Digital Signal Processing Lab - CSE 4632

Summer 2015, IUT

Classwork 1

1. Write down the commands for each of the following operations:
    a. Create a row vector x of 5 equally spaced elements between 2 and 3 add 1 to the second element
    b. Create a second row vector y of same dimension with elements equal to the successive even integers starting with 4.
    c. Create the matrix A, whose first row is equal to x, whose second row is a line of ones, and whose third row is equal to y.
    d. Define a row vector z, whose elements are equal to the mean value of the columns of A.
    e. Define a column vector zz, whose elements are the sum of the elements in each rows of A.
2. Create two matrices A and B:

$$A = \begin{pmatrix} 1 & 2 \\ 4 & -1 \end{pmatrix}, \qquad B = \begin{pmatrix} 4 & -2 \\ -6 & 3 \end{pmatrix}$$

    a. Compute C_1 = A+B and C_2 = A-B
    b. Compute the matrix products D_1 = AB and D_2 = BA
    c. Using element wise operations, compute the matrix F whose elements are computed as follows, $f_{ij} = b_{ij} + a_{ij}{b_{ij}}^{1/4}$
    d. In A, subtract from the second row, the first row multiplied by 4
3. Create a vector a with elements

$$a_n = \frac{(-1)^n \pi^{2n}}{(2n)!}, 0 \le n \le 100$$

    Compute the sum of the elements of vector a

4. Given x `= [7 6 1 2 0 -1 4 3 -2 0]`, what are the commands that will execute the following operations?
    a. Sets the negative values of x to zero.
    b. Extract the values of x greater than 3 in a vector y.
    c. Add 3 to the values of x that are even.
    d. Set the values of x that are less than the mean to zero.
    e. Set the values of x those are greater than the mean to their difference with the mean.
5. In MATLAB, plot the functions x, x^3, e^x and e^{x^2} over the interval 0 < x < 5. Learn about the command **`hold`** and apply it. Use labels and titles for your plot.
6. Following is an equation which is used to calculate the growth of population of a certain country where t is the year in AD format (2013, 1921 etc.)

$$P(t) = 197273000/(1 + e^{-0.0313(t-1913.26)})$$

a. Write a MATLAB function that takes two values of t (t_1 and t_2) and plots the population in that range.
b. Verify your function by setting values of t_1 = 1810 and t_2 = 2013
c. What will be predicted population in the year 2021?

7. Check the help for `diag` and use it (may be more than once) to build the following 16X16 matrix:

$$D = \begin{bmatrix} -2 & 1 & 0 & 0 & \cdots & 0 & 1 \\ 1 & -2 & 1 & 0 & \cdots & 0 & 0 \\ 0 & 1 & -2 & 1 & 0 & \cdots & 0 \\ \vdots & \ddots & \ddots & \ddots & \ddots & \ddots & \vdots \\ 0 & \cdots & 0 & 1 & -2 & 1 & 0 \\ 0 & 0 & \cdots & 0 & 1 & -2 & 1 \\ 1 & 0 & 0 & \cdots & 0 & 1 & -2 \end{bmatrix}$$