BMNG5230 Asst. 2. Jan 27, 2022 Due Feb 10.

The dataset mod2_5230.mat will be found on Brightspace for download. Use "load mod2_5230" to get the data into matlab.

The data set contains the test signals s1, s2, s3, s4, s5, and s6, s7, s8, s9 and s10.

Signals sx1 to sx5 contain two columns containing domain (time) and range information. Access them with the syntax:

t1 = s1(:,1);   % the ':' means all rows, and the '1' means column 1. This means extract all rows of column 1.
x1 = s1(:,2);   % This means extract all rows of column 2.

Signals s6 to s10, contain domain, and range values for input and output signals (i.e. t,x,y) from some unknown system. Similarly:

t6 = s6(:,1);   % This means extract all rows of column 1.
x6 = s6(:,2);   % This means extract all rows of column 2.
y6 = s6(:,3);   % This means extract all rows of column 3.

Assignment:

1. (4) Provide useful plots for s1 though s5 and compute and plot the **auto-correlation functions and the auto-covariance functions**. What can you deduce about these signals from your results including identify periodicities, including the period if present, and circle any evidence that the signal has memory. Make sure to choose 'biased' or 'unbiased', and explain your choice.

2. (6) Provide useful plots for x6 though x10, and y6 through y10 (these may be any plots you feel help figure out the relationship between x and y). Compute and plot the **auto-correlation-coefficient functions** for the input and output signals and the input-output **cross-correlation coefficient functions** for signals s6, s7, s8, s9 and s10.

   a. Like in question #1, examining the autocorrelations, what can you deduce about each input and output signals including the period if present? Again, circle all points that you believe are evidence of the signal's memory of itself using useful plots. If the signal has memory other than periodic memory, indicate the duration of the memory. How would you describe the signals and their characteristic features?

   b. Now looking at the changes in autocorrelation functions, and examining the cross-correlation-coefficient functions, what can you deduce about the possible system between x and y for the last 5 signal pairs? Is the system static or dynamic? Has the system changed the memory characteristics? Is there noise added? Anything else? (6)

Useful functions: plot, subplot, xcov, xlabel, ylabel.