Assignment 6: Matlab Input/Output

Date Due: March 19, 2021   Instructor: Trani

Problem 1

Data containing bus assets of a mass transit company are summarized in the file named BusCompany_Data.xls.

	A	B	C	D	E
1	City	Bus Type	Age	Miles	Route length
2	Charlotte	New Flyer MiDi35	7	398324	25.6
3	Charlotte	New Flyer MiDi35	8	335600	42.0
4	Seattle	New Flyer XDE40	9	552353	34.0
5	Charlotte	New Flyer MiDi35	10	462929	42.0
6	Salt Lake City	New Flyer XDE40	6	219703	46.0
7	Salt Lake City	New Flyer XDE40	5	194856	33.7
8	Atlanta	New Flyer XDE40	8	531048	24.6
9	Seattle	New Flyer XDE40	8	287000	32.3

Task 1

Use the Matlab Import Wizard function to read the data. Show me your script as a screen capture.

Task 2

Improve the script developed in Task 1 to do the following analyses:

   a) Find number of buses available in Seattle.

   b) Find the average route length of the buses in Seattle.

Task 3

In another part of the Matlab script, plot a histogram of the route length for buses in Atlanta.

Task 4

Find the average age of New Flyer XDE40 buses in all cities.

Task 5:

Add Matlab code to the script above to export the age and miles of vehicles in Salt Lake City in a comma delimited file.

Problem 2

A formula to estimate the noise generated by a train is found to be:

Leq = SELref + 10 log(Ncars) + 20 log(S/50) + 10 log (V) – 31.6

where:

Leq = equivalent noise level (decibels - dBA)

SEL ref = reference sound exposure level (decibels - dBA)

Ncars = number of cars in the train

S = train speed (mph)

V = hourly average train volume (trains per hour)

log = natural log of the number

a) Write a **Matlab script** to calculate the value of Leq given values of S (speed), SELref (sound exposure level), Ncars (train cars), and hourly train volume (V). The values of S, SELref, Ncars and V are entered at the top of the script. Your script should be able to process, without a FOR loop, multiple values of speed to produce a vector of Leq values.

b) Find the value of Leq for speeds ranging between 10 and 60 mph. In your calculations assume the train has 10 cars, the hourly train volume is 25 trains/hr, and use a value of Sref to be 55.

c) Add code to the Matlab script created to find the speed values of Leq below 60 dBA equivalent noise level.

d) Find the maximum speed permissible to keep noise levels below 60 dBA.

Note: in Matlab, the natural log of x is log(x). The logarithm base 10 is log10(x).

Problem 3

Data collected by a Global Positioning System (GPS) recording unit inside a car is presented in the accompanying file (GPS Data). Create a Matlab script that performs the following Tasks.

Task 1

Import the data into Matlab using the "load" command.

Task 2

Plot the speed of the car (in y-axis) vs. time (x- axis). Use a blue line with triangular markers joined by a solid line to plot the data. Observe the plot and comment on the number of stops the vehicle makes.

Task 3

Estimate the acceleration (in m/s-s) of the car as a function of time (use the Matlab "gradient" function to estimate the acceleration given the vehicle speed). Make a plot of acceleration vs. time.

Task 4

Add Matlab code to find the largest positive deceleration recorded in the data. Find the time when the maximum positive acceleration was recorded.

Task 5

Find the average speed of the car for the complete profile. Use the Matlab function MEAN function to get the average speed.

Task 6

Write code to find the number of seconds the car is stopped during the recorded data.

Problem 4

Data containing the largest cruise ships has been collected from CruiseMapper.com. A sample data is shown in the table below. The data is contained in an Excel spreadsheet shown below.

	A	B	C	D	E	F
1	Ship Name	Tonnage	Length_meters	Width_meters	Passengers	Cabins
2	Wonder Of The Seas	228081	362	47	6370	2759
3	Symphony Of The Seas	228081	362	47	6370	2759
4	Harmony Of The Seas	226963	362	47	6314	2745
5	Allure Of The Seas	225282	360	47	6314	2745
6	Oasis Of The Seas	225282	360	47	6307	2742
7	Global Dream	208000	342	46	4700	2500
8	MSC Europa	205700	333	47	6761	2632

Task 1

Use the Matlab XLSREAD function to read the data. Show me your script as a screen capture.

    a) Find number of ships with tonnage greater than 200,000 tons.

    b) Find the names of the ships found in (a).

Task 2

Improve your script created in Task 1 to find the number and the names of the cruise ships with total length below 325 meters.

Task 3

Find the average width of the ships in the database.

Task 4

Add Matlab code to the script above to find the cruise ships with a passenger to cabin ratio above 2.38. The script should produce the names of the ships.

Task 5

Add Matlab code to the script developed in Task 4 to export the ship name, tonnage and width (i that order) to a comma delimited file. The exported list is only for ships that meet criteria in Task 4.

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