Remeshing with MSC.Marc

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Types of Remeshing

- Global remeshing
  - Mesh of a contact body replaced with a new, better quality mesh.
  - Stress, strain quantities of previous mesh mapped to new mesh.
  - Useful if analysis fails because of highly distorted elements
- Local adaptivity
  - Mesh refined locally
  - Quad element subdivided into 4 smaller elements
  - Does not resolve distorted elements.
  - Better gradient in stress concentration areas

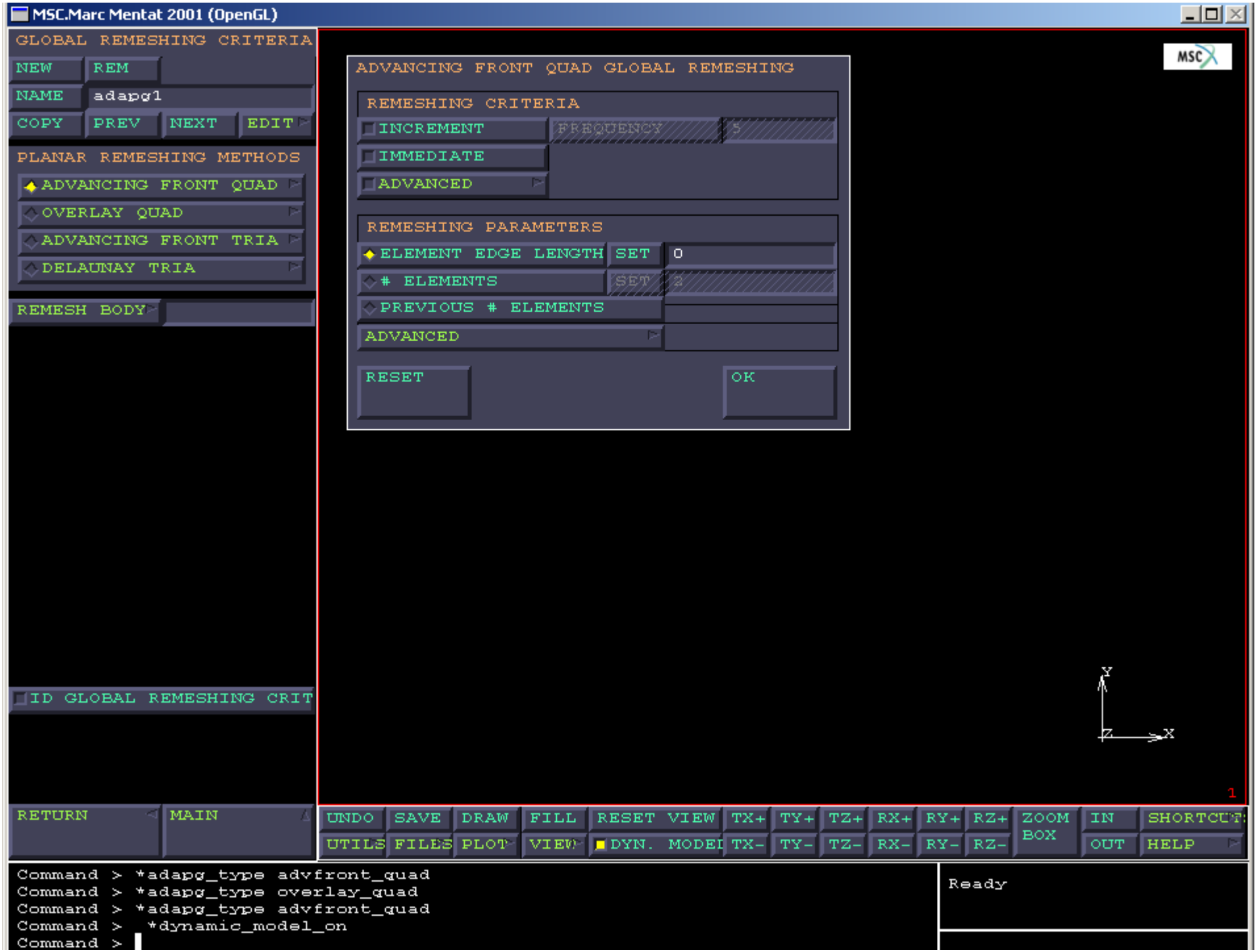
Global Remeshing

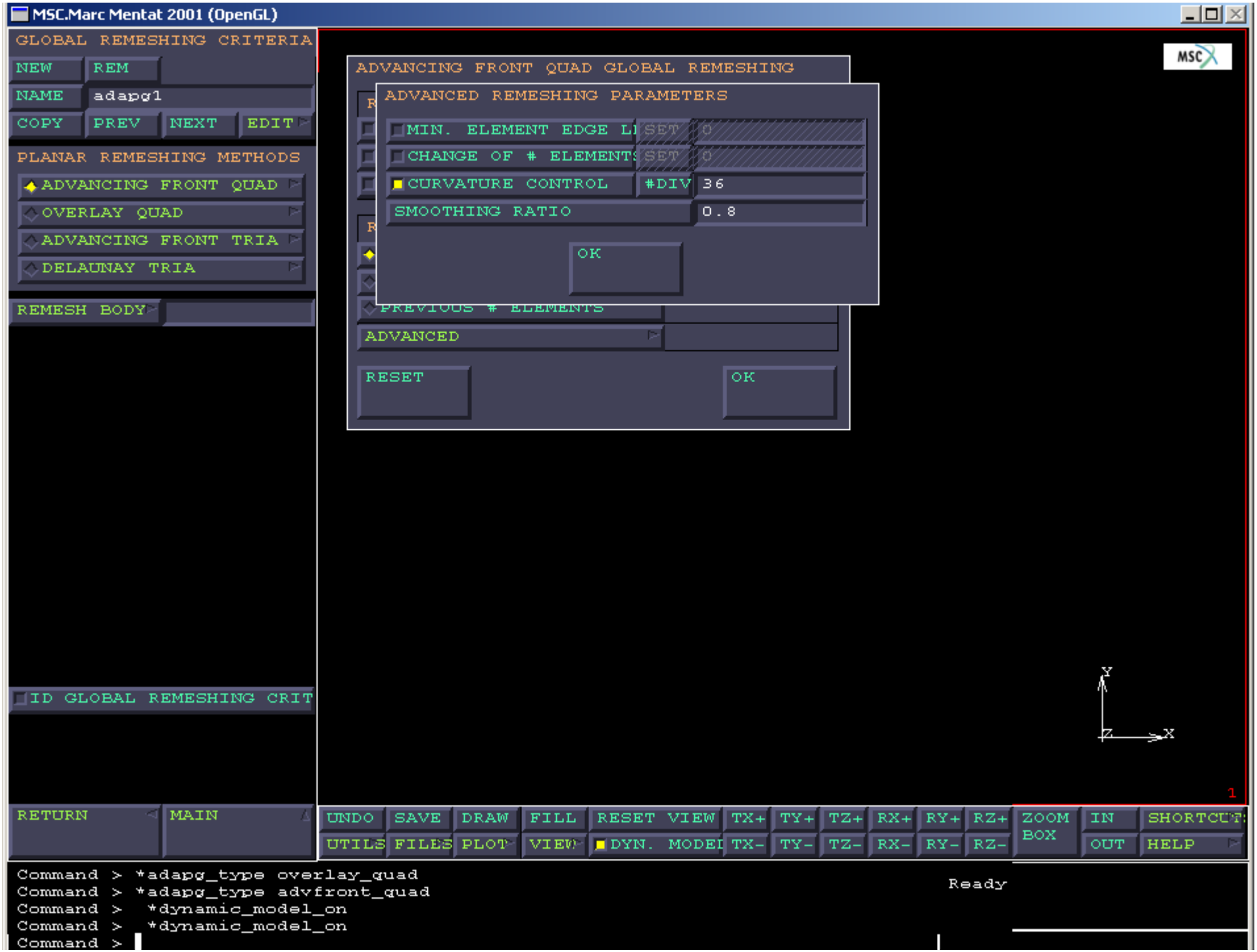
- Automatic
  - User specified criteria based on distortion and penetration.
  - Frequency of remeshing is also controlled by a user specified increment spacing.
  - Number of elements controlled by edge size or user specified number.
  - Advantage: Single input file
  - Drawback: BCs should be applied thru rigid bodies

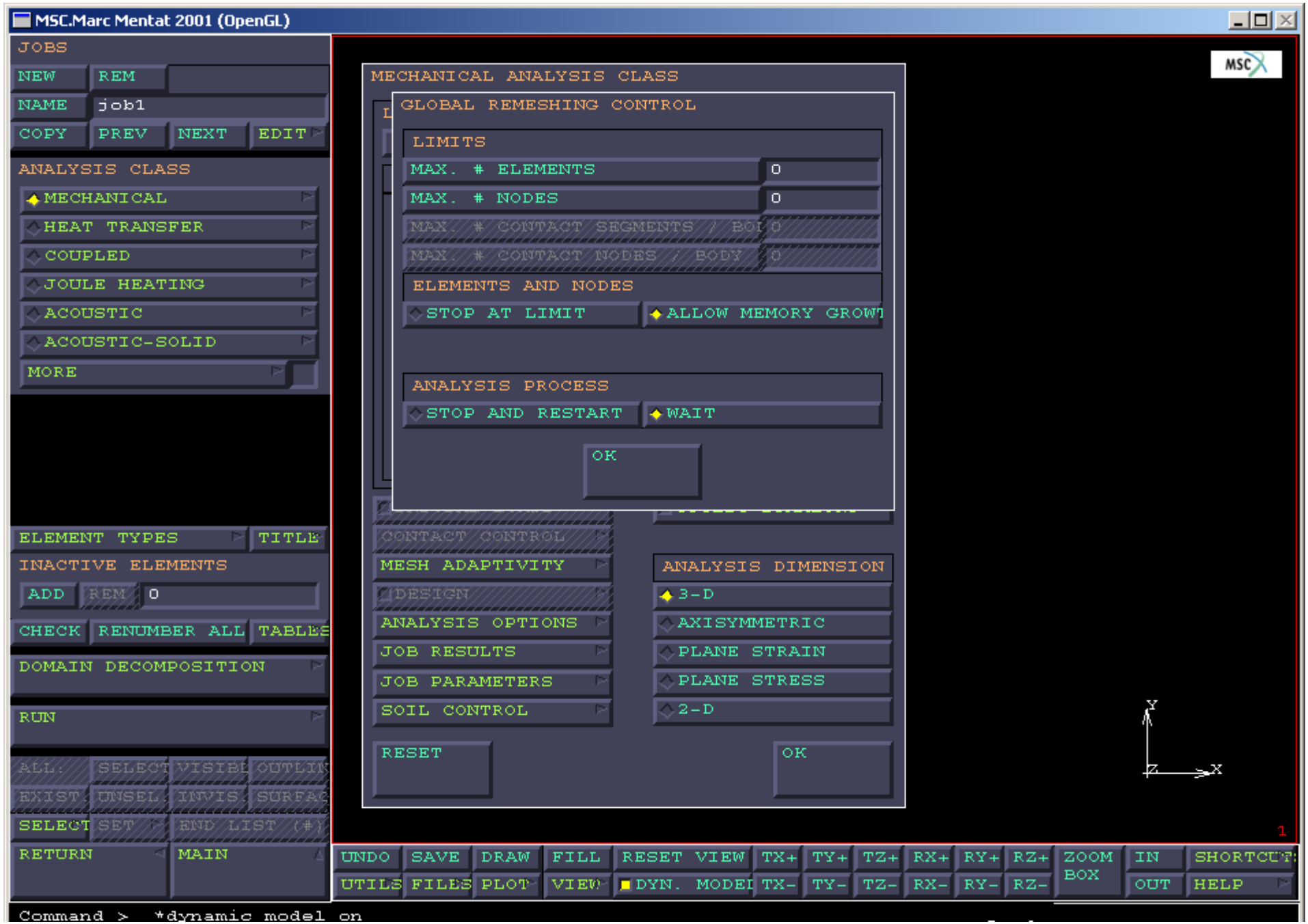
Global Remeshing

- Manual remeshing
  - Useful when automatic remeshing does not meet user needs.
  - Allows user to redefine the mesh used for analysis
  - Involves restarting of analysis
  - Allows specifying BCs (with the help of a subroutine)
  - Drawback: Involves editing of .dat file

Automatic Remeshing


MSC.Marc Mentat 2001 (OpenGL)
GLOBAL REMESHING CRITERIA
NEW
REM
NAME
adapg1
COPY
PREV
NEXT
EDIT
PLANAR REMESHING METHODS
ADVANCING FRONT QUAD
OVERLAY QUAD
ADVANCING FRONT TRIA
DELAUNAY TRIA
REMESH BODY
ID GLOBAL REMESHING CRIT
RETURN
MAIN
ADVANCING FRONT QUAD GLOBAL REMESHING
REMESHING CRITERIA
INCREMENT
FREQUENCY
5
IMMEDIATE
ADVANCED
REMESHING PARAMETERS
ELEMENT EDGE LENGTH
SET
0
ELEMENTS
SET
2
PREVIOUS # ELEMENTS
ADVANCED
RESET
OK
MSC
Y
X
Z
1
UNDO
SAVE
DRAW
FILL
RESET VIEW
TX+
TY+
TZ+
RX+
RY+
RZ+
ZOOM BOX
IN
SHORTCUT
UTILS
FILES
PLOT
VIEW
DYN. MODEL
TX-
TY-
TZ-
RX-
RY-
RZ-
OUT
HELP
Command > *adapg_type advfront_quad
Command > *adapg_type overlay_quad
Command > *adapg_type advfront_quad
Command > *dynamic_model_on
Command >
Ready


MSC.Marc Mentat 2001 (OpenGL)
GLOBAL REMESHING CRITERIA
NEW
REM
NAME
adapg1
COPY
PREV
NEXT
EDIT
PLANAR REMESHING METHODS
ADVANCING FRONT QUAD
OVERLAY QUAD
ADVANCING FRONT TRIA
DELAUNAY TRIA
REMESH BODY
ID GLOBAL REMESHING CRIT
RETURN
MAIN
ADVANCING FRONT QUAD GLOBAL REMESHING
ADVANCED REMESHING PARAMETERS
MIN. ELEMENT EDGE LI
SET
0
CHANGE OF # ELEMENTS
SET
0
CURVATURE CONTROL
#DIV
36
SMOOTHING RATIO
0.8
OK
PREVIOUS # ELEMENTS
ADVANCED
RESET
OK
UNDO
SAVE
DRAW
FILL
RESET VIEW
TX+
TY+
TZ+
RX+
RY+
RZ+
ZOOM BOX
IN
SHORTCUT
UTILS
FILES
PLOT
VIEW
DYN. MODEL
TX-
TY-
TZ-
RX-
RY-
RZ-
OUT
HELP
Y
X
Z
1
Command > *adapg_type overlay_quad
Command > *adapg_type advfront_quad
Command > *dynamic_model_on
Command > *dynamic_model_on
Command >
Ready


MSC.Marc Mentat 2001 (OpenGL)
JOBS
NEW
REM
NAME
job1
COPY
PREV
NEXT
EDIT
ANALYSIS CLASS
MECHANICAL
HEAT TRANSFER
COUPLED
JOULE HEATING
ACOUSTIC
ACOUSTIC-SOLID
MORE
ELEMENT TYPES
TITLE
INACTIVE ELEMENTS
ADD
REM
0
CHECK
RENUMBER ALL
TABLES
DOMAIN DECOMPOSITION
RUN
ALL
SELECT
VISIBL
OUTLIN
EXIST
UNSEL
INVIS
SURFAC
SELECT
SET
END LIST (#)
RETURN
MAIN
MECHANICAL ANALYSIS CLASS
GLOBAL REMESHING CONTROL
LIMITS
MAX. # ELEMENTS
0
MAX. # NODES
0
MAX. # CONTACT SEGMENTS / BOI
0
MAX. # CONTACT NODES / BODY
0
ELEMENTS AND NODES
STOP AT LIMIT
ALLOW MEMORY GROWT
ANALYSIS PROCESS
STOP AND RESTART
WAIT
OK
CONTACT CONTROL
MESH ADAPTIVITY
DESIGN
ANALYSIS OPTIONS
JOB RESULTS
JOB PARAMETERS
SOIL CONTROL
ANALYSIS DIMENSION
3-D
AXISYMMETRIC
PLANE STRAIN
PLANE STRESS
2-D
RESET
OK
MSC
Y
Z
X
1
UNDO
SAVE
DRAW
FILL
RESET VIEW
TX+
TY+
TZ+
RX+
RY+
RZ+
ZOOM BOX
IN
SHORTCUT
UTILS
FILES
PLOT
VIEW
DYN. MODEL
TX-
TY-
TZ-
RX-
RY-
RZ-
OUT
HELP
Command > *dynamic model on

Automatic Remeshing

- New mesh saved in the file *jobname.t18*
- If Marc is run with the option –me 1, Marc pauses everytime a new mesh is created.
- User has the option to modify the mesh.
- To restart the paused job,
  - Use ‘kill’ command if Marc runs in background
  - Type ‘go’ – if Marc runs in foreground

Modifying the Mesh

- Rename the .t18 to a .dat file
- To read it into Mentat, changes should be made to the file.
- Add the following lines at the beginning of the file
  - Extended (if required)
  - Elements,11 (element type)
  - End

Modifying the Mesh

- Remove all the words ‘change’
- Remove ‘exit’ lines
- Remove ‘outline’ and data blocks other than coordinates and connectivity
- Last line should be ‘end option’
- Read it into Mentat, using the command
  - *read_marc *filename.dat*
- Changes to the mesh done as explained later

Manual Remeshing

Manual Remeshing

- 2 types
  - Through .dat file
  - Through .mesh/.t18 file

Remeshing with .dat file

Remeshing with .dat file

- Make sure a restart file is written.
- In Mentat, go to Jobs -> Mechanical -> Job Parameters -> Restart and specify the appropriate flags to write out a restart file.

Remeshing with .dat file

1. Estimate the maximum number of
   - Elements (sizing card)
   - Nodes (sizing card)
   - Boundary conditions (sizing card)
   - Contact Segments (contact block)
   - Contact nodes (contact block)

Remeshing with dat file

2. Open the .dat file with an editor
   - On the ‘sizing’ line, change the number of elements and nodes (and BCs if applicable)
   - Add a new line ‘rezoning’ in the Parameter section (before the line ‘end’)

Remeshing with dat file

3. Look for ‘contact’ block in the .dat file.
   - In the second line of contact block, 2nd field represents maximum number of entities for a surface. Increase it.
   - 3rd field of the same line represents the maximum number of nodes that can lie on the periphery of a deformable body. Increase it.
   - You need to have an idea of the deformation of the body and the mesh size.

Remeshing with dat file

- If the job fails and remeshing is desired, you will be able to restart the job now with a modified mesh.

Redefining the mesh

- Read in the results of the 1st job.
- Go to the appropriate increment
  - A restart file should exist for the increment
- Go to Main -> Results -> Tools
- Click on Rezone Mesh
  - This will create a model of the deformed mesh
- Files -> Save As -> (Specify file name)

Redefining the mesh

- Go to Files -> Open and select the file just saved.
- Make only one contact body of interest visible
- Go to Plot and make sure Faces are turned off. Click on Next and select Outline (instead of default Surface).
  - Mentat will now display only the outline of mesh.
- Mesh Generation -> Convert -> Edges to Curves
  - Select all outline edges with a box (Do not click on All Visible)

Redefining the mesh

- Elements and nodes in current mesh can now be deleted (using All Visible)
- Create a new mesh using the new set of curves as boundary
  - Element edge size at boundary cannot be larger than the initial edge, since at least one element edge should exist per curve.
  - If a coarser mesh is desired, redefine the curves.

Redefining the mesh

- Repeat for all the desired contact bodies.
- Specify the appropriate boundary conditions
- Redefine the contact bodies
  - The only change should be the element numbers
- Note that rigid bodies cannot be changed
- RELAX NODES (in Mentat) can be used to get a better mesh without increasing elements

Redefining the mesh

- Save the model
- Write out a .dat file

Editing the .dat file

- Remove all lines before ‘connectivity’.
- Add a line before ‘connectivity’
  - Rezone,1
- The only data blocks in the file should be
  - Connectivity
  - Coordinates
  - Material properties (isotropic, Mooney etc.)
  - Contact
  - Loadcases, if required

Change from	**Change to**
Connectivity	Connectivity change
Coordinates	Coordinates change
Isotropic	Isotropic change
Mooney	Mooney change
Contact	Contact change

Contact block changes

- Rigid body definitions should not be changed
  - Remove the definition lines
- Read about ‘contact change’ in Volume C.

Completing the changes

- Remove all other data blocks upto ‘end option’
- Add the following lines after contact block, in this order
  - Continue
  - End rezone

Appending the files

- Copy the old model file to a new name.
- Remove the loadcase data, if necessary.
- Modify Restart block to read or read/write and specify the appropriate increment number to be read.
- Add Reauto 0,0,1
- Continuous or discontinuous post file

Run the job

- Run_marc –j new_job –r old_job

Manual Remeshing with .mesh

Manual Remeshing with .mesh

- .mesh file contains only the mesh information, unlike the .dat file rezoning
- One mesh file for each body to be remeshed
- The remesh file name has the following name convention
  - newjob_b01.mesh, newjob_b02.mesh
    - Newjob is the name of the new model file
    - b01 is the body number (b02, b03 etc)

Manual Remeshing with .mesh

- If using extended precision, first line should be ‘extended’
- ‘coordinates change’ and ‘connectivity change’ blocks are ended with ‘exit’ line
- No loadcase information in the .mesh files

For all your Technical Support needs, please go to:

http://www.mscsoftware.com/support/prod_support/marc/