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 matrix f 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 $[1 \times 10]$ 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 $[1 \times 10]$, 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 $[1 \times 100]$ 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
```
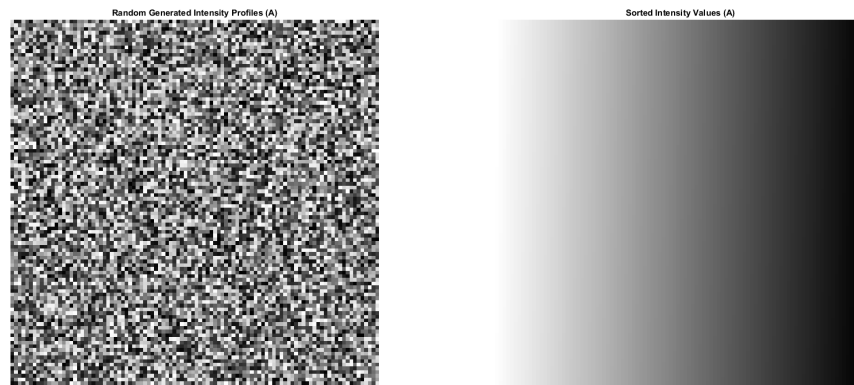
```
12  [x, I] = max(y);
13  % convert indice to subscripts (row and column number)
14  [r, c] = ind2sub(size(z),I);
15  %% PS0-1.3d
16  % create vector v = [1, 8, 8, 2, 1, 3, 9, 2]
17  v = [1,8,8,2,1,3,9,2];
18  % alter the value of vector x
19  % the problem can be solved by two different approach
20  % 1 - x = numel(v(v==1))
21  % 2 - x = sum(v==1)
22  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)

```matlab
(e) %% clear workspace , and command window , close all figures
        already open .
2  clear all , close all , clc ;
3  figure ( 1 ) ;
4  A = uint8 ( randi ( 255 ,[100 ,100]) ) ;
5  subplot ( 2 ,2 ,1 ) , imshow (A) ;
6  title ( 'Random Generated Intensity Profiles (A) ')
7  save ( 'inputAPS0Q1 . mat ' , 'A' ) ;
8  load ( 'inputAPS0Q1 . mat ' , 'A' ) ;
9  %% PS−0 4a
10  A_sorted = sort ( reshape (A,[ numel (A) , 1]) , 'descend ') ;
11  A_sorted = reshape ( A_sorted , size (A) ) ;
12  subplot ( 2 ,2 ,2 ) , imshow ( A_sorted ) ;
13  title ( 'Sorted Intensity Values (A) ')
14  %% PS−0 4b
15  bins = 20;
16  maxA = max (A( : ) ) ;
17  minA = min (A( : ) ) ;
18  range = (maxA−minA) / bins ;
19  hist = zeros ( 1 , bins ) ;
20  y = zeros ( 1 , bins ) ;
21  for i =1:20
22      hist ( i ) = numel (A(A>=(minA+(i −1)∗range ) & A<(minA+(i )∗
          range ) ) ) ;
23      y ( i ) = minA+(i −1)∗range ;
24  end
25  subplot ( 2 ,2 ,3 ) , bar (y, hist , 0 . 8 , 'r ') ;
```

```matlab
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.