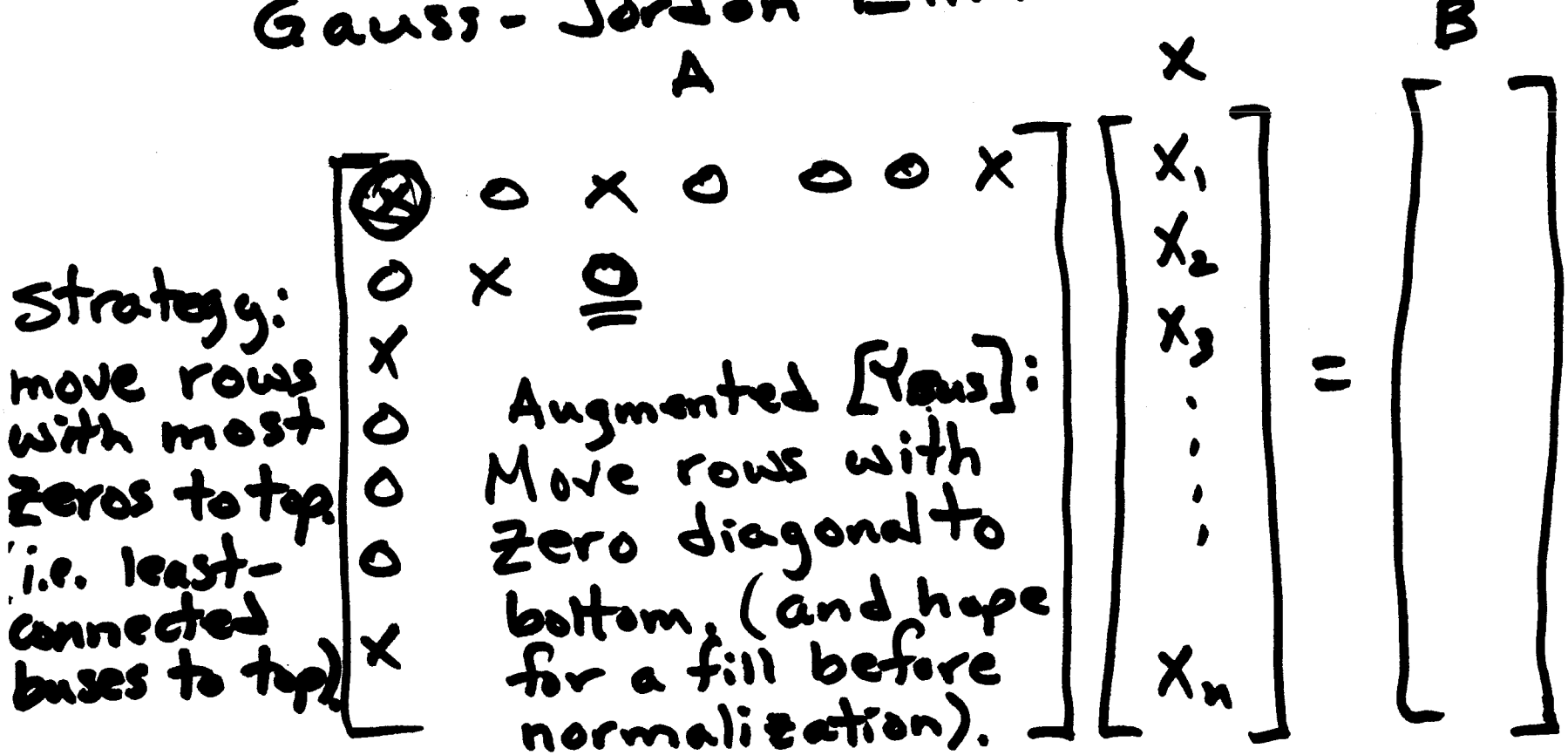
Reordering

- It is strategic to reorder the (row,column) indices of the coefficient matrix to make LU factorization most efficient
- Basic Idea:
  - Move the buses that have the fewest connections to the top of [Y]. This reduces the number of fills when factorizing.
  - Constraints:
    - Buses of known voltage must stay at the bottom.
    - Augmented equations with zero main diagonal should remain toward the bottom to guarantee a fill of the main diagonal.

Reordering: (in-situ methods)

For: LU factorization
Gaussian Elim
Gauss-Jordon Elim



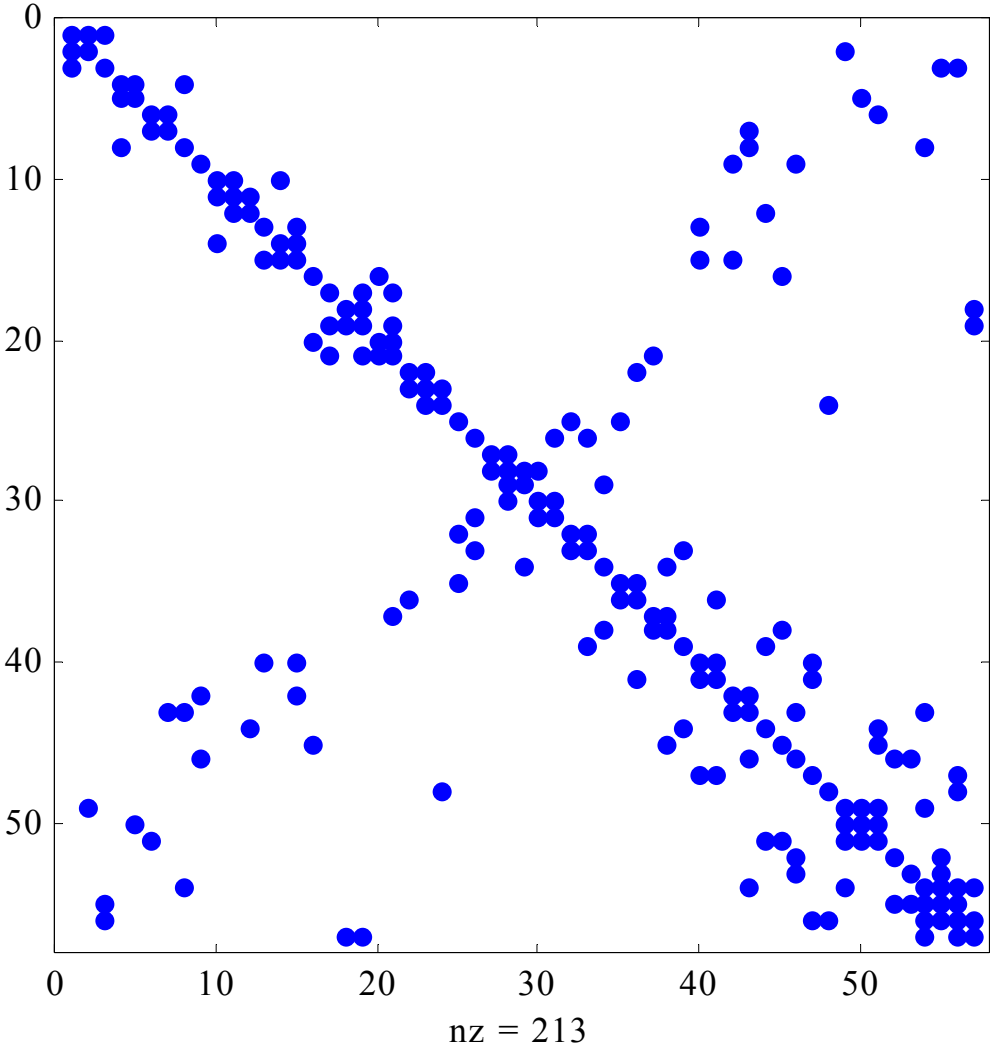
Helpful MatLab Commands

- General
  - save, load
  - who – lists variables
  - clear a, b, ..
  - inv(A) – inverts matrix
  - zeros, ones
  - find
  - help xxx to find help on a specific command
  - HTML help desk
- LU, sparse matrices
  - issparse, sparse, full
  - nnz, nonzeros
  - spy – shows topology
  - [L,U] = lu(A)
  - Reordering: colmd, symmmd, symrcm, colperm, randperm, dmperm

Use of the spy function

57-Bus
IEEE System

Sparsity:
93.44%



Exercise to Investigate Reordering

```
% COLMMD reordering:
   flops(0);        %Reset floating point operations counter
   %Reorder and fill new Y and I:
   Y1=sparse(nbus,nbus);      %Change to Y1=zeros(nbus,nbus)to give slower full matrix
   I1=zeros(nbus,1);
   Reord1=colmmd(Y);
   for n=1:nbus
      I1(n) = I(Reord1(n));
      for m=1:nbus
         Y1(n,m)=Y(Reord1(n),Reord1(m));
      end
   end
   BV1 = inv(Y1)*I1;

   % Un-Reorder and recover correctly-indexed bus voltages:
   BV_1 = zeros(nbus,1);
   for n=1:nbus
            BV_1(Reord1(n)) = BV1(n);
   end
   nflops(1)=flops;
```

We would not in a real case create duplicate matrices for the reordering.

Improve this part