Details

The input matrix *srcWave* is an MxN real or complex wave of single or double precision. Use **MatrixLUDTD** if your input is tri-diagonal.

The main results of the factorization are stored in the waves M_Lower, M_Upper and M_Pt. Alternatively the lower and upper factors can be combined and stored in the wave M_LUFactors (see /CMF). The waves M_Lower, M_Upper and M_LUFactors have the same data type as the input wave. M_Pt is always double precision.

When the input matrix *srcWave* is square (NxN), the resulting matrices have the same dimensions (NxN). You can reconstruct the input using the MatrixOp expression:

```
MatrixOp/O rA=(M_Pt^t) x (M_Lower x M_Upper)
```

If the input matrix is rectangular (NxM) the reconstruction depends on the size of N and M. If N<M:

```
MatrixOp/O rA=(M_Pt^t) x (subRange(M_lower,0,N-1,0,N-1) x M_Upper)
```

If N>M:

```
MatrixOp/O rA=(M_Pt^t) x M_lower x subRange(M_Upper,0,M-1,0,M-1)
```

The variable V_flag is set to zero if the operation succeeds and to 1 otherwise (e.g., if the input is singular). When you use the /B flag the polarity of the matrix is returned in the variable V_LUPolarity. The variables V_Sum and V_min are also set by some of the flag options above.

See Also

MatrixLUDTD, **MatrixLUBkSub**, **MatrixLinearSolve**, **MatrixLinearSolveTD**, **MatrixLLS**, **MatrixOp**

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

MatrixLUDTD

MatrixLUDTD [***flags***] ***srcMain***, ***srcUpper***, ***srcLower***

The MatrixLUDTD operation computes the LU factorization of a tri-diagonal matrix. The general form of the factorization/decomposition is expressed in terms of matrix products:

```
M_Pt x triDiagonalMat = M_Lower x M_Upper
```

`triDiagonalMat` is the matrix defined by the main diagonal specified by *srcMain*, the upper diagonal specified by *srcUpper*, and the lower diagonal specified by *srcLower*.

M_Pt is an output wave created when the /PMAT flag is present. M_Lower and M_Upper are output waves created when the /FM flag is present. M_Pt is the transpose of the permutation matrix, M_Lower is a lower triangular matrix with 1's on the main diagonal and M_Upper is an upper triangular (or trapezoidal) matrix.

Flags

/MIND	Finds the minimum magnitude diagonal element of M_Upper and stores it in V_min. This feature is useful if you want to investigate the behaviour of the determinant of the matrix when it is close to being singular.
/PMAT	Saves the transpose of the permutation matrix in the wave M_Pt in the current data folder. Note that the permutation matrix is orthogonal and so the inverse of the matrix is equal to its transpose.
/SUMP	Computes the sum of the phases of the elements on the main diagonal of M_Upper and store in the variable V_Sum. Note that the variable is initialized to NaN and that it is not set unless this flag is specified and M_Upper is complex.
/FM	The full matrix output is stored in the waves M_Lower and M_Upper in the current data folder.

Details

You specify the tridiagonal matrix using three 1D waves of the same data type (single or double precision real or complex).

If /FM is present the output of the operation consists of two 2D waves and one 1D wave:

M_Lower is a lower triangular matrix with 1's on the main diagonal.