Week 2 Session 6

Loop Statement

Task 1

Write a Matlab program to load and analyze "daily rainfall data.txt" (available on VU Collaborate).

1. Read the text file data to a MATLAB variable **rain**.
2. Bar plot the rainfall data.
3. Define a variable **sig** to store the user input value of significant rainfall threshold.
4. Use MATLAB **for** loop and **if-else** commands to count the number of days with significant rainfall (the number of days with rainfall greater than **sig**). Save the result in a variable **sig_day**.
5. Calculate the total rainfall **r_total** and average rainfall **r_ave**.
6. Display **sig_day**, **r_total**, and **r_ave** on the figure title. Set up other figure elements as well.
7. (optional) Highlight in red the bars with significant rainfall.
8. (optional) Calculate the cumulative rainfall and line plot results on a second graph under the bar graph using **subplot**.
   (Hint: day2 = day1+day2, day3 = day1 + day2 + day3, day4 = day1+day2+day3+day4, etc.)

Task 2

Write a Matlab program to load and analyze the force–deflection relationship (stiffness) of engineering materials.

1. Use any one of the five material samples available on VU Collaborate. Download the text file to your local drive. Read the data to Matlab and save it in a variable **sample**.
2. The 1st column of the data is time, the 2nd column is deflection, 3rd column is force. Save the three columns into three variables **t**, **d**, and **f**.
3. Scatter plot the Deflection (on x-axis) vs. Force (on y-axis).
4. In Command Window, allow users to input 2 values. Store them in variables **start** and **finish**.
5. Calculate the material stiffness using all the data between **start** and **finish**.
   1) The variables **start** and **finish** represent force data.
   2) Because the user input values may not be on your original data set, find the closest force values to these two input values.

   i.e. for the following sample, if a user inputs 5 as start and 10 as finish -> the closest samples are 5.34 and 12.3 -> use data indexed from 49 to 75 to calculate the stiffness.
   Hint: use **find** command to find all the values that are greater than **start**; the first number in the "find" results would be the closest one.

Index	…	48	49	…	74	75	…
Deflection	…	2	2.4	…	6	6.5	…
Force	…	4.3	5.34	…	7.8	12.3	…
Start	5						
End	10						

3) The stiffness is calculated using:
   a) Fit a line to Deflection – Force data (i.e. d(49:75) and f(49:75)) using Matlab command **polyfit**. Read this website for how to use this **polyfit**. The material stiffness is the gradient of the line.
   b) Use command **polyval** to evaluate the theoretical Force values based on the fitted equation. Read this website for how to use this **polyval**.
   c) Plot the fitted line on the same graph using the Deflection as x-axis and theoretical Force as y-axis.
6. Calculate the maximum load.
7. Display the maximum load and material stiffness on the graph title.

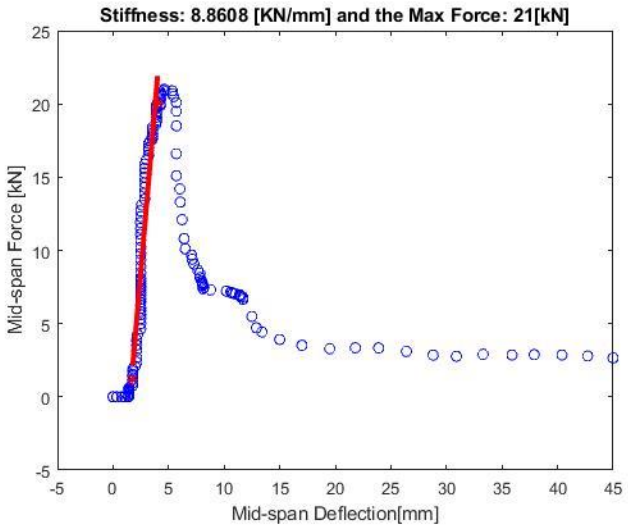

Figure 1. A Sample Result

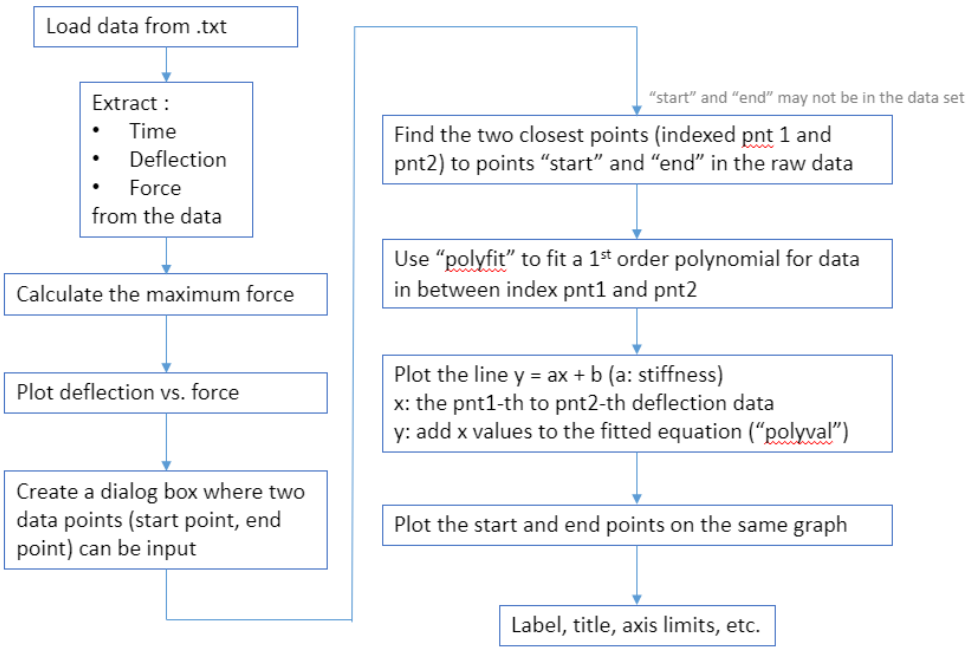

Figure 2. Flow chart of the program