Homework 1

ECE 253

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- **Problem 1. MATLAB basics**

  i.
  A =   B =

  ```
   3   9   5   1        0   1   0   1
   4  25   4   3        0   1   1   1
  63  12  23   9        0   0   0   1
   6  23  77   0        1   1   0   1
  12   8   5   1        0   1   0   0
  ```

  ii.   C =

  ```
  0   9   0   1
  0  25   4   3
  0   0   0   9
  6  23   0   0
  0   8   0   0
  ```

  iii.   product1 =

  ```
  0  200   0   0
  ```

iv.   maxValue =
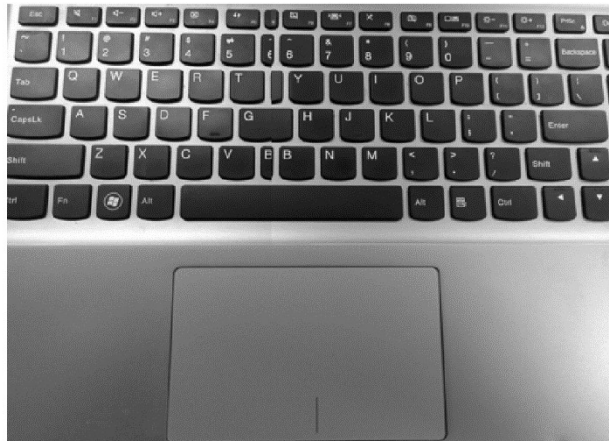
25

minValue =

0

maxValue index: (2,2)

minValue index: (1,1), (2,1), (3,1), (5,1), (3,2), (1,3), (3,3), (4,3), (5,3), (4,4), (5,4)
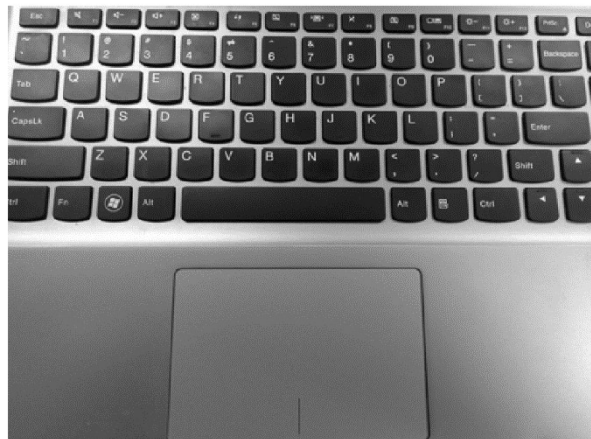
● **Problem 2. Simple image manipulation**

- **Problem 3. Keyboard Conundrum**

  i.   When k = 0:

  ii. When k = 15:

  k = 15 is the best k I got.

- Appendix

```
%% Problem 1: MATLAB basics


% i: Input A and B

A = [3 9 5 1; 4 25 4 3; 63 12 23 9; 6 23 77 0; 12 8 5 1];

B = [0 1 0 1; 0 1   1 1; 0 0 0 1; 1 1 0 1; 0 1 0 0];


% ii: Point-wise multiply A with B and set it to C.

C = A.*B;


% iii: Calculate the inner product of 2nd row and 5th row of C.

product1 = C(2, :) .* C(5, :);


% iv: Find the minimum and maximum values and their corresponding row

and column indices in Matrix C

maxValue = max(C(:));

[rowIndex_max, colIndex_max] = find(C == maxValue);

minValue = min(C(:));

[rowIndex_min, colIndex_min] = find(C == minValue);

%% Problem 2: Simple image manipulation

% i: Download any color image from the Internet with a spatial resolution of no
```

more than (720 X 480). Read this image into MATLAB. Call this image A.

A = imread('Surface-Book.jpg');

% ii: Transform the color image to grey-scale. Verify the values are between 0

and 255. If not, please normalize your image from 0 to 255. Call this image B.

B = rgb2gray(A);

% iii: Add 20 to each value of image B. Set all pixel values greater than 255 to

255. Call this image C

C = imadd(B, 20);

% iv: Flip image B along both the horizontal and vertical axis. Call this image

D.

D1 = flip(B, 2); % horizontal

D = flip(D1, 1); % vertical

% v: Calculate the median of all values in image B. Next, threshold image B

by the median value

% you just calculated i.e. set all values greater than median to 1 and set all

values less than or

% equal to the median to 0. Name this binary image E.

```matlab
medianB = median(B(:));

E = zeros(size(B,1), size(B,2));

for x = 1:size(B, 2)

    for y = 1:size(B,1)

        if B(y, x) > medianB

            E(y,x) = 1;

        else

            E(y,x) = 0;

        end

    end

end


figure(1)

subplot(5, 1, 1)

imshow(A)

subplot(5, 1, 2)

imshow(B)

subplot(5, 1, 3)

imshow(C)

subplot(5, 1, 4)

imshow(D)

subplot(5, 1, 5)
```

```
imshow(E)


%% Problem 3

img = merge('D:\ucsd\ece253\laptop_left.png',

'D:\ucsd\ece253\laptop_right.png', 0);

figure(1)

imshow(img);

img = merge('D:\ucsd\ece253\laptop_left.png',

'D:\ucsd\ece253\laptop_right.png', 15);

figure(2)

imshow(img);



function [ img ] = merge( file1, file2, ncol )

    left = imread(file1);

    right = imread(file2);

    [a1, b1, c1] = size(left);

    [a2, b2, c2] = size(right);

    img(1:a1, 1:b1) = left(1:a1, 1:b1);

    img(1:a2, b1+1:b1+b2-ncol) = right(1:a2, 1+ncol:b2);

end
```