**BIM472 IMAGE PROCESSING**

**HOMEWORK #1**

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1. **Using Matlab**
   1. **Matlab commands** 
      1. **>> x = randperm(50);**It will return a random permutated array with numbers from 1 to 50.
      2. **>> a = [1:2:10; 11:2:20]';**It will create a matrix with two columns: first one will have elements from 1 to 10 but with a step equal to 2; second one will have elements from 11 to 20 with the same step. **>> b = a(2,:);** It will be a array with two elements from a’s second row.
      3. **>> f = randn(10,2);**It will create a matrix of normally distributed random numbers with 2 columns and 10 rows. **>> g = f(find(f < 1));**It will find all values less than 1 from the f matrix.
      4. **>> x = 0.5.\* ones(1,10);**It will create a matrix of 1 with 1 row and 10 columns, therefore it will multiply this matrix by 0.5(all its elements by 0.5). **>> y = 0.5+zeros(1,length(x));**It will create a matrix of 0 with 1 row and number of columns equal to the matrix x’s length, therefore it will add 0.5 to the matrix. **>> z = x + y;**It will sum both matrix x and matrix y.
      5. **>> a = [1:100];**It will create an array with elements from 1 to 100. **>> b = a([end:-1:1]);**It will create an array inverting the matrix a: it begins for a’s end, taking a negative step of 1, and it will finish in 1.
   2. **Grayscale image**A = uint8(randi(255,[100,100]));  
      imshow(A);
      1. Intensities of A in descendent order:

*A\_sorted = sort(reshape(A,[numel(A), 1]), 'descend');  
A\_sorted = reshape(A\_sorted, size(A));  
imshow(A\_sorted);*

* + 1. Intensity Histogram of A:

bins = 32  
maxA = max(A(:));

minA = min(A(:));

range = (maxA-minA)/bins;

hist = zeros(1,bins);

y = zeros(1,bins);

for i=1:bins

hist(i) = numel(A(A>=(minA+(i-1)\*range) & A<(minA+(i)\*range)));

y(i) = minA+(i-1)\*range;

end

bar(y,hist, 0.8, 'r');

axis([0 255 min(hist) max(hist)\*1.05])

grid on;

title('Intensity Histogram of A (20 windows)');

* + 1. A in RGB with mean of A as threshold

t = mean(A(:))  
Z = uint8(zeros(size(A\_sorted,1),size(A\_sorted,2),3));

ind = find(A>t);

[u, v] = ind2sub(size(A),ind);

for i=1:numel(ind)

Z(u(i),v(i),:) = [255,0,0];

end

imagesc(Z);

imshow(Z);

* + 1. Left quadrant of A  
       X = A(size(A,1)/2+1:size(A,1), 1:size(A,2)/2);

save('outputXPS0Q1.mat','X');

imagesc(X);

title('Bottom left quadrant of A');

* + 1. A without mean intensity value  
       Y = A - mean(A(:));

save('outputYPS0Q1.mat','Y');

imagesc(Y);

title('A - mean(A(:))');

* + 1. Roll of a 6-sided die  
       function count = rollDire(N)  
       rolls = randi(6,1,N);
    2. Y  
       y = [1: 12]  
       z = reshape(y,[4,3])
    3. Maximum value in A  
       x = max(A(:));  
       [r, c] = find(A == x);
    4. X in V  
       v = [1 8 8 2 1 3 9 8]  
       x = length(find(v==8))

1. Short programming example