RunXCorr Documentation

Makes a cross correlation of the two input traces. This is a full (non-gated) cross correlation. To effect a gate, restrict one of the input vectors to the length of the gate.

Usage

The program is used as follows:

`runXCorr` `input1FileName input2FileName`

Where the `input1FileName` and `input2FileName` are in our standard file format.

Output

The output of the program appears one place:

(1) A copy of the output data is placed in the file `lastDataOutput`.

Theory

The formula used for this cross correlation is:

(1.1)
$$\phi_{GH}(\tau) = \frac{\sum_{-\infty}^{\infty} G_k H_{k+\tau} dt}{[\sum_{-\infty}^{\infty} G_k{}^2 dt \sum_{-\infty}^{\infty} H_k{}^2(\tau) dt]^{1/2}}$$

which of course is the non-gated version. (In this case, $(-\infty, \infty)$ means over all available samples.

A gated version would be over a subset of selected samples, and have the formula:

(1.2)
$$\phi_{GH}(\tau, N) = \frac{\sum_{-N}^{N} G_k H_{k+\tau} dt}{[\sum_{-N}^{N} G_k{}^2 dt \sum_{-N}^{N} H_k{}^2(\tau) dt]^{1/2}}$$

where the length of the gate would be 2N+1.

We can further generalize the formula by noting that the lengths of H and G, and the lengths of the gates of H and G need not be the same. In those cases, we can extend the values of H and G accordingly by 0 padding. This is what is done implicitly in MtConv.

Both equations produce numbers in the interval [-1,1]. 1 is achieved when $G = H$., and -1 is achieved when $G = -H$.

In the case of band limited data, and finite sample lengths Equation (1.2) is preferred. However, with judicious use of 0 padding, that will be the case.s

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