CS 151L – Summer 2017
Programming Assignment 3

Due: Monday, June 26, 2017 @ 11:59 PM

You will need to submit your program to learn for grading. The name of the file should be **cs151su17assn3.m**. Be sure to include your name as a comment in the m-file.

To determine a suitable site for a wind turbine near the mouth of a canyon in the Rocky Mountains north of Boulder, Colorado, an engineer takes wind-speed measurements. At this location, the wind blows in a westerly direction through the canyon towards a wide valley. The engineer uses a cup anemometer that is typically used by meteorologists. There are three locations where the cup anemometer is placed: the mouth of the canyon, one half-mile down the canyon and one mile down the canyon. The anemometers are mounted on 30-foot high towers and the data acquisition equipment is set to take the measurements at 10-second intervals and to calculate and record hourly wind-speed averages.

A data file, called "create_wind3.m", will create a wind3.mat file that contains the recorded average hourly wind speeds (in feet per second) for a 24-hour period on January 28, 2015. There are three separate variables, one for each of the anemometers. You will print out a table of values in miles per hour for all three anemometers, find the average of the values in the table, find the maximum and minimum wind speeds and plot the data.

<u>A Step-by-step Procedure</u>

1. Get the data file from the CS 151 learn web site and save it in the same directory as your program; run this m-file which will create the data file wind3.mat; then, load the data (NOTE that three separate variables will appear, wsp1, wsp2 and wsp3).
2. Create a time variable that begins at 1:00 AM and continues to 12:00 midnight using 1 hour increments (you should create these values in military time).
3. Create a table with the time in the first in the first column and the data for each of the mountings in the next columns.

ONLY USE THE TABLE FOR THE FOLLOWING STEPS (you cannot use the individual variables)

4. Find the maximum and minimum values of each anemometer and at what time each occurred (you will need to use the capabilities of the max and min functions to return the location).
5. Create a table of the maximum and minimum values and their respective times.
6. Determine the average of each anemometer.
7. Sort the data for each anemometer (a separate sort for each column of the table) and create new tables of 22 rows and 2 columns of the data after removing the largest and smallest values.
8. Find the averages of the new data.
9. Plot each original anemometer data versus the time on the same plot (only use the 'o', the '+' and the 'x' to indicate the points – do not connect the points with a line.)

<u>Example Output</u> (Note: I will have a separate data file when testing your code to verify that it is working correctly)

```
table =
    1.0000    5.3182    4.7045    4.5682
    2.0000    5.1136    4.6364    4.3636
    3.0000    5.7955    5.5227    5.4545
```

```
                        .
                        .

mxtable =
    8.0000   23.7955
            .
            .

mntable =
   21.0000    3.8182
            .
            .

allavg =
   10.0483    6.8835    ...


table2 =
   24.0000    4.0227
   23.0000    4.3636
   22.0000    4.5682
            .
            .

wsp1avg =
    9.7066

table3 =
   24.0000    3.0000
   23.0000    3.0682
   21.0000    3.8864
            .
            .

wsp2avg =
    6.6787

table4 =
   22.0000    2.4545
   24.0000    2.5909
   21.0000    3.2045
            .
            .

wsp3avg =
    6.2975
```