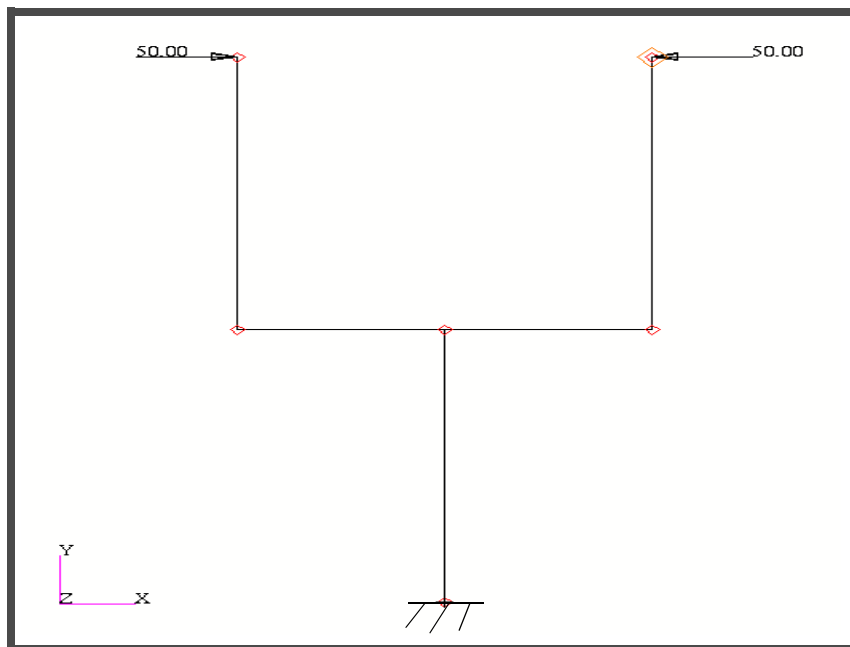

WORKSHOP 6b

Multipoint Constraints Relative Motion



Objectives

- Define time-varying excitation.
- Create a MSC.Nastran dynamic math model.
- Submit the file for analysis in MSC.Nastran.
- Compute nodal displacements for desired time domain.



Suggested Exercise Steps

- Use Model from 6a.
- Add a node and an MPC equation for relative motion calculation.

Exercise Procedure:

1. Start up MSC.Nastran for Windows 4.0.

Double click on the icon labeled **MSC.Nastran for Windows V4.0**.

On the *Open Model File* form, select the model created in Problem 6b.

Open Model File:

mpc1.mod

Open

2. Create a new node.

We wish to calculate the relative motion between nodes 5 and 6 in the x direction. We will create a new node, 1000, as an extra degree of freedom to store the results of the MPC equation. The equation is:

$$1000_x = 6_x - 5_x$$

Nastran requires the equation be written in the form:

$$0 = 1000_x + 5_x - 6_x$$

The location of Node 1000 is arbitrary. We choose to place it between Nodes 5 and 6 to make the graphical representations neat.

Model/Node...

ID:

1000

X:

0

Y:

40

Z:

0

OK

Cancel

3. Create a multipoint constraint (MPC).

Model/Constraint/Equation...

Coefficient:

1.0

Node ID:

1000

DOF:

TX

Add

Coefficient:

1.0

Node ID:

5

DOF:

TX

Add

Coefficient:

-1.0

Node ID:

6

DOF:

TX

Add

OK

Cancel

4. Write the input deck and run the analysis.

File/Export/Analysis Model...

Analysis Format/Type:

3..Transient Dynamic/Time History

OK

Filename:

mpc2

Write

Additional Info:

Run Analysis

Advanced...

Solution Type:

Direct

OK

OK

<Uncheck all under Output Requests, except Displacement>

OK

Under PARAM,

WTMASS 0.00259

OK

When asked “OK to Save Model Now?”

Yes

When the MSC.Nastran manager is through running, MSC.Nastran will be restored on your screen, and the *Message Review* form will appear. To read the messages, you could select **Show Details**. Since the analysis ran successfully, we will not bother with the details this time.

Continue

- Open the mpc2.dat using Notepad. Your file should look similar to the one below.

```

INIT MASTER(S)
ID D:\julie,MSC/N
SOL SEDTRAN
TIME 10000
CEND
ECHO = NONE
DISPLACEMENT(SORT1,PLOT) = ALL
SPC = 1
MPC = 1
DLOAD = 1
LOADSET = 1
TSTEP = 1
BEGIN BULK
$
*****
*****
$ Written by : MSC/NASTRAN for Windows
$ Version   : 6.02
$ Translator : MSC/NASTRAN
$ From Model : D:\julie\ws6b.MOD
$ Date      : Sun Dec 05 17:48:20 1999
$ Output To : D:\julie\mpc2
$
*****
*****
$
PARAM,POST,-1
PARAM,OGEO,NO
PARAM,AUTOSPC,YES
PARAM,MAXRATIO,1.E+8
    
```

```

PARAM,GRDPNT,0
PARAM,WTMASS,0.00259
CORD2C 1 0 0. 0. 0. 0. 0. 1.+MSC/NC1
+MSC/NC1 1. 0. 1.
CORD2S 2 0 0. 0. 0. 0. 0. 1.+MSC/NC2
+MSC/NC2 1. 0. 1.
$ MSC/NASTRAN for Windows Load Set 1 : force
PARAM,COUPMASS,1
PARAM,G,0.06
PARAM,W3,1570.8
PARAM,CURVPLOT,1
LSEQ 1 101 101
$ MSC/NASTRAN for Windows Function 1 : time_dependent_force
TABLED2 1 0. +
+ 0. 0. 4.E-4 0.58779 8.E-4 0.95106 0.0012 0.95106+
+ 0.0016 0.58779 0.002 0. 0.0024-0.58779 0.0028-0.95106+
+ 0.0032-0.95106 0.0036-0.58779 0.0041.53E-15 0.0044 0.58779+
+ 0.0048 0.95106 0.0052 0.95106 0.0056 0.58779 0.006-1.4E-15+
+ 0.0064-0.58779 0.0068-0.95106 0.0072-0.95106 0.0076-
0.58779+
+ 0.008 0. 0.04 0.ENDT
TLOAD1 101 101 1
FORCE 101 5 0 1. 50. 0. 0.
LSEQ 1 102 102
TLOAD1 102 102 1
FORCE 102 6 0 1. -50. 0. 0.
DLOAD 1 1. 1. 101 1. 102
TSTEP 1 100 4.E-4
$ MSC/NASTRAN for Windows Constraint Set 1 : constraint
SPC 1 1 123456 0.
MPC 1 1000 1 1. 5 1 1. +
+ 6 1 -1.
$ MSC/NASTRAN for Windows Property 1 : Prop_1
PBEAM 1 1 0.1 1. 1. 0. 2. 0.+PR 1
+PR 1 0. 0. 0. 0. 0. 0. 0. 0.+PA 1
+PA 1 YESA 1. +PC 1
+PC 1 0. 0.
$ MSC/NASTRAN for Windows Material 1 : mat_1
MAT1 1 2.9E+7 0.3 0.286 0. 0.
GRID 1 0 0. 0. 0. 0
GRID 2 0 -10. 20. 0. 0
GRID 3 0 0. 20. 0. 0
GRID 4 0 10. 20. 0. 0
GRID 5 0 -10. 40. 0. 0

```

```

GRID      6   0  10.  40.  0.   0
GRID     1000  0   0.  40.  0.   0
CBEAM      1   1   1   3   0.  0.  1.
CBEAM      2   1   2   3   0.  0.  1.
CBEAM      3   1   3   4   0.  0.  1.
CBEAM      4   1   2   5   0.  0.  1.
CBEAM      5   1   4   6   0.  0.  1.
ENDDATA 3c3fbb9f
    
```

- Open the mpc2.f06 using Notepad. Compare the results obtained in the mpc2.f06 file with the following:

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```

* * * * *
* * * * *
* *
* *      MSC.SOFTWARE      * *
* *      CORP              * *
* *
* *      M S C . N A S T R A N      * *
* *
* *      VERSION - 70.0.6      * *
* *
* *      AUG 25, 1999      * *
* *
* *
* *      Intel      * *
* *
* *MODEL PentiumIII/450 (tiber.cm.m * *
* *
* *      Windows NT 4.0 (Build 1381) * *
* *
* *
* *
* * * * *
* * * * *
    
```

1 DECEMBER 5, 1999
MSC.NASTRAN 8/25/99 PAGE 1
0
NASTRAN FILE AND SYSTEM PARAMETER
ECHO
0

\$AUTH=1700@SERVER_NAME \$(D:/MSCN4W|2/SOLVER/
CONF/NAST70.RCF[1])
\$AUTH=ESP\$(D:/MSCN4W|2/SOLVER/CONF/NAST70.RCF[2])
\$AUTH=D:\MSCN4W|2\SOLVER\CONF\DEMOCODE.DAT \$(D:/
MSCN4W|2/SOLVER/CONF/NAST70.RCF[
NASTRANREAL=30146560 \$(PROGRAMDEFAULT)
INIT MASTER(S)

1 DECEMBER 5, 1999
MSC.NASTRAN 8/25/99 PAGE 2
0 NASTRAN EXECUTIVE CONTROL DECK
ECHO
0

ID D:\JULIE, MSC/N
SOL SEDTRAN
TIME 10000
CEND

1 DECEMBER 5, 1999
MSC.NASTRAN 8/25/99 PAGE 3

0
0 CASE CONTROL DECK ECHO
CARD
COUNT
1 ECHO = NONE
2 DISPLACEMENT(SORT1,PLOT) = ALL
3 SPC = 1
4 MPC = 1
5 DLOAD = 1
6 LOADSET = 1
7 TSTEP = 1
8 BEGIN BULK
0 INPUT BULK DATA CARD COUNT = 64
0 TOTAL COUNT= 50

0*** USER INFORMATION MESSAGE 4109 (OUTPX2) THE LABEL IS XXXXXXXX FOR FORTRAN UNIT 12
 (MAXIMUM SIZE OF FORTRAN RECORDS WRITTEN = 7 WORDS.)
 (NUMBER OF FORTRAN RECORDS WRITTEN = 8 RECORDS.)
 (TOTAL DATA WRITTEN FOR TAPE LABEL = 17 WORDS.)
 1 DECEMBER 5, 1999
 MSC.NASTRAN 8/25/99 PAGE 4

0
 OUTPUT FROM GRID POINT WEIGHT GENERATOR

0 REFERENCE POINT = 0
 M O
 * 2.288000E+00 0.000000E+00 0.000000E+00
 0.000000E+00 0.000000E+00 -5.148000E+01 *
 * 0.000000E+00 2.288000E+00 0.000000E+00
 0.000000E+00 0.000000E+00 3.348887E-16 *
 * 0.000000E+00 0.000000E+00 2.288000E+00
 5.148000E+01 -3.348887E-16 0.000000E+00 *
 * 0.000000E+00 0.000000E+00 5.148000E+01
 1.384240E+03 0.000000E+00 0.000000E+00 *
 * 0.000000E+00 0.000000E+00 -3.348887E-16
 0.000000E+00 1.677867E+02 0.000000E+00 *
 * -5.148000E+01 3.348887E-16 0.000000E+00
 0.000000E+00 0.000000E+00 1.506267E+03 *

S
 * 1.000000E+00 0.000000E+00 0.000000E+00 *
 * 0.000000E+00 1.000000E+00 0.000000E+00 *
 * 0.000000E+00 0.000000E+00 1.000000E+00 *

DIRECTION
 MASS AXIS SYSTEM (S) MASS X-C.G.
 Y-C.G. Z-C.G.
 X 2.288000E+00 0.000000E+00 2.250000E+01
 0.000000E+00
 Y 2.288000E+00 1.463674E-16 0.000000E+00
 0.000000E+00
 Z 2.288000E+00 1.463674E-16 2.250000E+01
 0.000000E+00

I(S)
 * 2.259400E+02 -7.534996E-15 0.000000E+00 *
 * -7.534996E-15 1.677867E+02 0.000000E+00 *

```

* 0.000000E+00 0.000000E+00 3.479667E+02 *
      I(Q)
* 2.259400E+02 *
* 1.677867E+02 *
* 3.479667E+02 *
      Q
* 1.000000E+00 0.000000E+00 0.000000E+00 *
* 0.000000E+00 1.000000E+00 0.000000E+00 *
* 0.000000E+00 0.000000E+00 1.000000E+00 *

```

```

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MSC.NASTRAN 8/25/99 PAGE 5

```

```

0
1 DECEMBER 5, 1999
MSC.NASTRAN 8/25/99 PAGE 6

```

```

0
0 RESULTANTS ABOUT ORIGIN OF SUPERELEMENT BASIC
COORDINATE SYSTEM IN SUPERELEMENT BASIC SYSTEM
COORDINATES.

```

```

0 OLOAD RESULTANT
0 T1 T2 T3 R1 R2 R3
0 1 5.000000E+01 0.000000E+00 0.000000E+00
0.000000E+00 0.000000E+00 -2.000000E+03
0 1 -5.000000E+01 0.000000E+00 0.000000E+00
0.000000E+00 0.000000E+00 2.000000E+03
1 DECEMBER 5, 1999
MSC.NASTRAN 8/25/99 PAGE 7

```

```

0
0 GRID POINT SINGULARITY TABLE
0 POINT TYPE FAILED STIFFNESS OLD
0 USET NEW USET
0 ID DIRECTION RATIO EXCLUSIVE
UNION EXCLUSIVE UNION
0 1000 G 2 0.00E+00 B F SB S *
0 1000 G 3 0.00E+00 B F SB S *
0 1000 G 4 0.00E+00 B F SB S *
0 1000 G 5 0.00E+00 B F SB S *
0 1000 G 6 0.00E+00 B F SB S *
0*** USER INFORMATION MESSAGE 5222 , COUPLED
SOLUTION ALGORITHM USED.

```

```

0*** USER INFORMATION MESSAGE 4114 (OUTPX2)
  DATA BLOCK OUGV1 WRITTEN ON FORTRAN UNIT 12, TRL =
    101      0      5656      0      0      0      0
      (MAXIMUM POSSIBLE FORTRAN RECORD
SIZE =  4098 WORDS.)
      (MAXIMUM SIZE OF FORTRAN RECORDS
WRITTEN =  146 WORDS.)
      (NUMBER OF FORTRAN RECORDS WRITTEN
=  1020 RECORDS.)
      (TOTAL DATA WRITTEN FOR DATA BLOCK
=  21235 WORDS.)
1                                     DECEMBER  5, 1999
MSC.NASTRAN 8/25/99 PAGE  8

```

```

0
0*** USER INFORMATION MESSAGE 4110 (OUTPX2)END-OF-
DATA SIMULATION ON FORTRAN UNIT 12
      (MAXIMUM SIZE OF FORTRAN RECORDS
WRITTEN =  1 WORDS.)
      (NUMBER OF FORTRAN RECORDS WRITTEN
=  1 RECORDS.)
      (TOTAL DATA WRITTEN FOR EOF MARKER
=  1 WORDS.)
1                                     DECEMBER  5, 1999
MSC.NASTRAN 8/25/99 PAGE  9

```

```

0
  * * * * D B D I C T P R I N T * * * *   SUBDMAP = PRTSUM ,
DMAP STATEMENT NO.  13

```

```

0                                     * * * * A N A L Y S I S S U M M A R Y T A B
L E * * * *
0 SEID PEID PROJ VERS APRCH  SEMG SEMR SEKR SELG SELR
MODES DYNRED SOLLIN PVALID SOLNL LOOPID DESIGN
CYCLE SENSITIVITY
-----

```

```

  0 0 1 1 ' ' T T T T T F F T 0 F -1
0 F
0SEID = SUPERELEMENT ID.
  PEID = PRIMARY SUPERELEMENT ID OF IMAGE
SUPERELEMENT.
  PROJ = PROJECT ID NUMBER.

```


7. Plot the x-component of the displacement response at Node 5, Node 6, and Node 1000.

View/Select...

XY Style: **XY vs. Set**

XY Data...

First, plot the displacement response of Node 5 as Curve 1.

Curve: **1**

Output Set: **102..Case 1 Time 0**

Output Vector: **2..T1 Translation**

Output Location: **Node** **5**

Plot the displacement response of Node 6 as Curve 2.

Curve: **2**

Output Set: **102..Case 1 Time 0**

Output Vector: **2..T1 Translation**

Output Location: **Node** **6**

Plot the displacement response of Node 1000 as Curve 3.

Curve: **3**

Output Set: **102..Case 1 Time 0**

Output Vector: **2..T1 Translation**

Output Location: **Node** **1000**

OK

OK

Your plot should look similar to the following:

Figure 6b.2

