$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_n \end{bmatrix} \begin{bmatrix} y_1 & y_2 & y_3 & \cdots & y_n \end{bmatrix}^* = \begin{bmatrix} x_1 y_1^* & x_1 y_2^* & x_1 y_3^* & \cdots & x_1 y_n^* \\ x_2 y_1^* & x_2 y_2^* & x_2 y_3^* & & x_2 y_n^* \\ x_3 y_1^* & x_3 y_2^* & x_3 y_3^* & & x_3 y_n^* \\ \vdots & & & & \\ x_n y_1^* & x_n y_2^* & x_n y_3^* & \cdots & x_n y_n^* \end{bmatrix}$$

where * denotes complex conjugation. If you use the optional *waveB* then the matrix is the cross correlation matrix. *waveB* must have the same length of *waveA* but it does not have to be the same number type.

Flags

The flags are mutually exclusive; only one matrix can be generated at a time.

/COV Calculates the covariance matrix.

The covariance matrix for the same input is formed in a similar way after subtracting from each vector its mean value and then dividing the resulting matrix elements by (*n*-1) where *n* is the number of elements of *waveA*.

Results are stored in the M_Corr or M_Covar waves in the current data folder.

/DEGC Calculates the complex degree of correlation. The degree of correlation is defined by:

$$\deg C = \frac{M\_Covar}{\sqrt{Var(waveA) \cdot Var(waveB)}},$$

where *M_Covar* is the covariance matrix and *Var*(*wave*) is the variance of the wave.

The complex degree of correlation should satisfy: $0 \le |\deg C| \le 1$.

Examples

The covariance matrix calculation is equivalent to:

```
Variable N=1/(DimSize(waveA,0)-1)
Variable ma=mean(waveA,-inf,inf)
Variable mb=mean(waveB,-inf,inf)
waveA-=ma
waveB-=mb
MatrixTranspose/H waveB
MatrixMultiply waveA,waveB
M_product*=N
```

See Also

Matrix Math Operations on page III-138 for more about Igor's matrix routines.

References

Hayes, M.H., *Statistical Digital Signal Processing And Modeling*, 85 pp., John Wiley, 1996.

MatrixDet

matrixDet(*dataMatrix*)

The MatrixDet function returns the determinant of *dataMatrix*. The matrix wave must be a real, square matrix or else the returned value will be NaN.

Details

The function calculates the determinant using LU decomposition. If, following the decomposition, any one of the diagonal elements is either identically zero or equal to 10^{-100}, the return value of the function will be zero.