MATLAB Assignment 2

Spring 2019, Section B

This problem set will cement your understanding of array operations and go over several important built in functions. It also explores relational and logical indexing of matrices as well as basic plotting in MATLAB.

As with all the homeworks, please submit it as a *.m* file, with suppressed output. Remember that all lectures and homeworks may be found at *github.com/guybaryosef/ECE210-materials*. Homework is due on ——— to guybymatlab@gmail.com.

1. Lunar Eclipse This question guides you through some basic image processing techniques in MATLAB. You will create interesting images with relational and logical indexing, as well as the *imshow* function to visualize what you have created.

- Create a 100×100 A where its contents are all ones.

- Create a 100×100 B where its contents are all zeros.

- In matrix A, set the values of entry $a_{i,j}$ equal to 0 if $\sqrt{(i-50)^2 + (j-50)^2} < 20$. **Hint** : *meshgrid* would be useful in creating the indices.

- In matrix B, set the values of entry $a_{i,j}$ equal to 1 if $\sqrt{(i-40)^2 + (j-40)^2} < 20$.

- Visualize the following results with **figure** and **imshow**. Describe each of the results with one sentence each.

  - A

  - B

  - Intersection between A and B

  - Union between A and B

  - Complement of intersection between A and B

  - Complement of union between A and B

2. Array Foray Perform the following matrix operations.

(a) Use **reshape** to create a 10×10 matrix A where $A = \begin{bmatrix} 1 & 11 & ... & 91 \\ 2 & 12 & ... & 92 \\ \vdots & \vdots & \ddots & \vdots \\ 10 & 20 & ... & 100 \end{bmatrix}$.

(b) Use ***magic*** to create a 10×10 magic matrix B. Use B to create a matrix C which has the same diagonal values of B and is zero elsewhere. **Note**: You might want to look up ***diag*** to see how to do this elegantly.

(c) Flip the second column of B such that the column is inverted up down.

(d) Flip the matrix A from left to right.

(e) Make *cSum* the column-wise sum of every column of AB (normal matrix multiplication). The result should be a row vector.

(f) Make *cMean* the row-wise mean of every row of AB (element-wise matrix multiplication). The result should be a column vector.

(g) Delete the last column of A.