

**NAME**

ilutp - sparse incomplete lu factorization with truncation and pivoting

**CALLING SEQUENCE**

```
[L,U,perm,ierr]=ilutp(A,lfil,drop,ptol,bloc)
```

**PARAMETERS**

**A** : sparse matrix (must be square)  
**lfil** : the fill-in parameter(default: average number of nonzero entries per rows)  
**drop** : the threshold for dropping small terms in the factorization (default:  $0.001 * \max(A_{ij})$ )  
**ptol** : tolerance ratio used to determine whether or not to permute two columns (default: 0.5)  
**bloc** : permuting can be done within the diagonal blocks of size mbloc (default: n, with n the size of **A**)  
**L** : lower triangular sparse matrix  
**U** : upper triangular sparse matrix  
**perm** : contains the permutation arrays  
**ierr** : error message

**DESCRIPTION**

Builds an incomplete LU factorization of a sparse matrix **A**. The two factors **L** and **U** are stored in CSR format. The CSR format is the Compressed Sparse Row format used by Scilab.

**lfil** : each row of **L** and each row of **U** will have a maximum of **lfil** elements (excluding the diagonal element). **lfil** must be .ge. 0.  
**ptol** : tolerance ratio used to determine whether or not to permute two columns. At step i, columns i and j are permuted when  $\text{abs}(a(i,j)) * \text{ptol} > \text{abs}(a(i,i))$ . [0 --> never permute; recommended values from 0.1 to 0.01]  
**bloc** : useful for PDE problems with several degrees of freedom. To discard the feature, set **bloc**=n.  
**ierr** : error flag.  
 0 --> successful return.  
 >0 --> zero pivot encountered at step number ierr.  
 -1 --> error. input matrix may be wrong. (The elimination process has generated a row in **L** or **U** whose length is .gt. n.)  
 -2 --> storage of matrix **L** caused an overflow in array al.  
 -3 --> storage of matrix **U** caused an overflow in array alu.  
 -4 --> illegal value for lfil.  
 -5 --> zero row encountered.

**EXAMPLE**

```
A=mmread(SCILIN+'/tests/matrices/pde225.mtx')
n=size(A,1); b=ones(n,1);
lfil=10;drop=0;ptol=0;bloc=3;
[L,U,perm,ierr]=ilutp(A,lfil,drop,ptol,bloc);
x=U\(L\b)
A*x-b
```

**AUTHOR**

Sparskit procedure interfaced by Aladin Group

**SEE ALSO**

ilu0, milu0, iluk, ilut, ilud, iludp

