ECE4445 / MBP4445 / ECE9021 / ECE9201 / BME9509 / MBP9509

INTRODUCTION TO DIGITAL IMAGE PROCESSING

POSSIBLE SOLUTIONS TO PRACTICE PROBLEMS – POINT OPERATIONS

Question 1

`imcontrast` was demonstrated in class (See video lecture 2).

Question 2 (a)

Output is `im2 = [2 1 9; 7 8 5; 4 6 3]`.

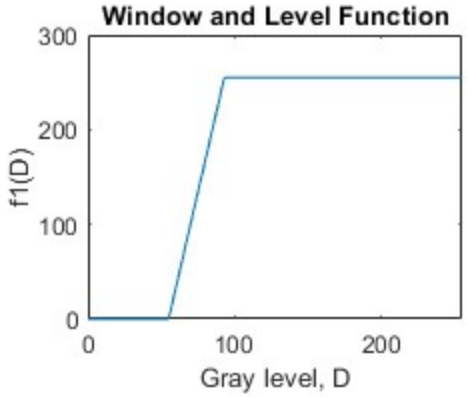
In the statement `im2=f(im)`, each element of `im` is treated as an index into `f`, thus resulting in an output matrix `im2` of the same size as `im` with element values generated by using `im` as an index into `f`. In other words, `im2=f(im)` allows you to apply the point operation `f` to the image `im` to generate another image `im2` without the use of `for` loops, which are inefficient in MATLAB.

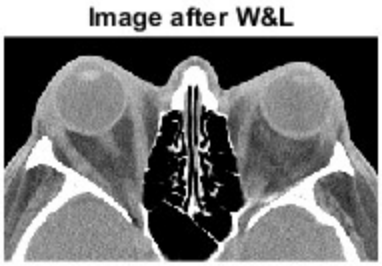
Question 2 (b)

Commands used:

```
im=imread('head.tif');
L=74;
W=38;
f1 = [zeros(1,L-W/2+1), (255/W)*(1:W), 255*ones(1,256-L-W/2-
1)];
f1=uint8(round(f1));
im2=f1( double(im) + 1 );
gl=0:255;
subplot(221), plot(gl,f1)
set(gca, 'xlim', [0 255], 'ylim', [0 300]) % Pretty up axes
xlabel('Gray level, D')
ylabel('f1(D)')
title('Window and Level Function')
subplot(223), imshow(im)
title('Original Image')
subplot(224), imshow(im2)
title('Image after W&L')
```

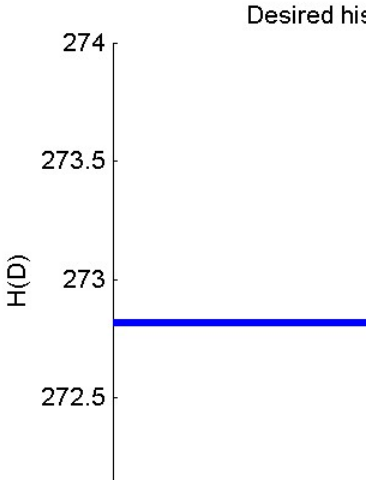
You may wish to expand the window to full screen to better view the various plots.





Question 3

See M-file `match.m` on OWL site. (Will be released after Assignment 2 is submitted.)



The vector h was generated using the commands:

```
im = imread('pout.tif');
A0 = prod(size(im));
h = ones( 1, 256 ) * (A0/256);
```

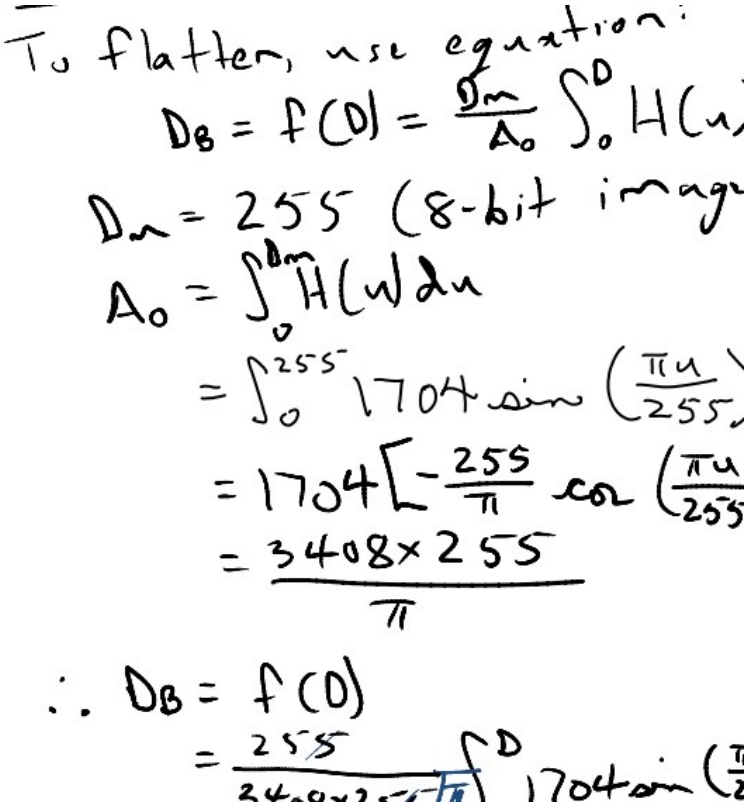
Note that the function as written will accept a vector h that is not of type uint8.

To generate the image and above figure, type:

```
im2 = match(im, h);
imshow(im2)
figure, stem(0:255, h)
```

Question 4

First bullet:

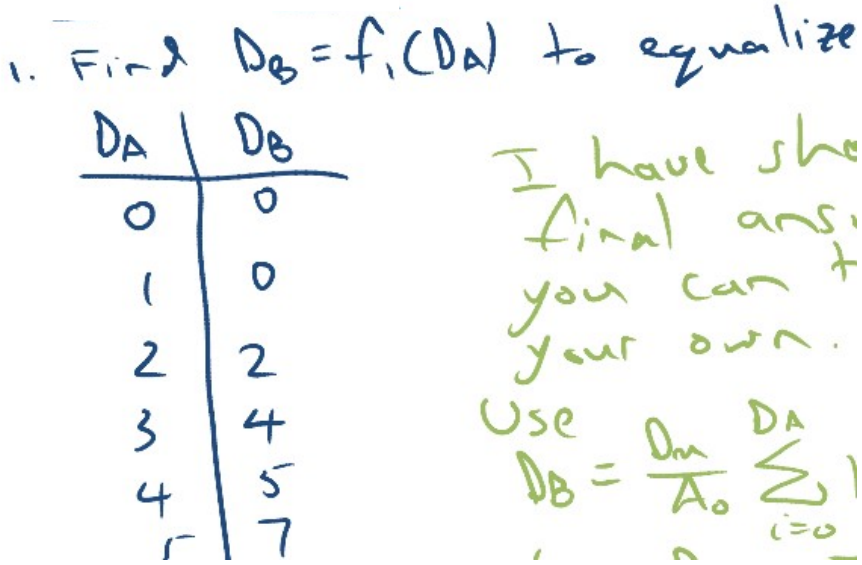


Second bullet: See lecture on histogram matching.

Question 5

See notes on page 4, topmost table in PDF on histogram matching derivation for final answer.

Question 6



2. Find $D_B = f_2(D_C)$ to equali

D_C	D_B
0	0
1	1
2	2
3	4
4	5
5	6
6	7
7	7

3. Find inverse mapping from D_B

D_B	D_C
0	0
1	1
2	2
3	2
4	3
5	4
6	5
7	6

specify m