

MAR 670 - Advanced Time Series Analysis of Ocean Data -

Exercise 1: Synthetic Time Series

(due Wednesday 6 February 2008)

The subdirectory at
 /hosts/iselin/data01/users/wsbrown/classes.dir/mar670.dir/wsbrown.dir/2008_DIR/LINUX_2008/ex1_syn_time_ser.dir
 contains parameter file templates and Matlab plot program templates that are relevant to EXERCISE 1. If you use them, then you will need to modify them to produce the series that are requested.

The following is an outline of the Exercise 1 assignment (minus some of the symbols) that was handed out in class.

PART A: BASIC SYNTHETIC SERIES FORMATION & DISPLAY

(1) Use "l_maket" to generate the synthetic time series specified below, with delta t = 1 hour; number of terms N = 1000. (Template parameter files *.PAR are provided).

[NOTE: Please use the specified file names so I can track what you are doing more easily).

(2) Gaussian Noise Series

(Note: These noise series must be generated within a single call to "l_maket" because the random number generator produces the same set of "random" noise series each time it is initialized).

- a) noise1 sigma-squared = 1.0 ; sigma = 1.000000
- b) noise2 sigma-squared = 1.0 ; sigma = 1.000000 (different series)
- c) noise3 sigma-squared = 0.1 ; sigma = 0.316228

(3) Sine Wave Series

The components:	Amp	Period (hr)	Period (cph)	Freq	Phase
a) sine.10	1	10	0.100		0
b) sine.100	1	100	0.010		0
c) sine.66	1	66.6	0.015		0

(4) COMPUTE BASIC SERIES STATISTICS

Use "l_stats" and l_lstats" to compute the basic statistics for each of the series.

[NOTE: The basic statistics of a time series - i.e., series mean, standard deviation, etc.- are easily-obtained diagnostics that can be used to track the processing of a time series. Compute them often to confirm your expected results for a particular processing step].

(5) PLOTTING SERIES

Use a MATLAB program "plt_ex1a_series.m" to display the 6 synthetic time-series on one plot;
 (HINT: vertical scaling ~ 4 units/in; horizontal scaling ~ 200hr/in).

PART B: COMPOSITE SERIES FORMATION & DISPLAY

(1) Use "l-arith" to form the following composite time series:

(2) Multi-sine waves

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sine.com = sine.10 + sine.100 + sine.66
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(3) Sine Waves with Noise

(a) sine10.N1 = sine.10 + noise1

(b) sine10.N2 = sine.10 + noise2

(c) sine100.N2 = sine.100 + noise2

(d) sinec.N2 = sine.com + noise2

(e) sine10.N3 = sine.10 + noise3

(4) Compute the basic statistics for each of the series.

(5) PLOTTING SERIES

Use a MATLAB program to display these composite synthetic time-series on one plot;

(hint: vertical scaling ~ 4 units/in; horizontal scaling ~ 200hr/in).

(6) DISCUSSION OF RESULTS

Discuss any unexpected results.

(a) Do the plotted results make sense? Why?

(b) Explain why the maximum (and minimum) amplitudes and standard deviations given by "l-stats" are different than the corresponding statistics that were specified in "l-maket"?