Problem

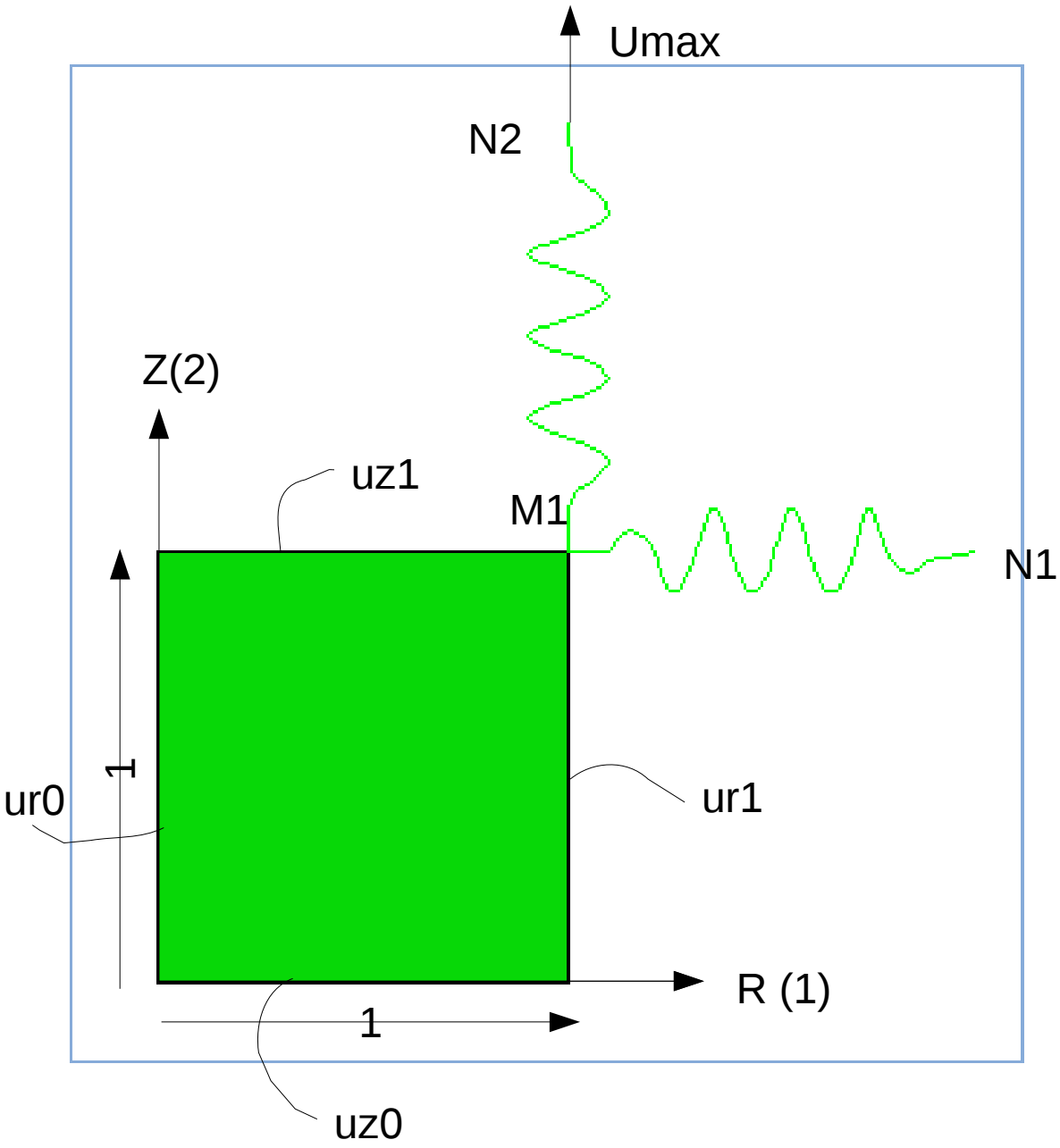
To simulate constant stress ratio condition using user defined MPC

Ref:

- C. Tekoglu, IJSS, 51 (2014), 4544-4533.
- L. Lecarme, C. Tekoglũ, T. Pardeon, IJP, 27 (2011), 1203-1233

Model description

- Square of dimension 1x1
- Four faces are named as ur0, uz0, ur1, uz1
- Nodes M1, N1 and N2 are seperate not connected to the element
- M1 is connected to N2 with a spring element (stiffness K)
- M1 is connected to N1 with a spring element (stiffness K)
- Displacement u2 of face uz1 is same as u2 of node M (applied Equation constraint)
- Displacement u1 of face ur1 is same as u1 of node M1 (applied Equation constraint)
- Displacement Umax is applied to node N2



Parts of Input file

Spring elements between M1 – N1 and M1 – N2
(CONN2D elements also been tried give similar results)

```
*Element, type=SpringA, elset=Springs/Dashpots-1-spring
1, 1, 2
2, 1, 3
*Spring, elset=Springs/Dashpots-1-spring

10000.
```

where

```
*Node
      1,          1.,          1.,          0.
*Node
      2,          1.,          2.,          0.
*Node
      3,          2.,          1.,          0.
```

Node M

Node N2

Node N1

```
*Nset, nset=m1
 1,
*Nset, nset=n1
 3,
*Nset, nset=n2
 2,
```

Equation constrains between node M1 and face ur1 and node M1 and face uz1

```
** Constraint: eqR
*Equation
2
ur1, 1, 1.
m1, 1, -1.
** Constraint: eqY
*Equation
2
uz1, 2, 1.
m1, 2, -1.
```

MPC between node N1, M1, N2

```
*MPC, user, mode=node
1, n1, m1, n2
```

Boundary conditions

```
** BOUNDARY CONDITIONS
**
** Name: BC-1 Type: Displacement/Rotation
*Boundary
ur0, 1, 1
** Name: BC-2 Type: Displacement/Rotation
*Boundary
uz0, 2, 2
** Name: BC-3 Type: Displacement/Rotation
*Boundary
n2, 2, 2, 0.5
**
```

User defined MPC

```
if(JTYPE.eq.1) then
   rho=1

   u1m=U(1,2)
   u2m=U(2,2)
   u2n2=U(2,3)

   UE(1) = (u1m + 2*rho*(1+u2m)/(1+u1m)*(u2n2-u2m))

   A(1,1,1)=  1.0
   A(1,1,2)= -1 + 2*rho*(1+u2m)*(u2n2-u2m)/(1+u1m)**2
   A(1,2,2)= -2*rho*(u2n2 - 2*u2m - 1)/(1+u1m)
   A(1,1,3)= -2*rho*(1+u2m)/(1+u1m)

  JDOF(1,1)=1
  JDOF(1,2)=1
  JDOF(2,2)=2
  JDOF(1,3)=2
```

Expected results:

Constant stress ratio in R and Z directions. For rho=1, same Stress in R and Z.

Results I am getting:

For any rho I am getting results similar to the problem of unidirection pull in Z-direction
i.e. Sr=0.