CS 216 Homework 1

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Due Date: April 9

Problem 4

Problem 4a

The variable x will be assigned to an array that is the numbers 1 through 5 arranged in a random order.

Problem 4b

The variable a will be assigned to an array that is the numbers 1 through 10 arranged in chronological order. The variable b will end up being assigned an array that is the numbers $1, 4, 7, 10$ because it is the first number and then every third number after that.

Problem 4c

The variable f will be assigned to an array that is the numbers 1501 to 2000 in chronological order. The variable g will be assigned to the indices of f where the entries are greater than 1850 which is 351 to 500. The variable h will then be assigned an array that is the numbers 1851 to 2000.

Problem 4d

The variables x will be assigned to a vector of 10 entries where each entry has value 22. The variable y will be assigned the sum of the entries which will be 220.

Problem 4e

The variable a will be assigned an array that is the numbers 1 to 1000 in chronological order. The variable b will be assigned a vector that is the numbers 1 to 1000 in reverse order.

Problem 5

Figure 1: Original Image from the Internet

Figure 2: Modified 100 by 100 image

Figure 3: Modified 100 by 100 image in grayscale

Here is the initialization code:

```
A = rgb2gray(imread('modifiedImageProb5.jpg'));
A = im2double(A);
imwrite(A,'blackWhiteImage.jpg','JPEG');
```

Problem 5a

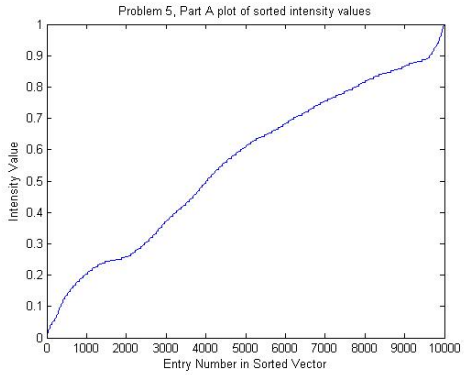

Figure 4: Plot of Intensity Values

Here is the code used to get the plot:

```
singleVectorA = A(:);
sortedValuesA = sort(singleVectorA);
figure
plot(sortedValuesA);
xlabel('Entry Number in Sorted Vector');
ylabel('Intensity Value');
title('Problem 5, Part A plot of sorted intensity values');
```

Problem 5b

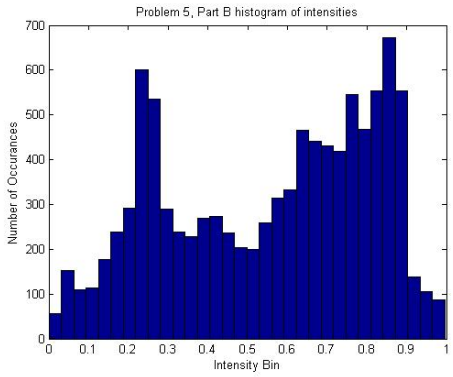

Figure 5: Histogram of Intensities with 32 bins

Here is the code used to get the plot:

```
figure
hist(singleVectorA,32);
xlabel('Intensity Bin');
ylabel('Number of Occurances');
title('Problem 5, Part B histogram of intensities');
```

Problem 5c

Figure 6: Binary Image using 0.65 as the threshold

Here is the code used to get the image:

```
threshold = 0.65;
binaryA = zeros(size(A));
```

```
binaryA(A > threshold) = 1;
imwrite(binaryA,'partCimage.jpg','JPEG');
```

Problem 5d

Figure 7: Bottom Right Quadrant of A

Here is the code used to get the image:

```
sizeA = size(A);
sizeAhoriz = sizeA(1);
sizeAvert = sizeA(2);
bottomRightA = A(sizeAhoriz/2:sizeAhoriz,sizeAvert/2:sizeAvert);
imwrite(bottomRightA,'partDimage.jpg','JPEG');
```

Problem 5e

Figure 8: New image with mean subtracted

Here is the code used to get the image:

```
meanBrightness = mean(singleVectorA);
meanSubtractedA = A-meanBrightness;
meanSubtractedA( meanSubtractedA < 0) = 0;
imwrite(meanSubtractedA,'partEimage.jpg','JPEG');
```

Problem 5f

```
function [ result ] = diceRoll_partF()
%DICEROLL_PARTF Summary of this function goes here
%   Detailed explanation goes here

result = floor(rand(1)*6) + 1;

end
```

Problem 5g

```
y = [1:6];
z = reshape(y,3,2);
```

Problem 5h

Result is that $x = 0$ and $[r, c] = [95, 99]$. Code to accomplish it is the following

```
x = min(singleVectorA);
[r,c] = find(A==x,1);
```

Problem 5i

The result is 5 unique values. Here is the code that was used:

```
v = [1 8 8 2 1 3 9 8];
sizeUniqueV = size(unique(v));
numUnique = sizeUniqueV(2);
```

Problem 5 Compiled Code

Here is the entire script used for problem 5, except for part F which was a separate function. This just puts all the code pieces from the previous sections together:

```
A = rgb2gray(imread('modifiedImageProb5.jpg'));
A = im2double(A);
imwrite(A,'blackWhiteImage.jpg','JPEG');

%Part A
singleVectorA = A(:);
sortedValuesA = sort(singleVectorA);
figure
plot(sortedValuesA);
xlabel('Entry Number in Sorted Vector');
ylabel('Intensity Value');
title('Problem 5, Part A plot of sorted intensity values');

%Part B
figure
hist(singleVectorA,32);
xlabel('Intensity Bin');
ylabel('Number of Occurances');
title('Problem 5, Part B histogram of intensities');

%Part C
threshold = 0.65;
binaryA = zeros(size(A));
binaryA(A > threshold) = 1;
imwrite(binaryA,'partCimage.jpg','JPEG');

%Part D
sizeA = size(A);
sizeAhoriz = sizeA(1);
sizeAvert = sizeA(2);
bottomRightA = A(sizeAhoriz/2:sizeAhoriz,sizeAvert/2:sizeAvert);
imwrite(bottomRightA,'partDimage.jpg','JPEG');

%Part E
meanBrightness = mean(singleVectorA);
```

```
meanSubtractedA = A-meanBrightness;
meanSubtractedA( meanSubtractedA < 0) = 0;
imwrite(meanSubtractedA,'partEimage.jpg','JPEG');

%diceRoll_partF.m is part F

%Part G
y = [1:6];
z = reshape(y,3,2);

%Part H
x = min(singleVectorA);
[r,c] = find(A==x,1);

%Part I
v = [1 8 8 2 1 3 9 8];
sizeUniqueV = size(unique(v));
numUnique = sizeUniqueV(2);
```