EXPERIMENT: AUTOCORRELATION

OBJECTIVE: To understand the concept of correlation and to measure the degree to which the two signals are similar using autocorrelation.

PRE-SESSION WORK: Correlation is defined as the measure of similarity between two waveforms as a function of time lag applied to one of the signals.

Auto Correlation is defined as the correlation of a signal with its own time shifted version. Some applications where we can find them are, Radar, Sonar etc...

Correlation is very similar to convolution in terms of its operation i.e. if x(n) and y(n) are the two input signals. Correlation can be defined as the convolution of x(n) and y(-n).

The mathematical expression to compute auto correlation is given by

$$\mathrm{Rxx(l)} = \sum_{n=-\infty}^{\infty} \mathrm{x(n)y(n-l)}$$

PRE-SESSION QUIZ:

1. Energy present in the signal is given by

a. Rxx(0)

b. Rxx(1)

c. Rxx(∞)

d. Rxx (-1)

2. If any one or both signals involved in correlation are scaled

a. Shape of correlation sequence changes.

b. Shape of correlation sequence does not change.

c. Shape of correlation sequence cannot be determined.

d. shape of correlation sequence is zero.

3. Auto-Correlation is

a. An even function

b. An odd function

c. Neither even nor odd.

d. Convex function

PROCEDURE:

- Load the auto.sce file in Scilab.
- Enter the values of the signal x(n).
- Save the file.
- Go to Execute->Execute in Scilab or press Ctrl-E
- Verify the result of the by using the corr command provided by Scilab.

POST_SESSION WORK:

1. Compute the autocorrelation for the sequence

x(n) = α^nu(n) for n = 0… 7

2. Compute its Fourier transform. How is it related to the power spectral density of the signal?