407 Comp Lab 3

Image sampling and quantization

Dr. Hewayda Lotfy

1-The x-axis of a histogram of a gray image is number of gray levels (ex, 0-255 for 8-bit image) and the y-axis is the number of pixels exist in image having that gray level. Displaying Image Histogram using the imhist command. Write a matlab code to construct an image histogram without using imhist. Compare your histogram and the imhist histogram. >>imhist(I) % shows the histogram of I

```
clear
clc
a=imread('pout.tif');
b=zeros(1,255);
for i=1:255
    x=find(a==i);
    b(i)=length(x);
end
subplot(1,2,1);imhist(a)
subplot(1,2,2);
bar(b)
xlim([0 255]);
ylim([0 1600]);
```

2-write a program to change the gray level quantization of an original image by reducing the number of bits per pixel from **8 to 7, 6, 5, 4, 3, 2** and 1 bit/pixel.

```
% Note: imshow(Y,colormap(gray(32)));  will just show the image with 32
levels but you can not save it in a variable

%here is how to reduce to 7-bit so 2^7= 128 so we divide the image by 2 to
%get in the range approximately from 0-128 according to image values
I=imread('pout.tif');
figure
imshow(I)
y = uint8(floor(double(I)/2));
figure, imshow(y,[])
```

```
clear
clc
a=imread('pout.tif');
b = a/2;

subplot(1,2,1);imshow(a)
subplot(1,2,2);imshow(b,[])
min(min(b))
max(max(b))
```

```
%Now check the minimum and maximum value of y
min(min(y))
max(max(y))
```

3- image arithmetic's

Compute

1. the average of 2 images , to add images they must be of same size

```
I = imread('path????\fount1.jpg')
imsum = double(I);
I1 = imread('cameraman.tif')
imsum = imsum+double(I1);
immean = imsum / 2;
figure, imshow(immean,[]);
```

```
clear
clc
x=randi([0 255],500,500);
y=randi([0 255],500,500);
z=(x+y)/2;
z=uint8(z);
subplot(1,3,1),imshow(x)
subplot(1,3,2),imshow(y)
subplot(1,3,3),imshow(z)
```

2. subtract two images to detect differences in similar images, to subtract images they must be of same size

```
clear
clc
x=randi([0 255],500,500);
y=randi([0 255],500,500);
z=x-y;
z=uint8(z);
subplot(1,3,1),imshow(x)
subplot(1,3,2),imshow(y)
subplot(1,3,3),imshow(z)
```

3. add images (must be of same size) to add more features to images

```
a= imread('path???\fount1.jpg');
b= imread('cameraman.tif');
c=imadd(a,b)
subplot(1,3,1), imshow (a)
subplot(1,3,2), imshow (b)
subplot(1,3,3), imshow (c)
```

```
clear
clc
x=randi([0 255],500,500);
y=randi([0 255],500,500);
z=x+y;
z=uint8(z);
subplot(1,3,1),imshow(x)
subplot(1,3,2),imshow(y)
subplot(1,3,3),imshow(z)
```

4. adding/ subtract a constant to an image

```
clear
clc
a=randi([0 255],500,500);
b=a+5;
b=uint8(b);
subplot(1,2,1),imshow(a)
subplot(1,2,2),imshow(b)
```

```
clear
clc
a=randi([0 255],500,500);
b=a-5;
b=uint8(b);
subplot(1,2,1),imshow(a)
subplot(1,2,2),imshow(b)
```

Problem 1: Demonstration of logical AND and OR operation with cameraman.tif image

```
a=imread('cameraman.tif');
b=zeros(size(a));
for x=100:200
   for y=100:200
      b(x,y)=255;
   end
end
b=uint8(b);
and=bitand(a,b);
or=bitor(a,b);
subplot(1,3,1);imshow(a);
subplot(1,3,2);imshow(and,[]);
subplot(1,3,3);imshow(or,[]);
```

Problem 2: -find all connected components using 8 neighbors in a binary image, without using the function "bwlabel".

```
clear
clc
img = imread('cameraman.tif');
a=imbinarize(img);
[r,c] = size(a);
b=zeros(r,c);
for i = 2:r-1
    for j = 2:c-1
     if isequal( a(i,j), a(i,j+1), a(i+1,j),a(i+1,j+1) )
          b(i,j) = a(i,j)+1;
          b(i,j+1) = a(i,j)+1;
          b(i+1,j) = a(i,j)+1;
          b(i+1,j+1) = a(i,j)+1;
      else
         b(i,j) = a(i,j);
      end
    end
end

[comp,num] = bwlabel(a,4);
subplot(2,2,1); imshow(img);
subplot(2,2,2); imshow(b,[]);
subplot(2,2,3); imshow(comp);
```