output:</u>



<u>Example 22:</u>

```
%program to separate Missing R-G-B from RGB
RGB=imread('dog.jpg');
R=RGB;
G=RGB;
B=RGB;
R(:,:,1)=0;
G(:,:,2)=0;
B(:,:,3)=0;
subplot(2,2,1),imshow(RGB),title('original image')
subplot(2,2,2),imshow(R),title('red missing image')
subplot(2,2,3),imshow(G),title('green missing image')
```

subplot(2,2,4),imshow(B),title('blue missing image')



Example 23:

%Code that runs conversion of color image to YCbCr

%read in image filename
%inimage = input('Enter image file name with extension (like jennifer.bmp): ', 's');

%open image file
inimage = imread('dog.jpg');

%display on screen the image
figure(1), imshow(inimage); title('Original Image');

%the command size returns the size of the matrix/image
%A semi-colon suppresses the screen output of the variable
%values, while the lack of semi-colon prints it to the screen

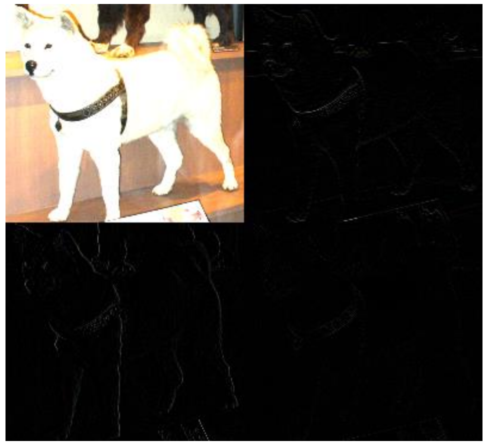
size(inimage)

```
U = rgb2ycbcr(inimage);
figure(1), imshow(inimage); title('RGB image');
figure(2), imshow(U); title('YCBCR Image');
size(U)

%Here pick off the 256x256 luminance part of the ycbcr image
Y = U(:,:,1);
figure(3), imshow(Y); title('Y part of Image');
size(Y)

%Here pick off the 256x256 Cb part of the ycbcr image
CB = U(:,:,2);
figure(4), imshow(CB); title('Cb part of Image');
size(CB)

%Here pick off the 256x256 Cr part of the ycbcr image
CR = U(:,:,3);
figure(5), imshow(CR); title('Cr part of Image');
size(CR)
```

Example 24:

```
%dwt based compression
clc
clear all
close all
a=imread('dog.jpg');
[p q r t]=dwt2(a,'db1')
b=[uint8(p),q;r t];
[p1 q1 r1 t1]=dwt2(p,'db1');
b1=[p1 q1; r1 t1];imshow(b);
% b2=[b1,q;r,t];
% imshow(b2);
```

Output:



Example 25:

```
%C:\Documents and Settings\gsuresh\Desktop\Desktop 09-08-2012\code1
%boat.jpg %lena.jpg

%This program hides a message image in the lower
%bit planes of a cover image
%read in cover image filename
covername = input('Enter image file name with extension (like jennifer.bmp): ', 's');
%read in message image filename
messagename = input('Enter message image file name with extension: ', 's');
%open cover and message image files
cover = imread(covername);
message = imread(messagename);
%display on screen the two images
figure(1), imshow(cover); title('Original Image (Cover Image)');
figure(2), imshow(message);title('Image to Hide (Message Image)');
%change to double to work with addition below
cover=double(cover);
message=double(message);
%imbed = no. of bits of message image to embed in cover image
imbed=4;
%shift the message image over (8-imbed) bits to right
messageshift=bitshift(message,-(8-imbed));
%show the message image with only embed bits on screen
%must shift from LSBs to MSBs
showmess=uint8(messageshift);
showmess=bitshift(showmess,8-imbed);
figure(3),imshow(showmess);title('4 Bit Image to Hide');
%now zero out imbed bits in cover image
coverzero = cover;
```

```
for i=1:imbed
coverzero=bitset(coverzero,i,0);
end
%now add message image and cover image
stego = uint8(coverzero+messageshift);
figure(4),imshow(stego);title('Stego image');
%save files if need to
%4 bit file that was embedded = same as file extracted
imwrite(showmess,'showmess4.bmp'); %use bmp to preserve lower bits
%jpg will get rid of them
%stego file
imwrite(stego,'stego4.bmp');
```

output:

Original Image (Cover Image)

4 Bit Image to Hide

Stego image

Image to Hide (Message Image)

Email Address	Hall Ticket Number	Name of the Student (as per SSC)	**Department**	Willing to choose to the Course	Contact Number
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neeleshgoud45@gmail.com	18D41A04F2	NEELESH KUMAR GOUD	ECE	Yes	7993292705
ganeshparitala2701@gmail.com	18D41A04G0	PARITALA GANESH	ECE	Yes	9121816469
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vamshidharreddy709@gmail.com	18D41A04L5	THALASANI VAMSHIDHAR REDDY	ECE	Yes	7095880325
tharunreddy2000t@gmail.com	18D41A04E9	N.Tharun kumar reddy	ECE	Yes	9652590841
masadiajay@gmail.com	18D41A04D7	Masadi ajay	ECE	Yes	6303582156
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SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDS ON TRAINING COURSE

ON

IMPLEMENTATION OF IMAGE PROCESSING CONCEPTS FOR REALTIME APPLICATIONS USING MATLAB

Date: From 19.09.2021 (6 Week Course, Only on Saturdays)

SHORTLISTED STUDENTS

ATTENDANCE SHEET

S. No	Hall Ticket Number	NAME OF THE STUDENT	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
1	18D41A04F9	P.VIVEK VARDHAN REDDY	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
2	18D41A04E0	MOHAMMED ADNAN	[signature]	[signature]	[signature]	← A →	[signature]	[signature]
3	18D41A04F2	NEELESH KUMAR GOUD	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
4	18D41A04G0	PARITALA GANESH	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
5	18D41A04N8	RANAVATH ABHISHEK RAJ NAIK	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
6	18D41A04L5	THALASANI VAMSHIDHAR REDDY	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
7	18D41A04E9	N.THARUN KUMAR REDDY	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
8	18D41A04D7	MASADI AJAY	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
9	18D41A04G7	PIRLA VENKATA SUDHEER	[signature]	[signature]	[signature]	[signature]	[signature]	← A →
10	17D41A0483	GUDIPALLY.MANASA	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
11	17D41A04J0	RAMISHETTI VARUN KUMAR	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
12	17D41A0408	ANGOLI RISHWANTH GPUD	[signature]	← A →	[signature]	[signature]	[signature]	[signature]
13	18D41A04Q0	PUNNA KARTHIK	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
14	18D41A04H1	AMRUTHA VARSHINI PONNA	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
15	19D45A0418	D INDRA KUMAR	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
16	18D41A04H0	POLOJU POORNA CHANDAR	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]
17	18D41A04P8	VAISHNAVI	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]

18	17D41A0483	GUDIPALLY.MANASA	Manasa	Manasa	Manasa	Manasa	Manasa	Manasa
19	18D41A04J8	SAMALA ROSHAN	Sam	Sam	Sam	Sam	Sam	Sam
20	18D41A04F3	P UNESHCHANDRA	Umesh	Umesh	Umesh	Umesh	Umesh	Umesh
21	18D41A04M5	VADYALA SATHWIKA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	18D41A04C2	M NISHITHA	Nishitha	Nishitha	Nishitha	Nishitha	Nishitha	Nishitha
23	18D41A04L3	SÜREPALLY.MOUNIKA	Mounika	Mounika	Mounika	Mounika	Mounika	Mounika
24	18D41A04L3	SUREPALLY.MOUNIKA	Mounika	Mounika	Mounika	←A→	Mounika	Mounika
25	18D41A0425	BHAVANI YAMSANI	Bhavani	Bhavani	Bhavani	Bhavani	Bhavani	Bhavani
		Present →	25/25	24/25	25/25	23/25	25/25	24/25

1. [signature]
2. [signature]

Coordinator

Convener

[signature]
HOD/ECE