

CmpE 362 Homework 1 : Getting Started with MATLAB

Prof. Dr. Fatih ALAGOZ
TA : Yekta Said CAN

Deadline : 01 / 03 / 2018 - 23:59 (Sharp)

1 Description

1.1 Problem 1

Record your voice with as highest frequency as possible. Save the file as highFreq.wav. Plot the signal on both time and frequency domain (for frequency domain you can use spectrogram). Mark your highest frequency. As a second step, record your voice with lowest frequency. Save the file as lowFreq.wav. Plot the signal on both time and frequency domain (for frequency domain you can use spectrogram). Mark your lowest frequency. Determine your voice spectra and put in your report. Create a script called problem1.m for this question.

1.2 Problem 2

Suppose you have number of .csv files on some folder (possibly inside subfolders also). Read all csv files on a given folder. Folder name in the working directory will be given you as an input. Determine all the peaks for signals inside all of these csv. files. Plot all of these signals on time domain and mark detected peaks by using MATLAB plot function properties. Examine these plots by looking at them and analyze peaks that you have found or missed. Describe reasons why the algorithm missed some peaks by demonstrating examples in your report. (An example input csv files is provided in files as exampleSignal.csv) Create a script called problem2.m for this question.

1.3 Problem 3

For problems 3-10, write a script called signalAndNoise.m and put all the commands in it. Separate and label different problems using comments.

Let x is vector of real numbers (-100:100)

plot y1 = sinx, y2=sin50x, y3=50sinx, y4= sinx+50,y5= sin(x+50),y6= 50sin50x, y7= x*sinx, y8=sinx/x

Use 4x2 subplot to fit all subfigures belong to a single figure (Hint: write help for SUBPLOT in MATLAB)

1.4 Problem 4

Let x is vector of real numbers (-20:20)

Plot y1 = sinx, y2=sin50x, y3=50sinx, y4= sinx+50,y5= sin(x+50),y6= 50sin50x, y7= x*sinx,

$y_8 = \sin x / x$, $y_9 = y_1 + y_2 + y_3 + y_4 + y_5 + y_6 + y_7 + y_8$

Use 5x2 subplot to fit all subfigures belong to a single figure

1.5 Problem 5

randn generates zero-mean, unit variance Gaussian distributed random number in (-,.) . Generate 41 random numbers following Gaussian distributed random numbers, call this as vector z.

Plot $y_{10} = z$, $y_{11} = z + x$, $y_{12} = z + \sin x$, $y_{13} = z \sin x$, $y_{14} = x \sin z$, $y_{15} = \sin(x + z)$, $y_{16} = z \sin 50x$, $y_{17} = \sin(x + 50z)$ $y_{18} = \sin x / z$, $y_{19} = y_{11} + y_{12} + y_{13} + y_{14} + y_{15} + y_{16} + y_{17} + y_{18}$

Use 5x2 subplot to fit all subfigures belong to a single figure

1.6 Problem 6

rand generates uniformly distributed random number in [0,1] . Generate 41 random numbers following uniformly distributed random numbers.

Plot $y_{20} = z$, $y_{21} = z + x$, $y_{22} = z + \sin x$, $y_{23} = z \sin x$, $y_{24} = x \sin z$, $y_{25} = \sin(x + z)$, $y_{26} = z \sin 50x$, $y_{27} = \sin(x + 50z)$ $y_{28} = \sin x / z$, $y_{29} = y_{21} + y_{22} + y_{23} + y_{24} + y_{25} + y_{26} + y_{27} + y_{28}$

Use 5x2 subplot to fit all subfigures belong to a single figure

1.7 Problem 7

Starting with z (0,1) Gaussian(Normal) Random variable. (Use help menu for hist)

- Generate 10000 random variables with mean 0, variance 1; call it r1 vector
 - Generate 10000 random variables with mean 0, variance 4; call it r2 vector
 - Generate 10000 random variables with mean 0, variance 16; call it r3 vector
 - Generate 10000 random variables with mean 0, variance 256; call it r4 vector
- Plot hist(r1), hist(r2), hist(r3), hist(r4) on the same figure for comparison purposes

1.8 Problem 8

Starting with z (0,1) Gaussian Random variable. (Use help menu for hist)

- Generate 10000 random variables with mean 10, variance 1; call it r6 vector
 - Generate 10000 random variables with mean 20, variance 4; call it r7 vector
 - Generate 10000 random variables with mean -10, variance 1; call it r8 vector
 - Generate 10000 random variables with mean -20, variance 4; call it r9 vector
- Plot hist(r6), hist(r7), hist(r8), hist(r9) on the same figure for comparison purposes

1.9 Problem 9

Starting with z (0,1) uniformly distributed random variable.

- Generate 10000 random variables with mean 0, variance 1; call it r11 vector
 - Generate 10000 random variables with mean 0, variance 4; call it r21 vector
 - Generate 10000 random variables with mean 0, variance 16; call it r31 vector
 - Generate 10000 random variables with mean 0, variance 256; call it r41 vector
- Plot hist(r11), hist(r21), hist(r31), hist(r41) on the same figure for comparison purposes

1.10 Problem 10

Starting with z (0,1) uniformly distributed random variable. (Use help menu for hist)

- a. Generate 10000 random variables with mean 10, variance 1; call it r61 vector
- b. Generate 10000 random variables with mean 20, variance 4; call it r71 vector
- c. Generate 10000 random variables with mean -10, variance 1; call it r81 vector
- d. Generate 10000 random variables with mean -20, variance 4; call it r91 vector

Plot `hist(r61)`, `hist(r71)`, `hist(r81)`, `hist(r91)` on the same figure for comparison purposes

2 Report Preperation

Put the figures and explanations about questions into your report. Report must be a pdf file. Briefly describe what you have learnt from the above plots (plots from Questions 3-10) in your report. Furthermore, briefly describe what you have learnt about MATLAB. What were the challenges that you faced? What are the differences (advantages and disadvantages) between MATLAB and the other programming languages you have learned so far?

3 Submission and Grading

Prepare a report (pdf file) includes your code , explanations and comments of your code for each question. Compress the report and code files. Name it as "YourNumber CmpE362 HW1.rar. Upload the file by using canvas before the deadline.

4 Notes

Deadline is strict. Do not send after deadline. When copying is detected, both parties will get zero.