ECE-5554 Computer Vision: Problem Set 0

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LaTeX

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Matlab Code

Answer Sheet

Short answer problems

1. Skipped.

2. (a) Creates a row vector containing random permutations of numbers between 1 and 1000.

   (b) Line 1: Creates a matrix:

$$a = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

   Line 2 assigns the second row of x to the variable b.

$$b = [4, 5, 6]$$

   (c) Creates a matrix:

$$a = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Line 2 assigns the all the values the variable b in column vector form.

$$b = \begin{bmatrix} 1 \\ 4 \\ 7 \\ 2 \\ 5 \\ 8 \\ 3 \\ 6 \\ 9 \end{bmatrix}$$

(d) Line 1 creates the column vector f [1×10] with the normally distributed random values.

Line 2 sets another variable and fills it with the elements of f which are above 0.

(e) Line 1 sets a row vector [1×10] with zeros and adds 0.5 to each element of it.

$$x = [0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5]$$

Line 2 creates another row vector with the same size of vector x [1×10], and multiplies each element of new row vector with 0.5.

$$y = [0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5]$$

Line 3 sums vector x and y and assigns the result to z.

$$z = x + y$$

$$z = [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]$$

(f) Line 1 creates a row vector [1×100] which contains the sequence starting from 1 to 100 (inclusive).

$$a = [1, 2, 3, 4 \ldots 98, 99, 100]$$

Line 2 flips the vector and sets vector b with these values.

$$a = [100, 99, 98, 97 \ldots 3, 2, 1]$$

3. The code is in PS0_1-3.m file.

(a)
```
function result = diceTrials(n)
    if(n>0)
        result = uint8(rand([1,n])*5)+1;
    else
        result = 'You may wanna not to do that operation,
           the number of trials must be greater than 0';
        error(result)
end
```

(b)

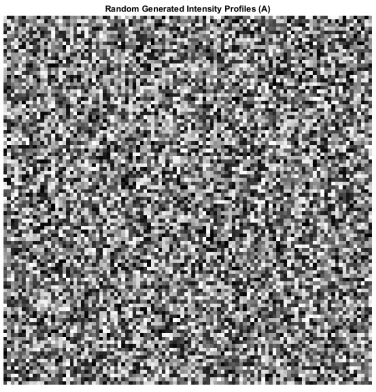
(c)

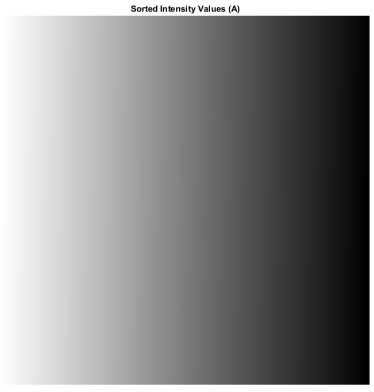
(d)
```
%% clear workspace , and command window, close all figures
    already open.
clear all, close all, clc;
%% PS0-1.3a
diceResults = diceTrials(99);
%% PS0-1.3b
% y = [1, 2, 3, 4, 5, 6]'
y = (1:6)';
% z = [1, 3, 5; 2, 4, 6]
z = reshape(y,[2,3]);
%% PS0-1.3c
% find the max value of matrice y and of which indice
```

```
[x, I] = max(y);
% convert indice to subscripts (row and column number)
[r, c] = ind2sub(size(z),I);
%% PS0-1.3d
% create vector v = [1, 8, 8, 2, 1, 3, 9, 2]
v = [1,8,8,2,1,3,9,2];
% alter the value of vector x
% the problem can be solved by two different approach
% 1 - x = numel(v(v==1))
% 2 - x = sum(v==1)
x = numel(v(v==1));
```

4. The code is in PS0Q1.m file.

   (a) Randomly generated intensity and the result of sort process.





   (b)

   (c)

   (d)

(e)
```
%% clear workspace , and command window, close all figures
    already open.
clear all, close all, clc;
figure(1);
A = uint8(randi(255,[100,100]));
subplot(2,2,1), imshow(A);
title('Random Generated Intensity Profiles (A)')
save('inputAPS0Q1.mat', 'A');
load('inputAPS0Q1.mat', 'A');
%% PS-0 4a
A_sorted = sort(reshape(A,[numel(A), 1]), 'descend');
A_sorted = reshape(A_sorted, size(A));
subplot(2,2,2), imshow(A_sorted);
title('Sorted Intensity Values (A)')
%% PS-0 4b
bins = 20;
maxA = max(A(:));
minA = min(A(:));
range = (maxA-minA)/bins;
hist = zeros(1,bins);
y = zeros(1,bins);
for i=1:20
    hist(i) = numel(A(A>=(minA+(i-1)*range) & A<(minA+(i)*
        range)));
    y(i) = minA+(i-1)*range;
end
subplot(2,2,3), bar(y,hist, 0.8, 'r');
```

```
26 axis([0 255 min(hist) max(hist)*1.05])
27 grid on;
28 title('Intensity Histogram of A (20 windows)');
29 %% PS-0 4c
30 % X = A_sorted(size(A,1)/2:size(A,1), 0:size(A,2)/2);
31 X = A_sorted(size(A_sorted,1)/2+1:size(A_sorted,1), 1:size
       (A_sorted,2)/2);
32 save('outputXPS0Q1.mat','X');
33 subplot(2,2,4), imagesc(X);
34 %% PS-0 4d
35 Y = A - mean(A(:));
36 save('outputYPS0Q1.mat','Y');
37 figure(2);
38 imagesc(Y);
39 %% PS-0 4e
40 Z = uint8(zeros(size(A_sorted,1),size(A_sorted,2),3));
41 ind = A(A>mean(A(:)));
42 [u v] = ind2sub(size(A),ind);
43 for i=1:numel(ind)
44     Z(u(i),v(i),:) = [255,0,0];
45 end
46 figure(4);
47 imshow(Z);
```

Short Programming Question

1.

2.

3.

4.