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Sns lab 06

task 1:

```
%%Task1

clear all

close all

%Read image, visualize it, and display its size and class.

I = imread("flower.jpg");

% Convert to double precision

I = im2double(I);

% Display

figure,

imshow(I)

whos I

[R, G, B] = imsplit(I);

whos R

% Create a 2-D convolution filter or kernel for averaging or smoothing

W = 20;

h = ones(W)./W.^2

Ravg = conv2(R,h,"same");

% Convolve G with h to blur the image

Gavg = conv2(G,h,"same"); %Write your code here

% Convolve B with h to blur the image

Bavg = conv2(B,h,"same"); %Write your code here

% Concatenate the three matrices to put together the color image

Iavg = cat(3,Ravg,Gavg,Bavg);

imshow(Iavg)
```

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```
whos Iavg
```

```
%If we increase the value of W the image gets more blurred because W is the size of blurring matrix and as the size of the matrix increases the blur also increases

%The border pixels are black because for the corner values we have to take some value for the convolutoin matrix, so we use black pixels or zeros for the padding. That is why we are getting black borders.
```

In this code we read the image and then split it into its RGB channels. Then we create a 2D convolution filter for averaging or smoothing the image. Then we blur the image by convolving each color channel with this filter. increasing the size of the convolution filter (W) results in a more blurred image. This is because a larger filter size implies a wider area being considered for averaging, leading to a greater level of smoothing. The black borders observed in the resultant image are a consequence of the convolution operation. When we apply the convolution filter the image then needs to be with additional pixels to balance for the filter's size. In this code we use zeros for padding which results in black borders around the image. These border pixels are influenced by the nearby black pixels due to the padding, causing them to also appear black.

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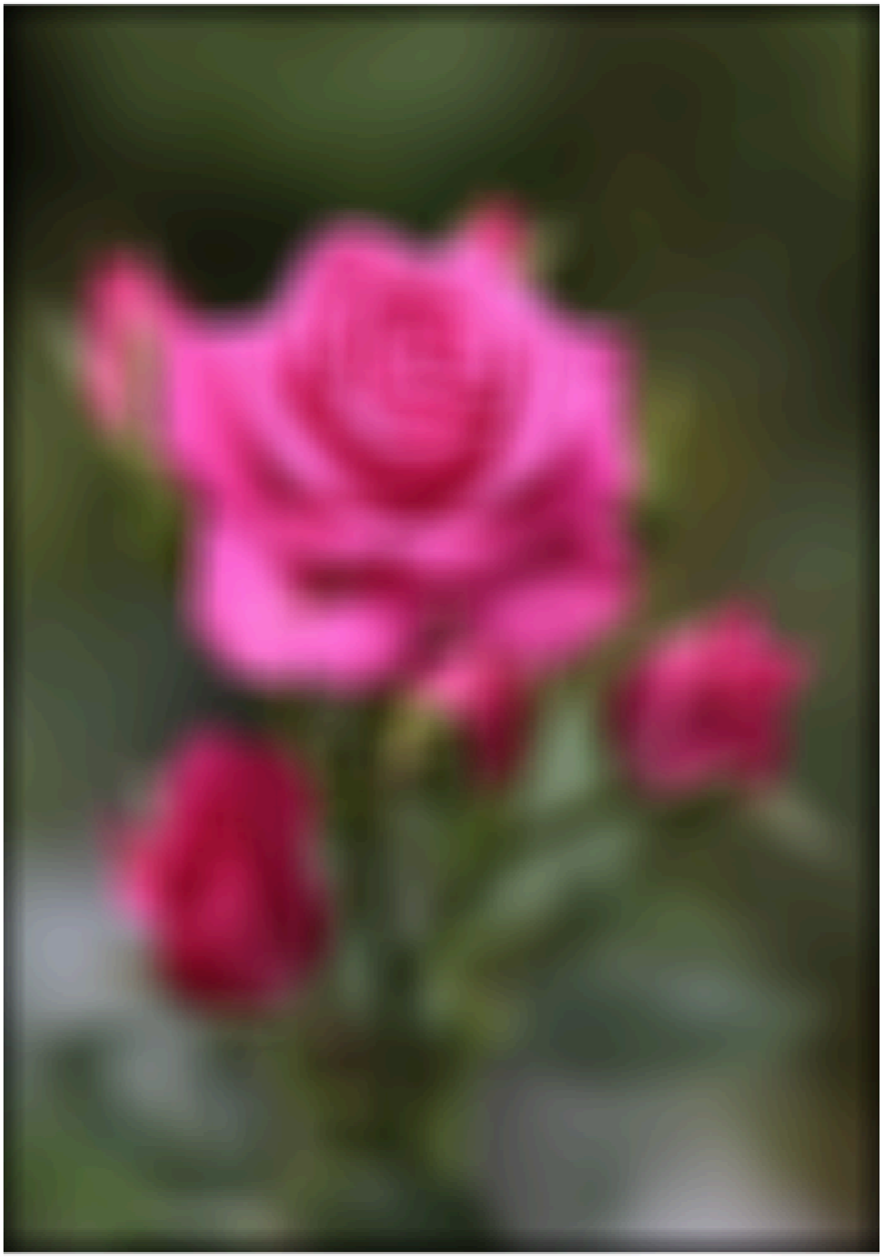

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Task 2:

```
%task2

n=0:50

xn=double((sin(0.5*n)+0.2) < 0);
```

```
hn=((n==0)-(n==1));

con=conv(xn,hn)

figure;

subplot 311; stem( xn);

title ("plot of xn");

subplot 312; stem( hn);

title ("plot of h[n]");

subplot 313; stem(con);

title ("plot of convolution");

axis([0 50 -3 3]);

%The output is non zero where there are edges in the signal. At positive
edge the value of filter is +1 and where there are nagative edges the
value of the filter is -1.
```

Observation:

In this code we make a discrete-time signal xn, then we convolve it with a discrete-time filter hn. The resulting convolution is plotted for visualization. we can observe that the output is non-zero precisely where there are edges in the original signal xn. Specifically, at positive edges in the signal, the filter value is +1, and at negative edges, the filter value is -1. This behavior is consistent with the behavior of the filter hn, which is constructed to detect edges by taking the difference between adjacent samples in the signal.

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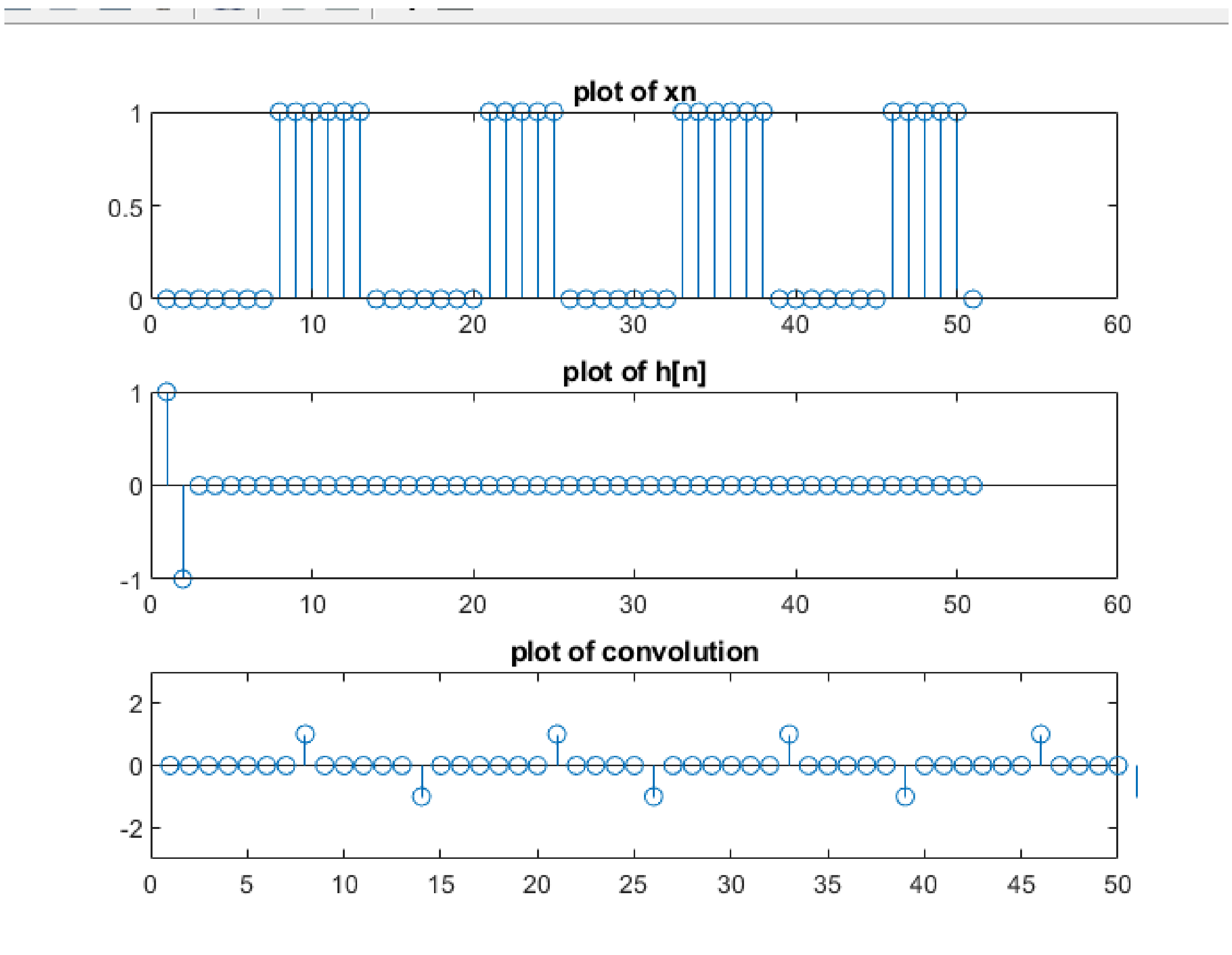

Task 3:

```
%task3
n = 0:50;
load("echart.mat");
hn = (n==0) - (n==1);
con2 = conv(hn, echart(221,:));
figure;
```

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```
subplot 311; stem(echart(221,:));

title("Input");

subplot 312; stem(hn);

title("h[n]");

subplot 313; stem(con2);

title("Output");

%observation: The 0 represents that the color is black and 255 (or 1)
shows that the color is white.In the output signals there are 0 and 255
(255=1) so where there is a rising edge the value of the output signal
is +1 and where there is a falling edge the value of the output signal
is -1
```

In this code we load a matrix 'echart' and then perform convolution with a filter hn. The resulting convolution output is then visualized along with the input signal and the filter. we can observe that the values are either 0 or 255. 0 shows the color black and 255 (or 1) shows the color white. where there is a rising edge in the input signal the output signal takes a value of +1 and where there is a falling edge the output signal takes a value of -1.

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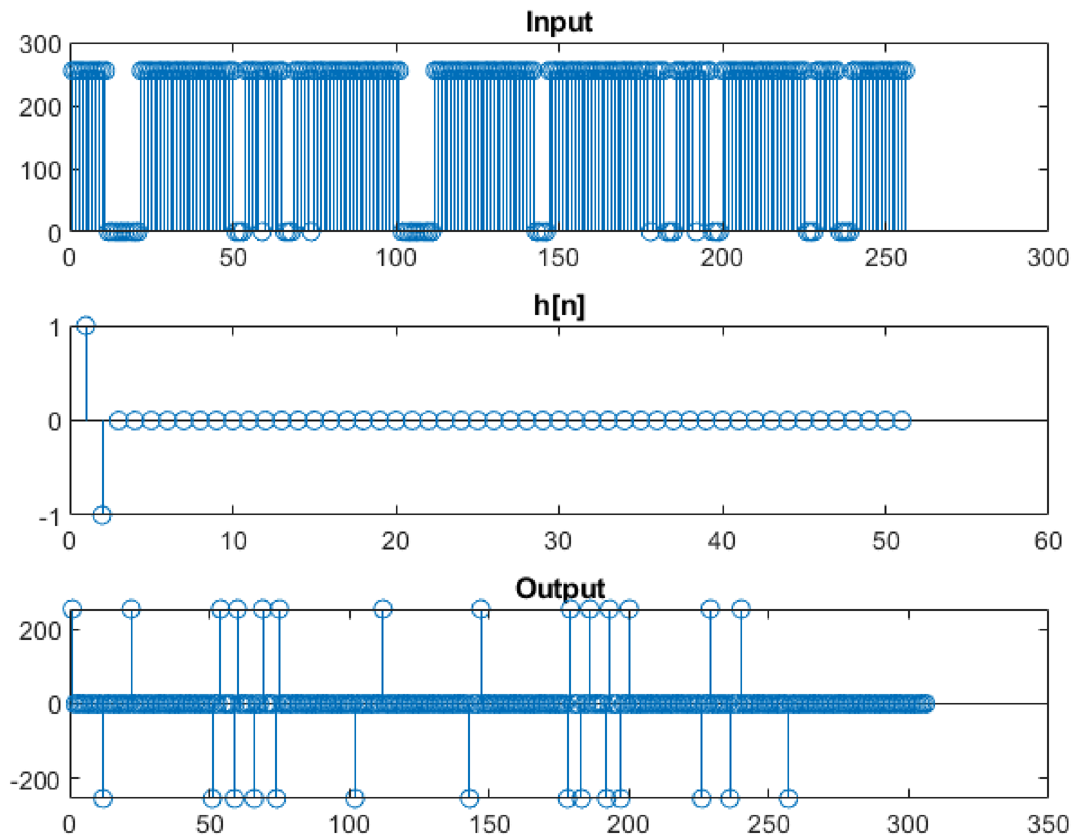

Task 4:

```
bar = imread("HP110v3.png");

% imshow(bar);

siz = size(bar)/2

xn = bar(siz(1)/2,:);

hn = (n==0) - (n==1);

yn = conv(xn, hn);

whos bar
```

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```
figure;
subplot 211; stem(xn);
title("Input");
subplot 212; stem(yn);
title("output");
```

The output has different magnitudes becaue the colors in the image are not completely black or white but there are colors in between black and white such as gray so that is why the output is not 255 but also low values upto 210.

The values with 1 are of 4 different lengths which are also seen in the filtered output and by taking difference of consecutive +ve and -ve values, we can calculate the width of the rows.

```
dn = (abs(yn) > 210);
figure;
stem(dn);
title("d[n]");
```

```
ln = find(dn)
```

The find fucntion is used to find the index of non zero values from a array.

```
deltan = conv(hn, ln);
```

```
figure;
subplot 211; stem(ln);
title("l[n]");
subplot 212; stem(deltan);
title("delta [n]");
```

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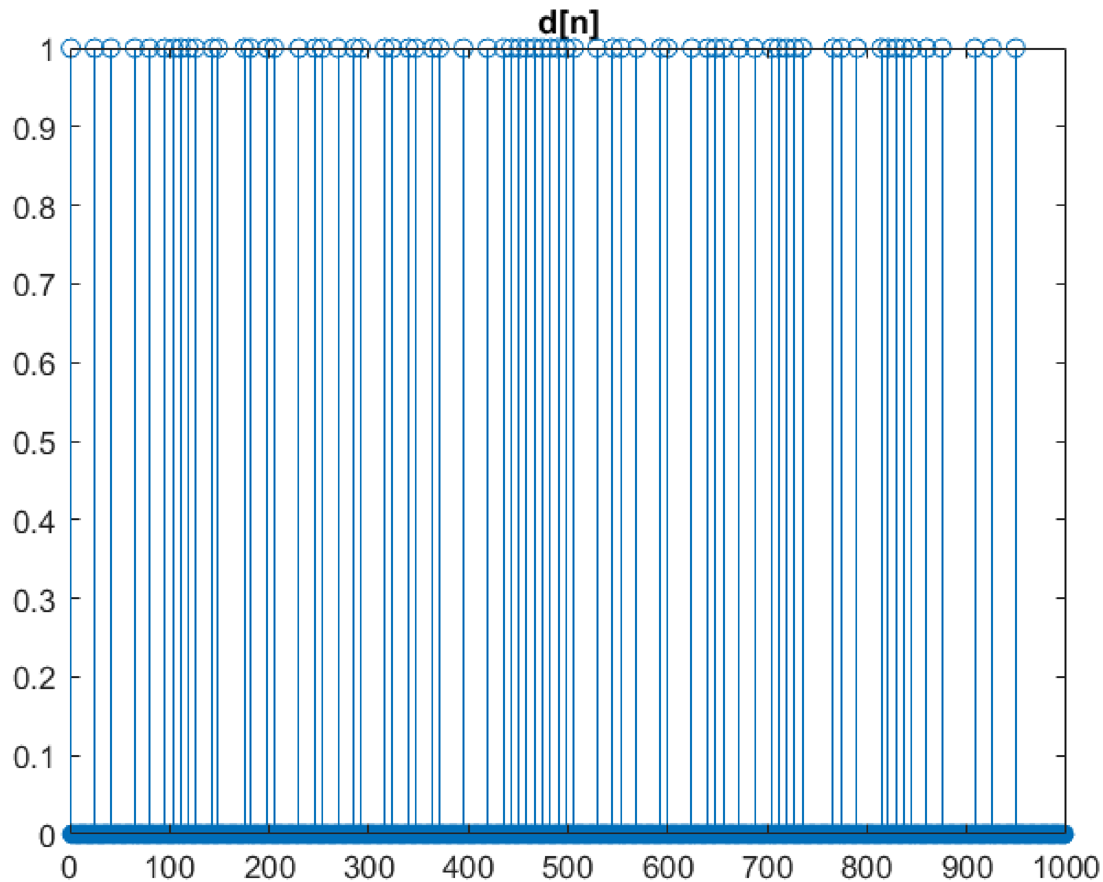

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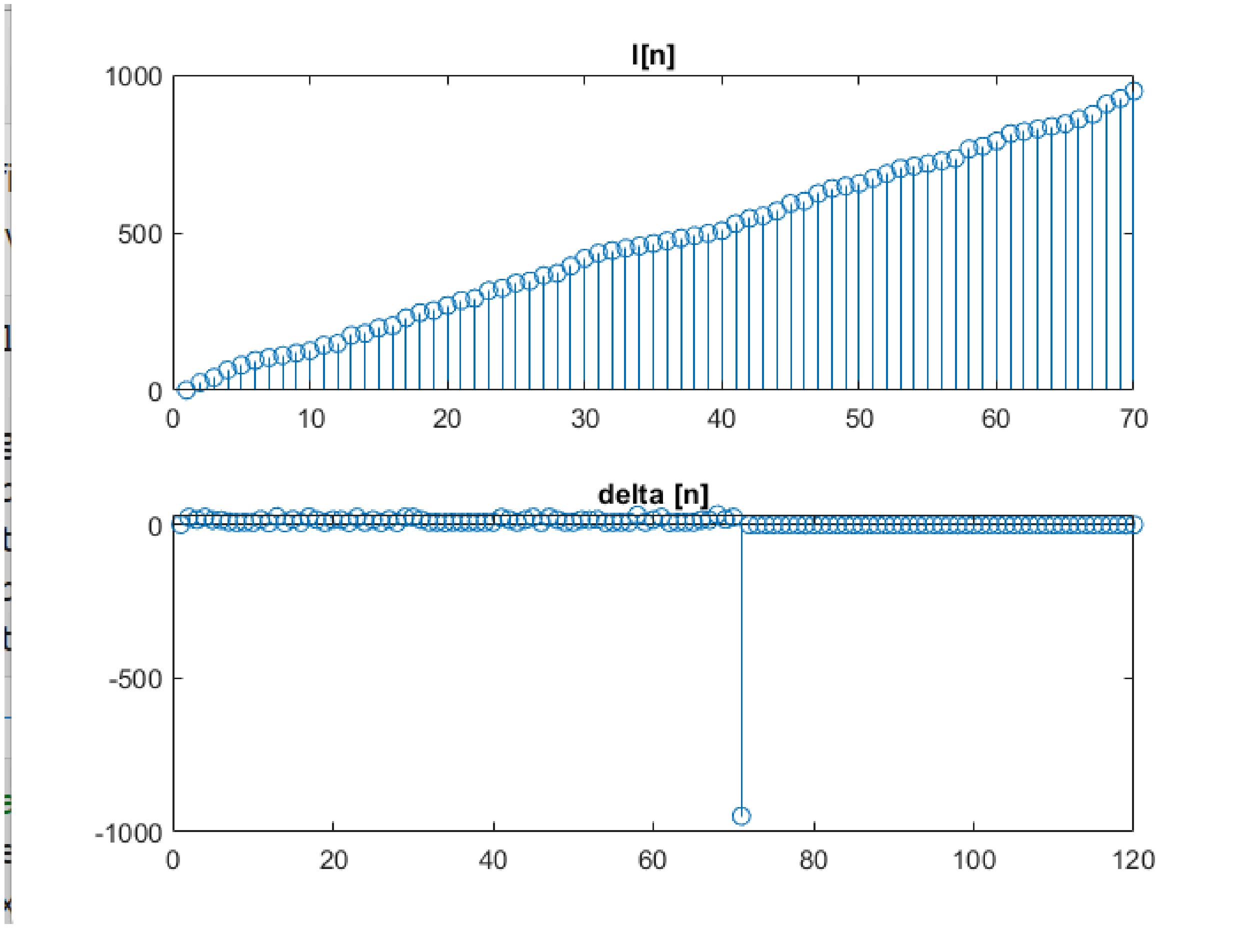

Task5:

```
%task 5:

theta = 95/12;

fixed_deltan = round((deltan(7:65))./theta)

figure;

stem(fixed_deltan)

title("Fixed deltan");

decodeUPC(fixed_deltan)
```

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