MATH 5485 Introduction to Numerical Methods I

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Matlab Demonstration (10/11/2013)

(a)

First solve the problem without free nodes

We have 5 nodes and 4 trusses:

```
>> N=5; K=4;
```

Enter trusses (start point and end point)

```
>> t=[1 2; 2 3; 3 4; 4 5]

t =

     1     2
     2     3
     3     4
     4     5
```

Set matrix B:

```
>> for k=1:K, B(k,t(k,1))=-1; B(k,t(k,2))=1; end;
>> B

B =

    -1     1     0     0     0
     0    -1     1     0     0
     0     0    -1     1     0
     0     0     0    -1     1
```

Set `kappa` to be the spring (truss) constants:

```
>> kappa=[1 1 1 1];
>> C = diag(kappa)

C =
     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1

>> A = B'*C*B

A =

     1    -1     0     0     0
    -1     2    -1     0     0
     0    -1     2    -1     0
     0     0    -1     2    -1
     0     0     0    -1     1
```

The matrix A is singular (because we did not fix any nodes):

```
>> det(A)

ans =

     0
```

The matrix A is singular (because we did not fix any nodes):

(b)

Doing the same thing, but with some nodes fixed:

Here M is the number of free nodes

```
>> M=3;
>> map=[0;1;2;3;0]

map =

     0
     1
     2
     3
     0
```

Next, we create a script `go.m` with the following content:

```
B=zeros(K,M);
for k=1:K
    if(map(t(k,1))~=0)
        B(k,map(t(k,1)))=-1;
    end;
    if(map(t(k,2))~=0)
        B(k,map(t(k,2)))=1;
    end;
end;
```

And continue with Matlab commands:

```
>> go
>> B

B =

     1     0     0
    -1     1     0
     0    -1     1
     0     0    -1

>> A = B'*C*B

A =

     2    -1     0
    -1     2    -1
     0    -1     2
```

Now *A* is the expected matrix.