Recent Developments

in LS-PREPOST

P. Ho (LSTC)

Latest Features in LS-PREPOST 2.2

6th German LS-DYNA Forum
Frankenthal, Germany

October 11-12, 2007

LSTC Livermore Software Technology Corp.

LS-PREPOST

Outline of Presentation

- Current Status of LS-Prepost
- New features in General functions
- Meshing
- Post-Processing
- Pre-processing
- Current and future developments

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LS-PREPOST

Current Status of LS-Prepost

- LS-Prepost 2.2 will be released in November 2007
- LS-Prepost 2.2 can be freely download from ftp://ftp.lstc.com/outgoing/lsprepost2_2 or ftp://ftp22.lstc.com/outgoing/lsprepost2_2
- ftp22 is for countries that has no access to ftp.lstc.com
- http://www.lstc.com/lspp for online documentation and tutorials

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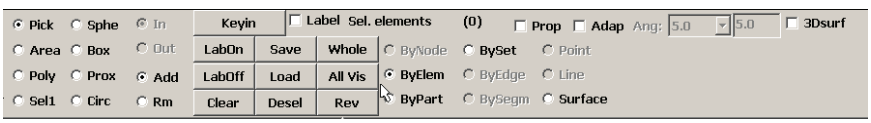
LS-PREPOST

General Function

A more powerful general selection interface

- By Sphere - Select entities inside/outside of a sphere
- By Box – Select entities inside/outside of a box. Box can defined here, or one of the LSDYNA keyword data
- By Proximity – Select entities inside/outside the proximity of a part
- By Circle – Select entities inside/outside of a circle



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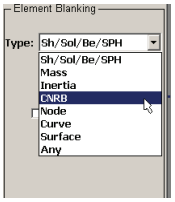
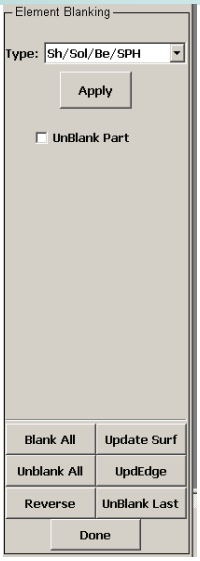
General Function

Blanking now using General selection

- Shell/Solid/Beam/Sph
- Mass/Inertia
- Constrained Nodal Rigid Bodies
- Nodes
- Curves/Surface
- Or Any other entities





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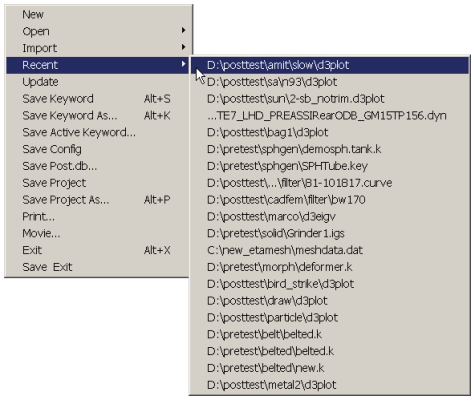
General Function



Recent file menu

- Provide fast access to the last used files
- Pull Down File->Recent
- No. of files can be controlled by user, default is 5
- Edit first line in .lspp_recent in user's home directory: c:\Document Setting\pho

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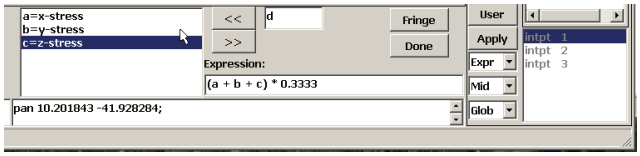
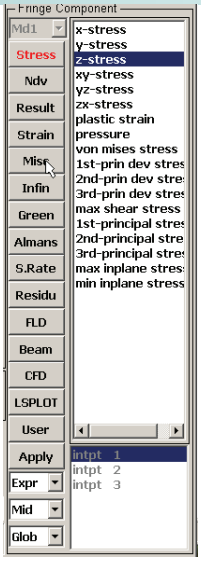
Post-Processing

Fringe component by expression

- Assign regular fringe component to variables a, b,c, ...
- Define expression
- Click Fringe button to view result





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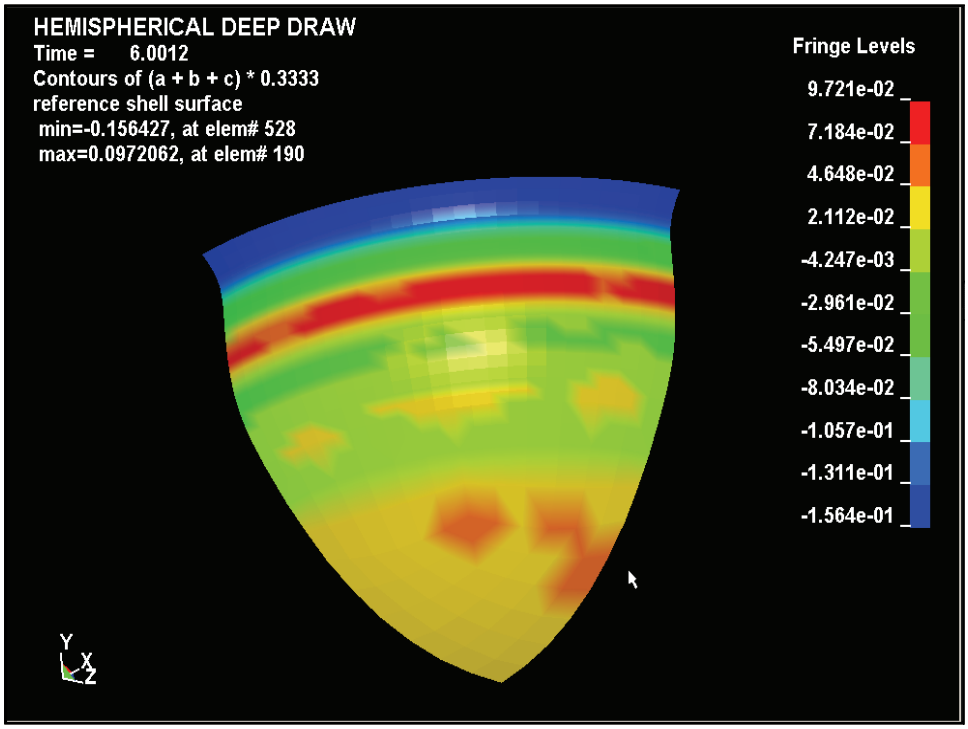

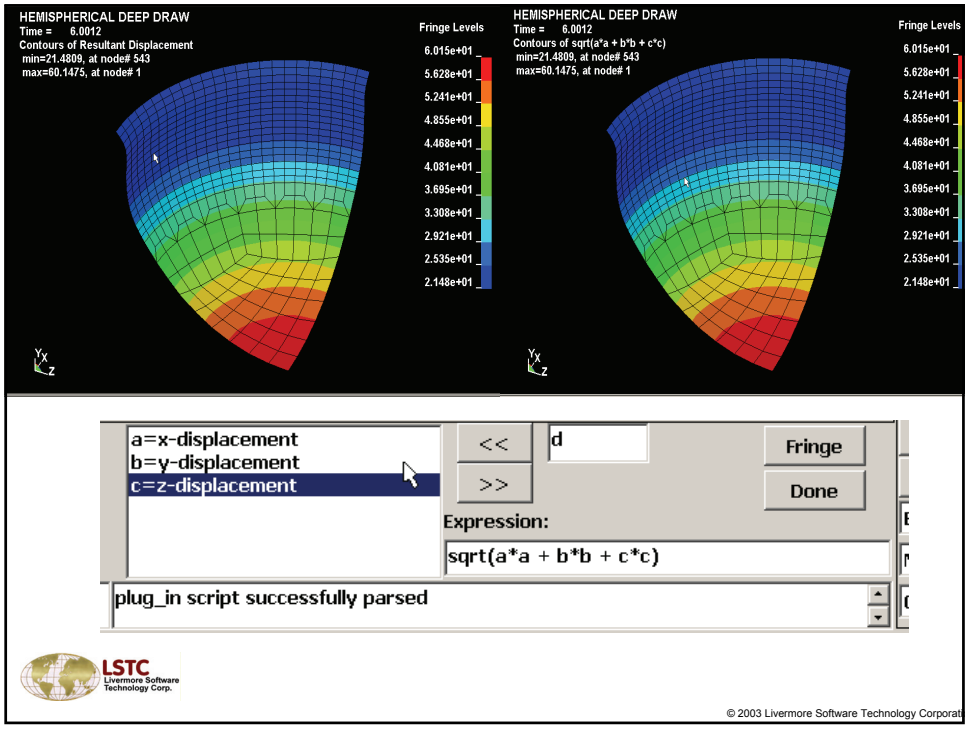

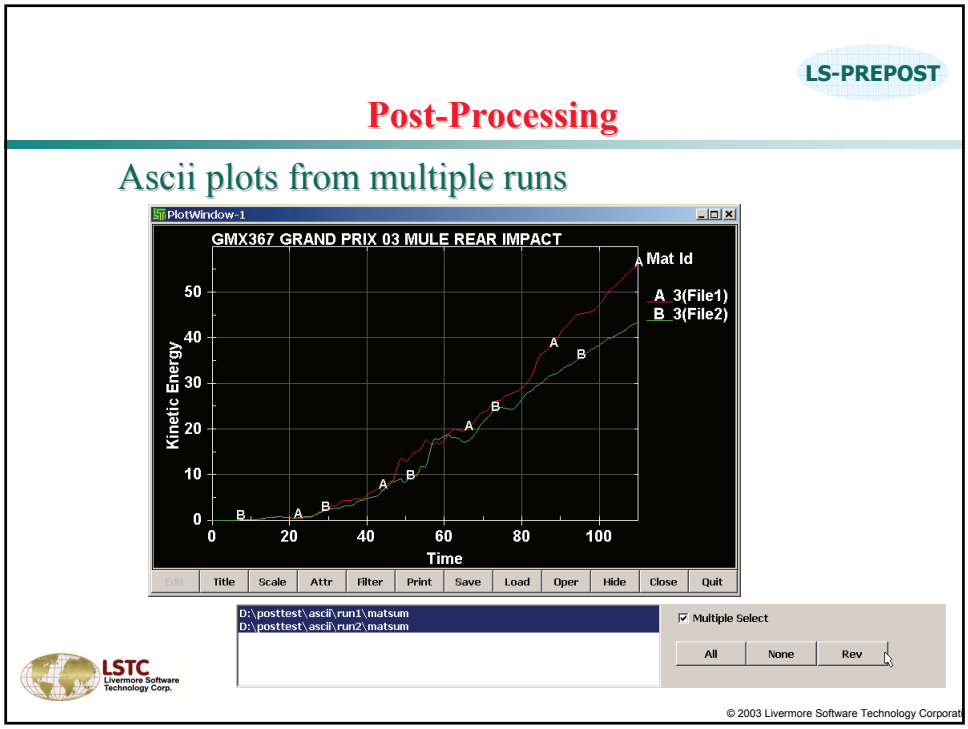

LS-PREPOST

Post-Processing

FEMZIP file format support

- Treated as regular d3plot files
- Automatically recognized as FEMZIP format
- Adaptive meshing is not yet supported
- Some other LSDYNA data may not be supported at this time like CFD data, Particle Data, etc.
- Will work with SCAI to further improve file reading performance

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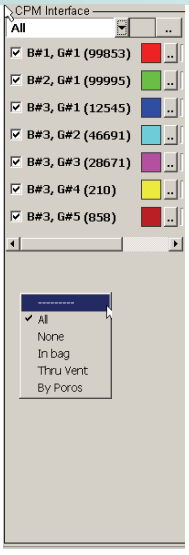
Post-Processing

Particle method post-processing

- Button located on page 1 ->Particle
- Separate viewing of particle from Different airbags and different gases
- View particles in all locations or inside the bag, or escape through the vent hole or leak by porosity
- Color of the particle can be changed by user



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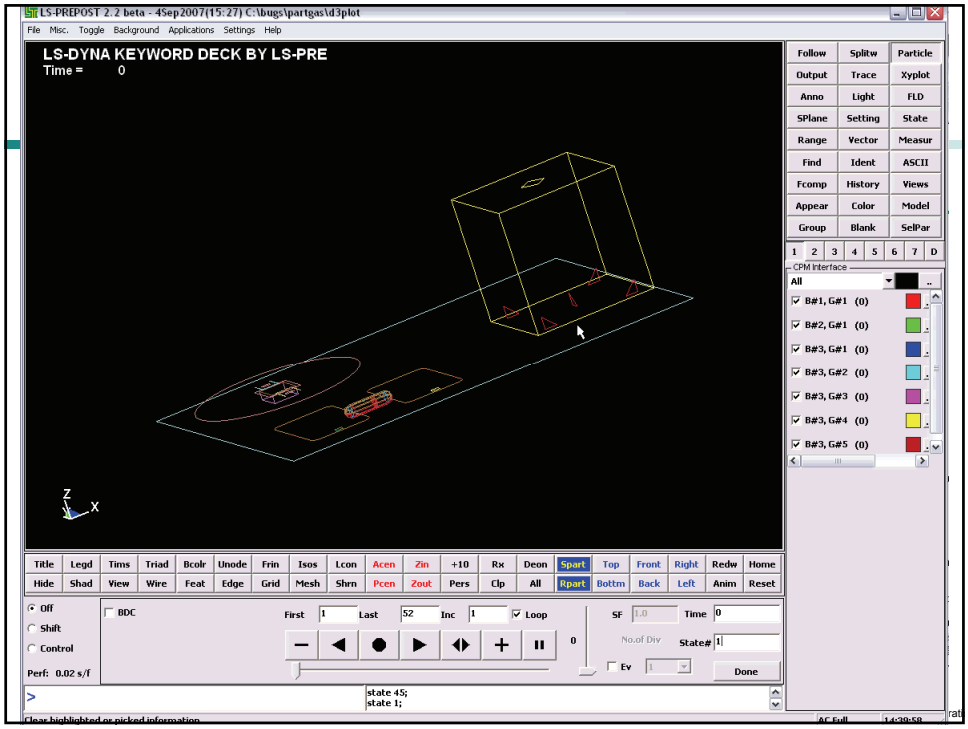

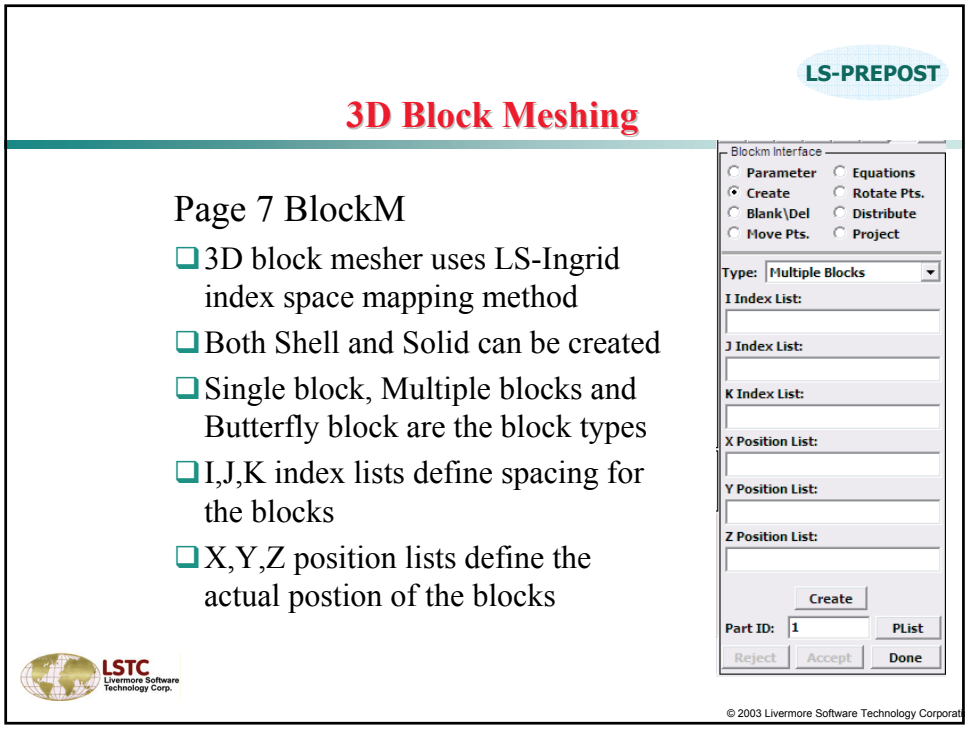

LS-PREPOST

3D Block Meshing

Page 7 BlockM

- Computation window provides the block topology in graphical form
- Computation window also provide manipulation on the mapping projection
- When physical model rotated graphically, the computation blocks also rotated accordingly. The viewing of the physical model and the computation blocks are in sync.

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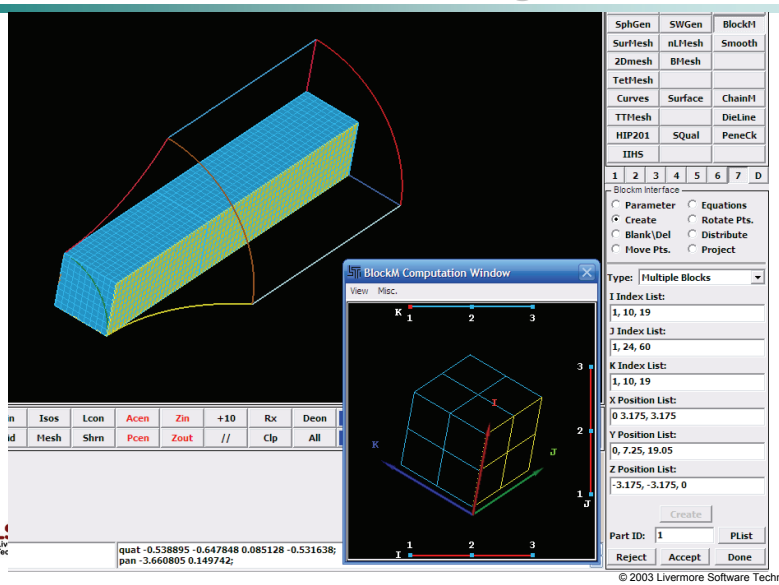
3D Block Meshing



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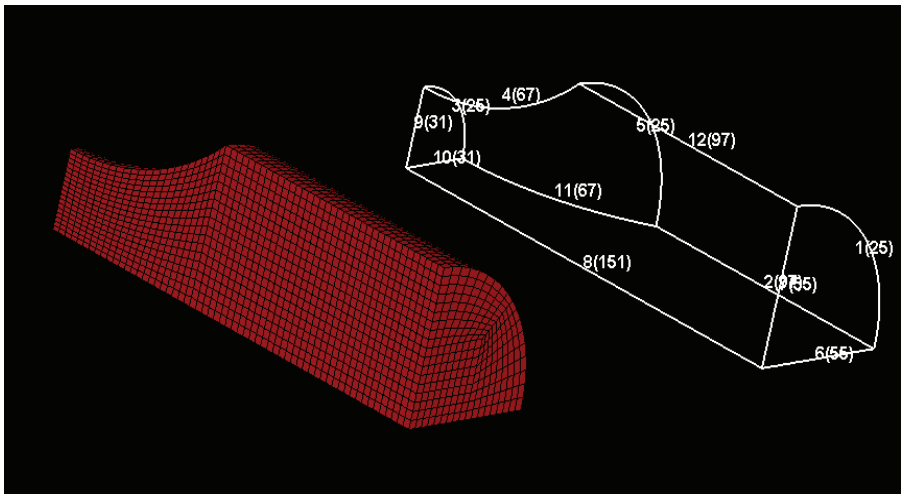
3D Block Meshing



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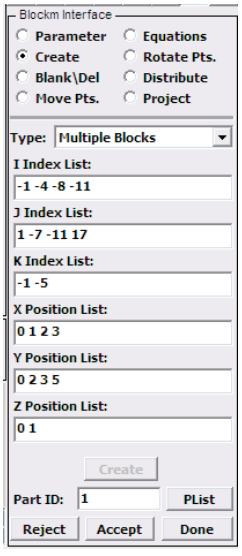
3D Block Meshing

- Using negative numbers in the index list to indicate it is shell mesh instead of solid mesh
- When there is negative number in the index list, it represents shell model, positive numbers just give space index, will not generate shell
- Solid mesh and shell mesh do not mixed



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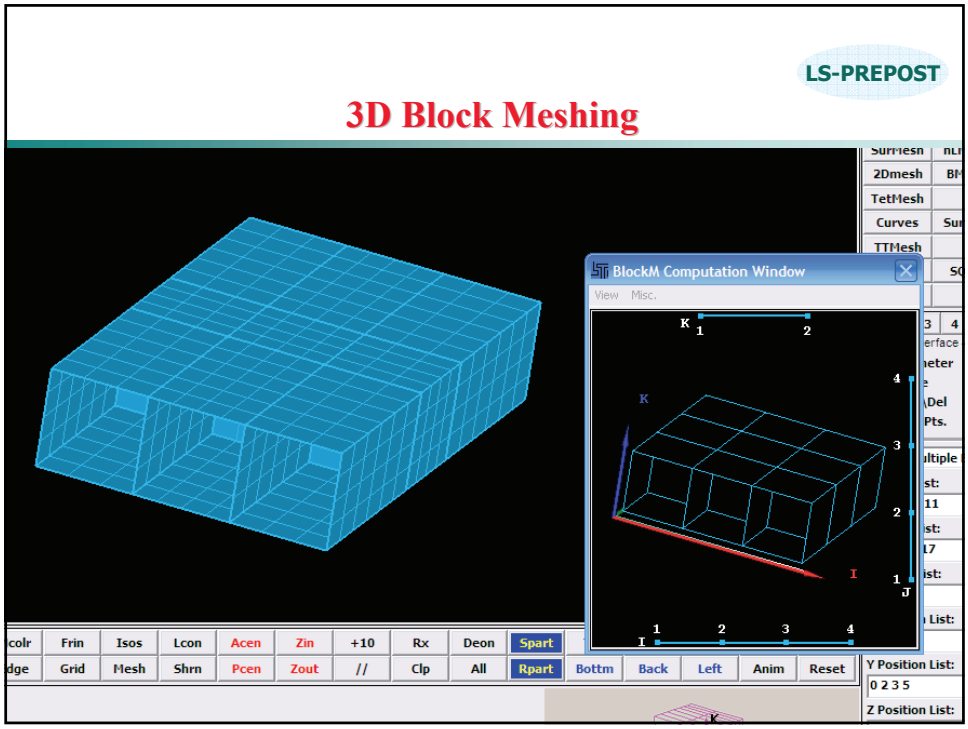
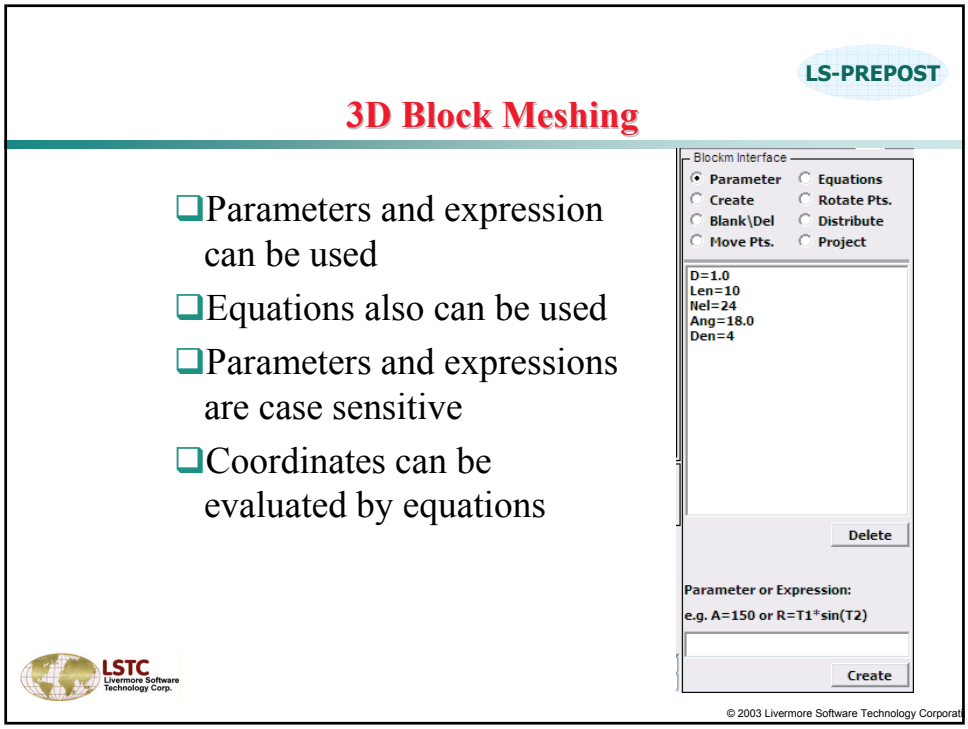

LS-PREPOST
3D Block Meshing
BlockM Computation Window
View Misc.
2Dmesh
TetMesh
Curves
TTMesh
colr Frin Isos Lcon Acen Zin +10 Rx Deon Spart
dge Grid Mesh Shrn Pcen Zout // Clp All Rpart Bottm Back Left Anim Reset
Y Position List:
0 2 3 5
Z Position List:


LS-PREPOST
3D Block Meshing
❑Parameters and expression can be used
❑Equations also can be used
❑Parameters and expressions are case sensitive
❑Coordinates can be evaluated by equations
Blockm Interface
Parameter
Equations
Create
Rotate Pts.
Blank\Del
Distribute
Move Pts.
Project
D=1.0
Len=10
Nel=24
Ang=18.0
Den=4
Delete
Parameter or Expression:
e.g. A=150 or R=T1*sin(T2)
Create
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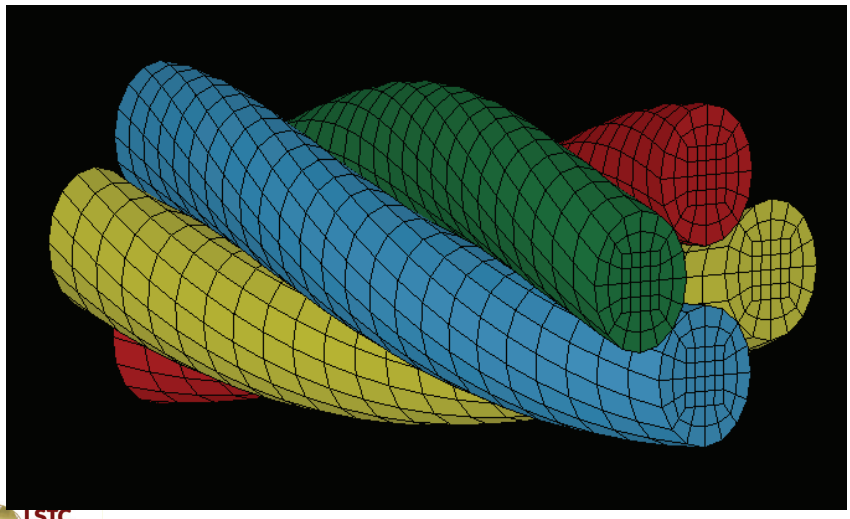
3D Block Meshing



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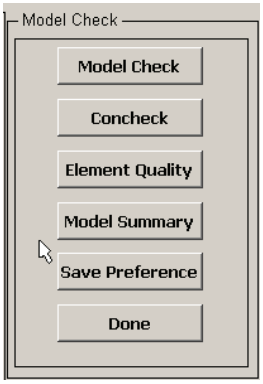
Extensive Model Checking

- Extensive Keyword check
  - Intelligent check that match LS-DYNA requirements
  - Provide limited autofix
  - Go to keyword directly and do manual fix
- Contact interface check
- Mesh quality check
- Model Summary
- Parameters use in model check can be setup by user



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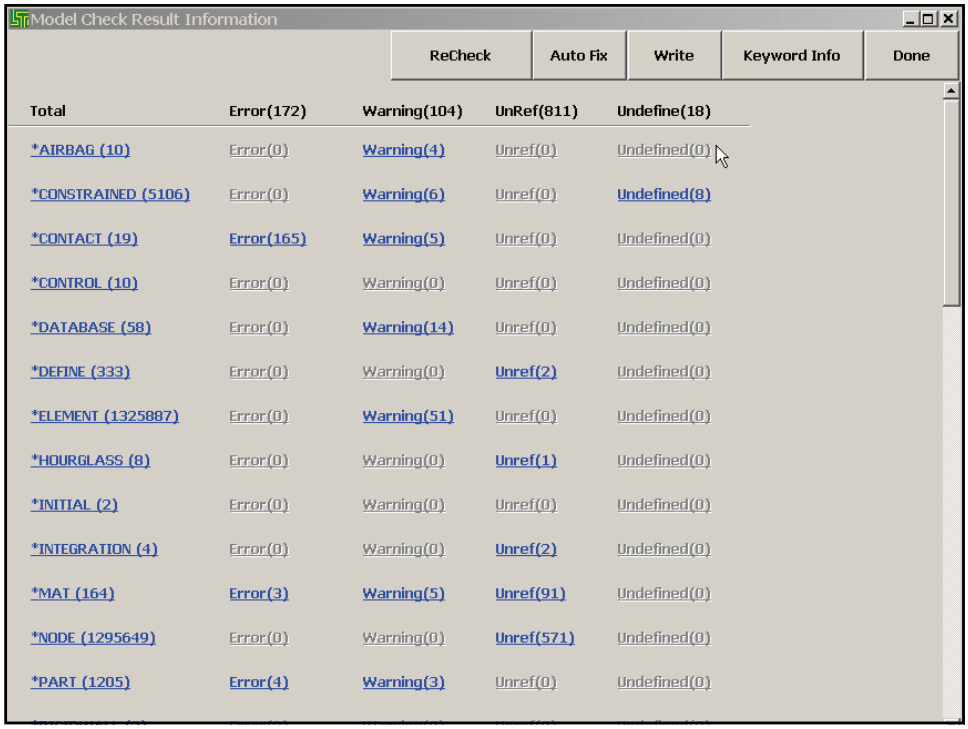
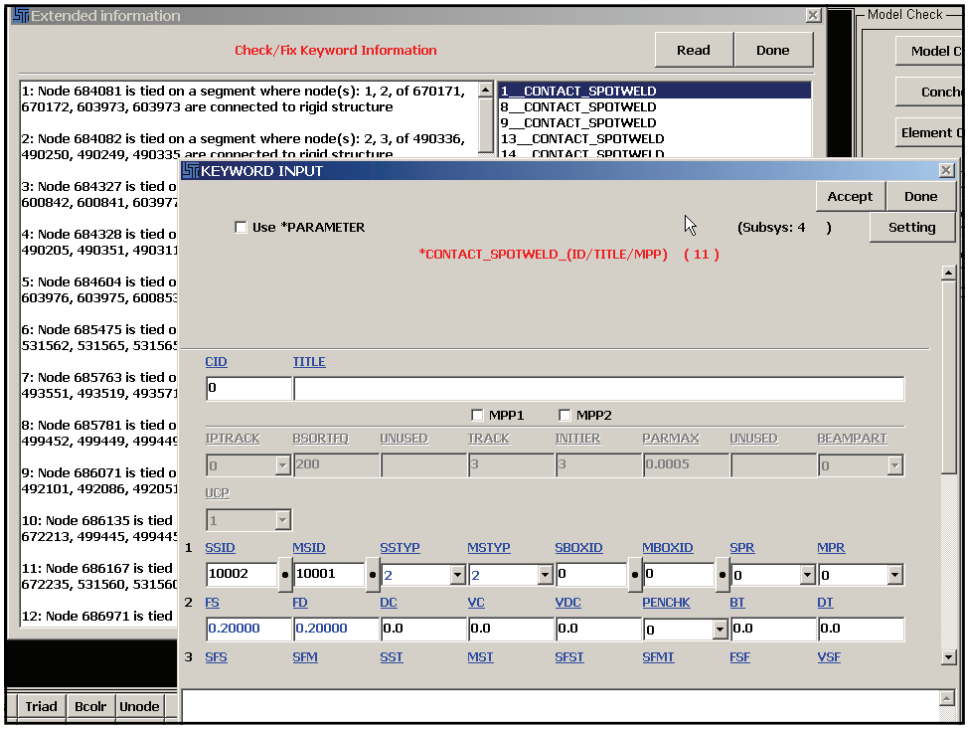
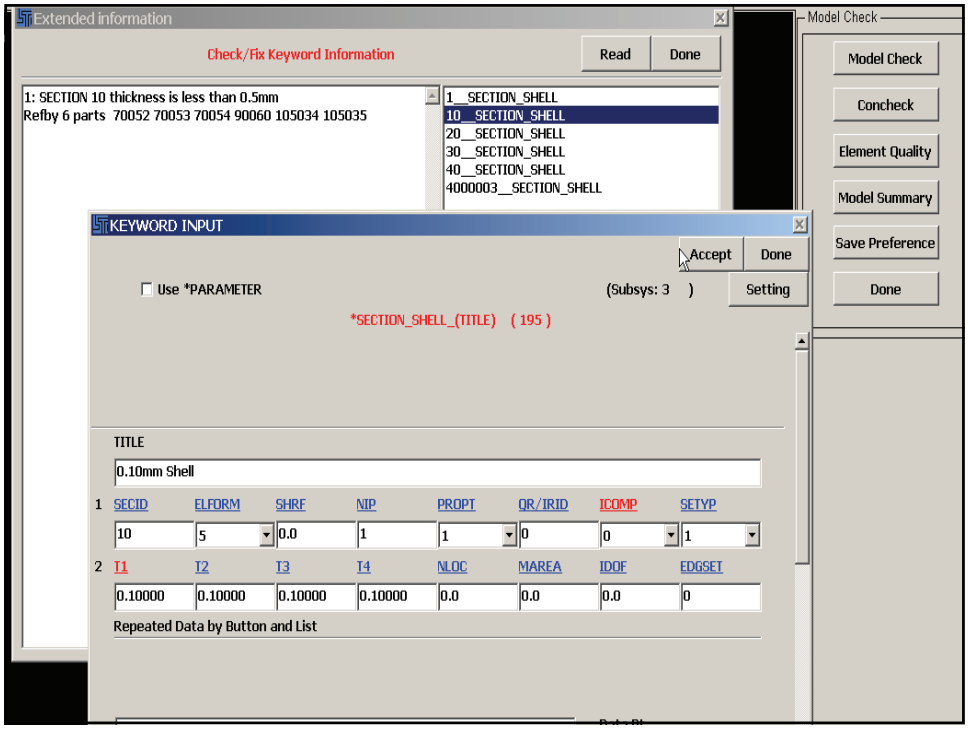
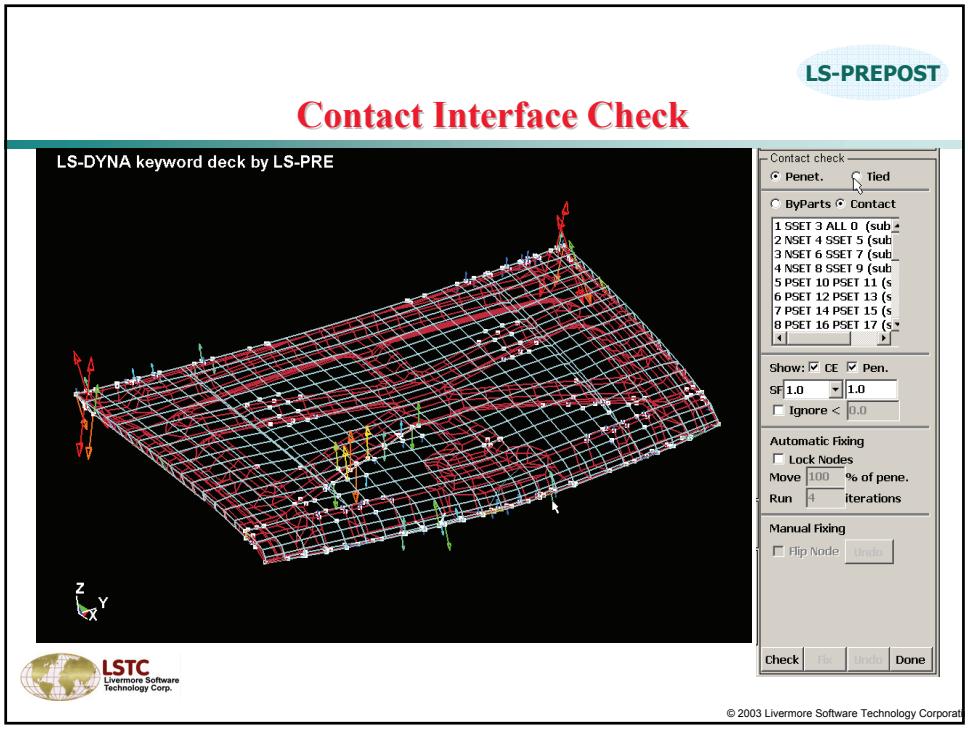

Model Check Result Information
ReCheck
Auto Fix
Write
Keyword Info
Done
Total
Error(172)
Warning(104)
UnRef(811)
Undefine(18)
*AIRBAG (10) Error(0) Warning(4) Unref(0) Undefined(0)
*CONSTRAINED (5106) Error(0) Warning(6) Unref(0) Undefined(8)
*CONTACT (19) Error(165) Warning(5) Unref(0) Undefined(0)
*CONTROL (10) Error(0) Warning(0) Unref(0) Undefined(0)
*DATABASE (58) Error(0) Warning(14) Unref(0) Undefined(0)
*DEFINE (333) Error(0) Warning(0) Unref(2) Undefined(0)
*ELEMENT (1325887) Error(0) Warning(51) Unref(0) Undefined(0)
*HOURGLASS (8) Error(0) Warning(0) Unref(1) Undefined(0)
*INITIAL (2) Error(0) Warning(0) Unref(0) Undefined(0)
*INTEGRATION (4) Error(0) Warning(0) Unref(2) Undefined(0)
*MAT (164) Error(3) Warning(5) Unref(91) Undefined(0)
*NODE (1295649) Error(0) Warning(0) Unref(571) Undefined(0)
*PART (1205) Error(4) Warning(3) Unref(0) Undefined(0)


Extended information
Check/Fix Keyword Information
Read
Done
1: Node 684081 is tied on a segment where node(s): 1, 2, of 670171, 670172, 603973, 603973 are connected to rigid structure
2: Node 684082 is tied on a segment where node(s): 2, 3, of 490336, 490250, 490249, 490335 are connected to rigid structure
1__CONTACT_SPOTWELD
8__CONTACT_SPOTWELD
9__CONTACT_SPOTWELD
13__CONTACT_SPOTWELD
Model Check
KEYWORD INPUT
Accept
Done
Use *PARAMETER
(Subsys: 4)
Setting
*CONTACT_SPOTWELD_(ID/TITLE/MPP) (11)
CID
TITLE
MPP1
MPP2
IPTRACK
BSORTFQ
UNUSED
TRACK
INITIER
PARMAX
UNUSED
BEAMPART
UCP
SSID
MSID
SSTYP
MSTYP
SBOXID
MBOXID
SPR
MPR
FS
FD
DC
VC
VDC
PENCHK
BT
DT
SFS
SFM
SST
MST
SFST
SFMT
FSF
VSF
Triad
Bcolr
Unode





LS-PREPOST

Model Part Info Summary

Part Sort

Sort Part

	Type	PartId	PartName	SectionId	MatId	EosId	Hrglass	Elform	Thickness	Mass	NumElem
1	Solid	1	PSOLID : 1	1	1	0	0	2	0	0.392552	192
2	Solid	2	PSOLID : 1	2	2	0	0	0	0	0.0976057	16
3	Solid	3	PSOLID : 1	3	3	0	0	0	0	0.247188	16
4	Solid	4	PSOLID : 1	4	4	0	0	0	0	0.07875	16
5	Solid	5	PSOLID : 1	5	5	0	0	0	0	0.0787491	16
6	Solid	6	PSOLID : 1	6	6	0	0	0	0	0.0787466	16
7	Solid	7	PSOLID : 1	7	7	0	0	0	0	7.9937e-0(	1
8	Solid	8	PSOLID : 1	8	8	0	0	0	0	0.107898	1
9	Solid	9	PSOLID : 1	9	9	0	0	0	0	0.10794	1
10	Solid	10	PSOLID : 1	10	10	0	0	0	0	4.281	8
11	Solid	11	PSOLID : 1	11	11	0	0	0	0	1.26076	120
12	Solid	12	PSOLID : 1	12	12	0	0	0	0	2.33035	175
13	Shell	13	PSHELL : 1	13	13	0	0	0	0.4259	15.74	17
14	Solid	17	PSOLID : 1	17	17	0	0	0	0	0.569594	1
15	Shell	18	PSHELL : 1	18	18	0	0	0	5	0.319971	99
16	Shell	19	PSHELL : 1	19	19	0	0	0	5	0.267631	87
17	Solid	20	PSOLID : 1	20	20	0	0	0	0	0.0248878	1
18	Shell	21	PSHELL : 1	21	21	0	0	0	5	0.320095	99
19	Shell	22	PSHELL : 1	22	22	0	0	0	5	0.267632	87
20	Solid	23	PSOLID : 1	23	23	0	0	0	0	0.0248879	1
21	Shell	24	PSHELL : 1	24	24	0	0	0	2	2.086	32
22	Solid	25	PSOLID : 1	25	25	0	0	0	0	0.0194329	2
23	Shell	26	PSHELL : 1	26	26	0	0	0	2	2.086	32
24	Solid	27	PSOLID : 1	27	27	0	0	0	0	0.0194338	2
25	Shell	28	PSHELL : 1	28	28	0	0	0	2	1.723	22
26	Shell	30	PSHELL : 1	30	30	0	0	0	2	1.723	22
27	Shell	32	PSHELL : 1	32	32	0	0	0	2	0.584999	10
28	Shell	34	PSHELL : 1	34	34	0	0	0	2	0.584999	10
29	Solid	36	PSOLID : 1	36	36	0	0	2	0	1.05803	24
30	Solid	37	PSOLID : 1	37	37	0	0	0	0	0.145323	12

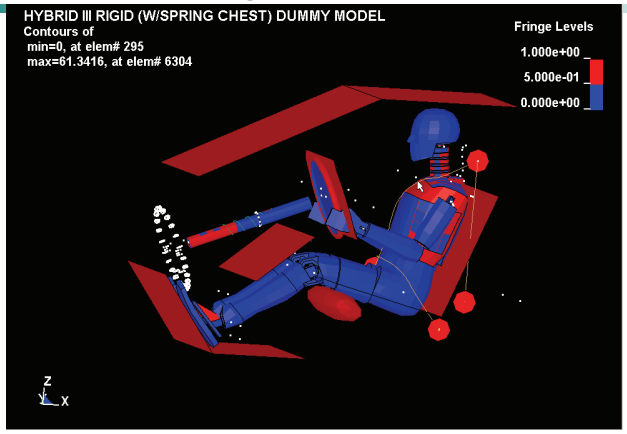
Setting Column:

- Type
- PartId
- PartName
- SectionId
- SectionName
- MatId
- MatName
- EosId
- Hrglass
- Elform
- Thickness
- Mass
- Cent_XYZ
- NumElem
- Area
- Volume

Set Active

LS-PREPOST

Mesh Quality Check Interface - Eledit



Element Edit Interface

Node	Element
Ident	Check
Create	Create
Delete	Delete
Replace	Split/Merge
Align	Modify
Modify	Direction

Show Free Edges

Beam Solid

Shell TShell

Checking method

Quality Check
Duplicate
Normal
Free - Unattached
UnderCut
Curvature

Criterion:

SolidReverse

Check Done

Shell Quality Check	Allowable	Min. val	Max. val	#Violated(%)
Min side length	3	0.990012	212.501	52(1.67%)
Max side length	30	0.990012	212.501	2030(65.19%)
Aspect Ratio	10	1.00001	11.2058	12(0.3854%)
Warpage	10	0	61.3416	118(3.789%)

Clear All
Save Failed
Write Report

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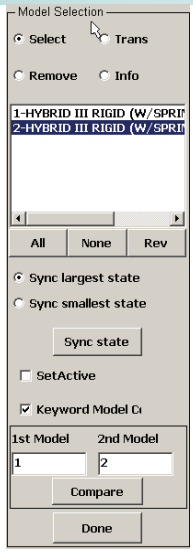
LS-DYNA Keyword model Compare

Compare 2 LS-DYNA keyword models – very often it is very hard to find the difference between 2 similar models with minor changes

- Go to Page 1->Model interface
- Read in 2 LS-DYNA keyword models (use open, not import on the second model)
- Activate "Keyword Model Compare"
- Select 1st model, and 2nd model
- Click Compare



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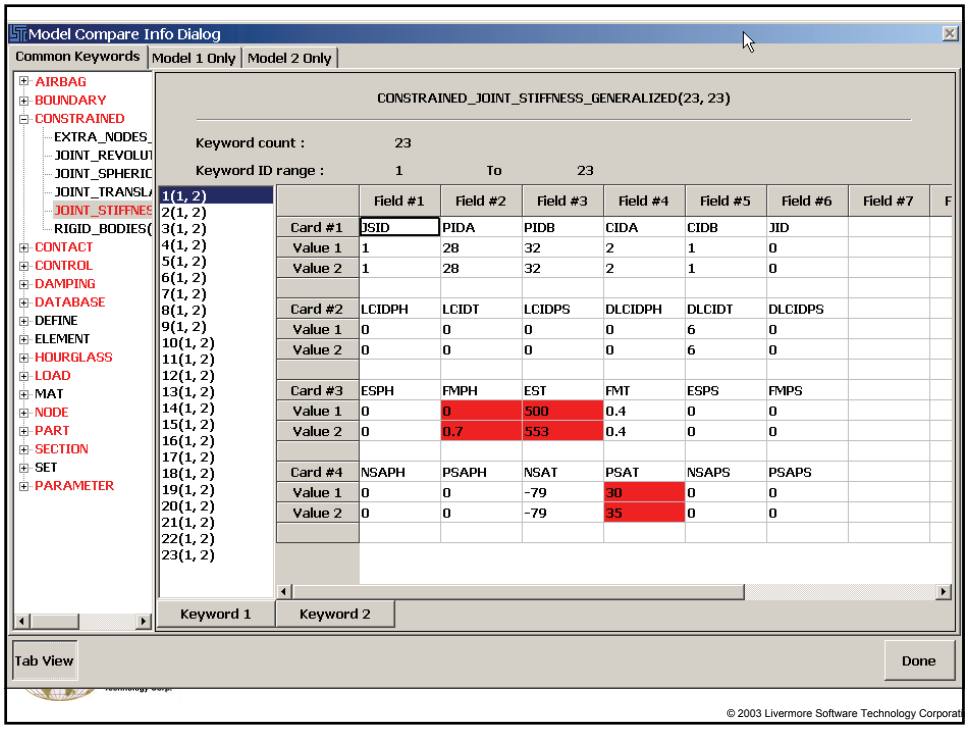
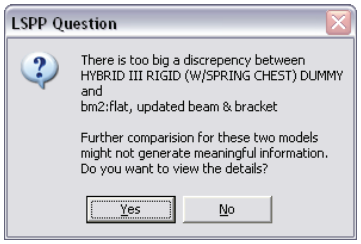


LS-PREPOST

Models with too much difference



Details ...

	Model 1	Model 2	Difference	% Diff
Num. Nodes	7787	11519	3732	32.3986
Num. Beam Elems	1	0	1	100
Num. Shell Elems	3114	10920	7806	71.4835
Num. Solid Elems	1836	260	1576	85.8388
Num. TShell Elems	0	0	0	0
Num. SPH Elems	0	0	0	0
Num. Mass Elems	0	0	0	0
Num. Inertia Elems	0	0	0	0
Num. Discrete Elems	18	0	18	100
Num. Seatbelt Elems	220	0	220	100
Num. Beam Parts	1	0	1	100
Num. Shell Parts	41	19	22	53.6585
Num. Solid Parts	52	1	51	98.0769
Num. TShell Parts	0	0	0	0
Num. SPH Parts	0	0	0	0
Num. Mass Parts	0	0	0	0
Num. Inertia Parts	0	0	0	0
Num. Discrete Parts	15	0	15	100
Num. Seatbelt Parts	1	0	1	100
Num. Nod Rgd Bodies	0	0	0	0
Model Extent X	1600.75	1600.75	470.178	29.3723
Model Extent Y	821.851	821.851	777.748	48.6214
Model Extent Z	1118.51	1118.51	322.883	28.8672

Close

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LS-PREPOST

Dummy Positioning

- Dummy Database
- Multiple Dummies
- Handle a dummy with its Model
- Local Coordinate Systems for Occupants
- Primer Tree Reader and more(LS-PREPOST 2.2)

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Dummy Database

- For the sharing and management purposes to the occupant models
- A dummy database contains
  - Occupant name
  - Tree/Keyword file directory
  - Tree and Keyword file names
- LS-PREPOST read the database from .LSPOSTRC file

  [occupant_list = …]

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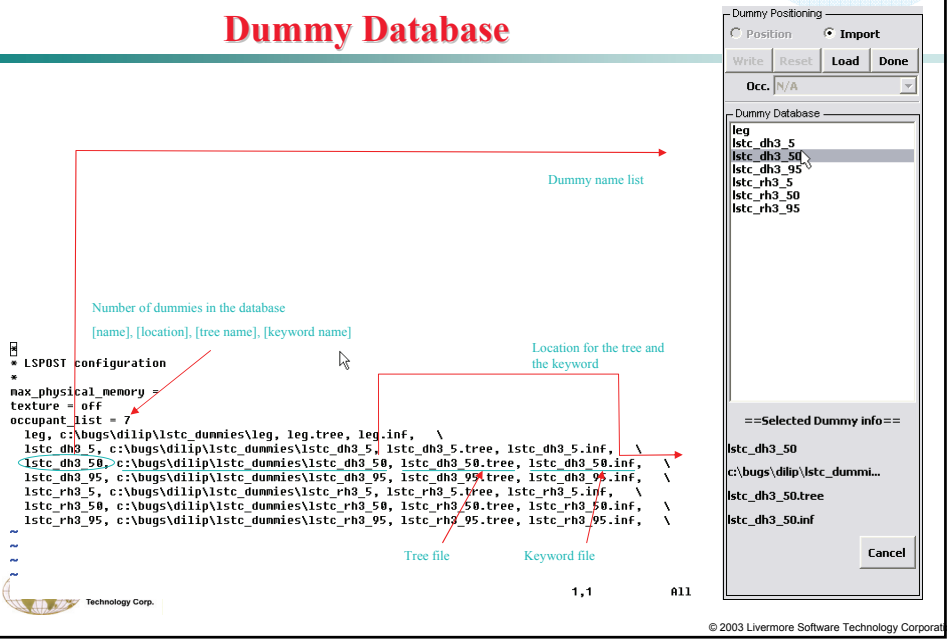
Dummy Database



LS-PREPOST

Multiple Dummies

Through [Import] interface, LS-PREPOST now can handle more than one dummies in positioning process

- Dummy Switching
  - With right-mouse click
  - With Pull-down menu
- Each dummy is operated the same way as one single dummy imported.
- All dummies can be exported into a same keyword file

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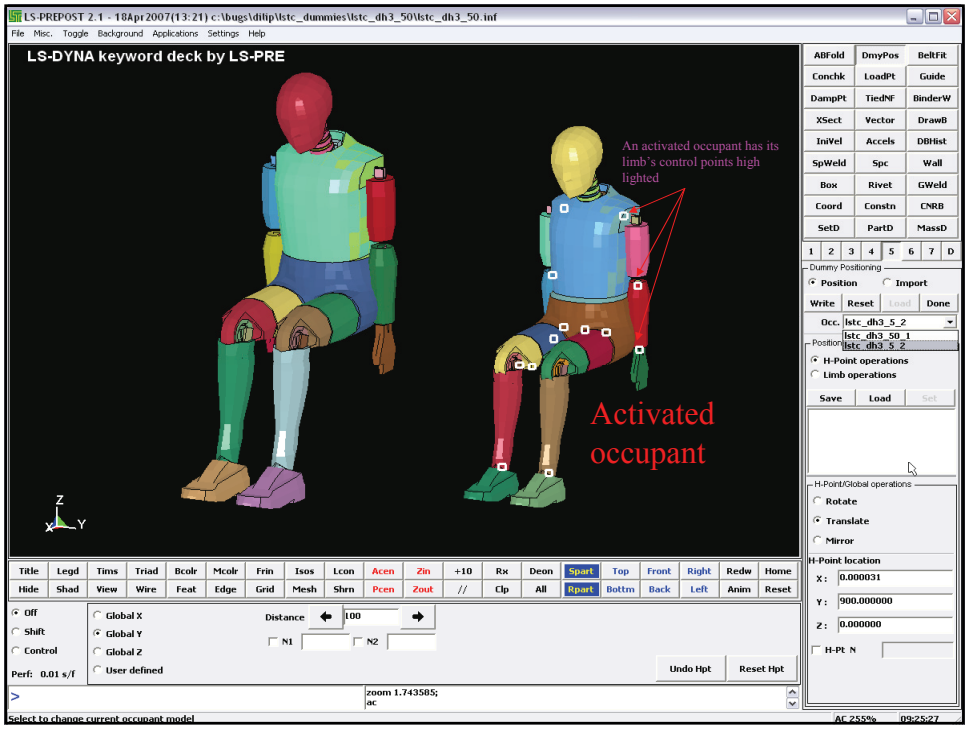

LS-PREPOST

Handle dummies with its Model

- The latest release of LS-PREPOST will detect and process occupant information if one is presented in the keyword model
- The %occinfo and %endoccinfo blocks will be inserted into a keyword file after *END to carry extra occupant information with the keyword model
- Keyword files with dummies included can be later on used as a stand-alone dummy.

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OCCINFO

- OCCINFO
  - Supports multiple dummies

    Each OCCINFO block may contain information about different dummies that are in the model
  - Can be separated in different include files

    Each OCCINFO can also be separated into different keywords and through *INCLUDE card, users can import them into same model
  - Can be used as a tree file

    If separated with the original keyword model with the dummy, it can be a tree file to be added into the dummy database

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Local Coordinate Systems

- Inside an OCCINFO block, users may assign limbs with different rotation axes:
  - Global Coordinate System
  - Assign a specific axis by two nodes
  - Local coordinate systems assigned in *CONSTRAINED_JOINT_STIFFNESS_GENERALIZED cards.
- When Local coordinate system is turned on for the limb, LS-PREPOST will show the two coordinate systems when rotating about the limb.

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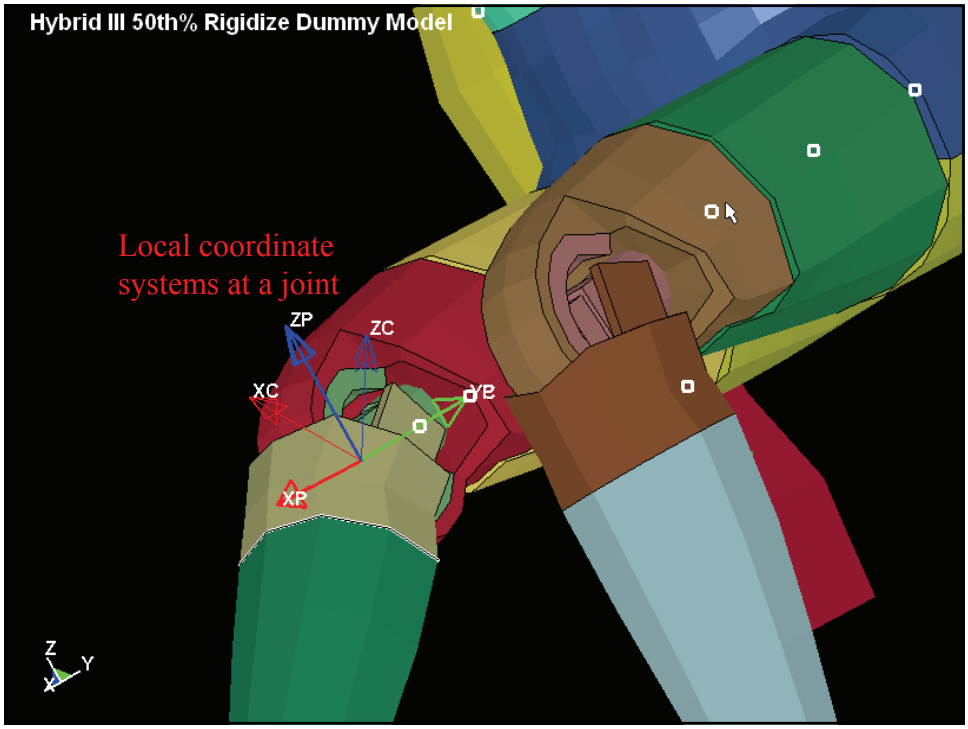

LS-PREPOST

Primer Tree Reader and More…

•LS-PREPOST 2.2 will have the following new developments on Occupant Positioning System

- •A Primer Tree Reader to import a Primer's dummy seamlessly.
- •Report Rotation Angles for an occupant
- •Rotate an Occupant about global and local coordinate systems.
- •Rotation axes change through User Interfaces.

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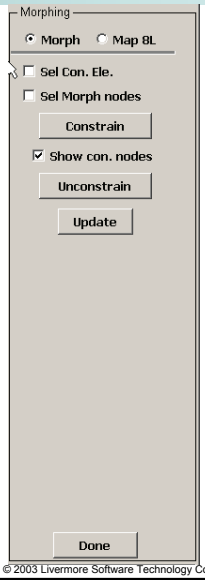
Basic Morphing in LS-PREPOST

LS-PREPOST

Applications:

- ❑ Bending side curtain bags for packaging
- ❑ Optimization studies
- ❑ Deforming seat foams



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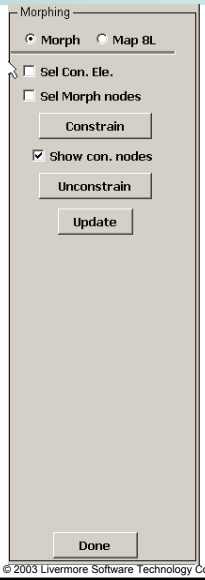

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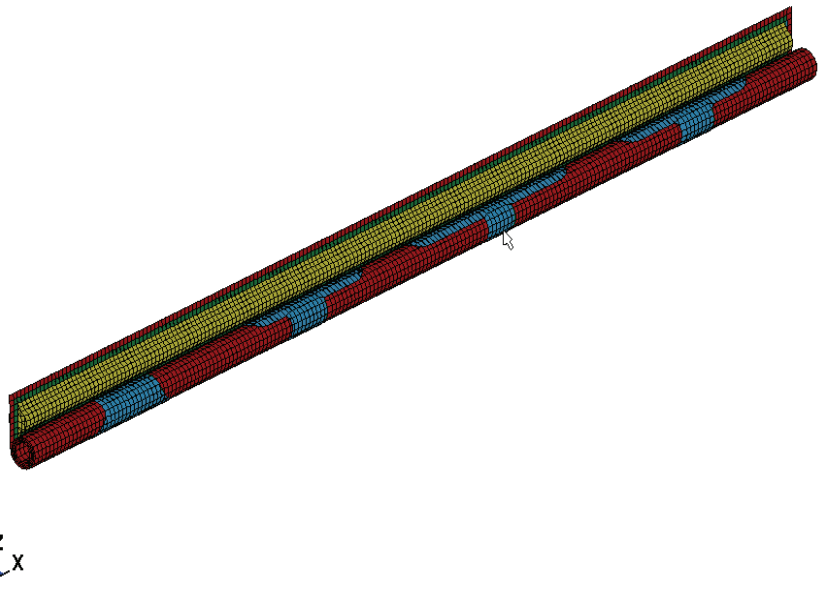
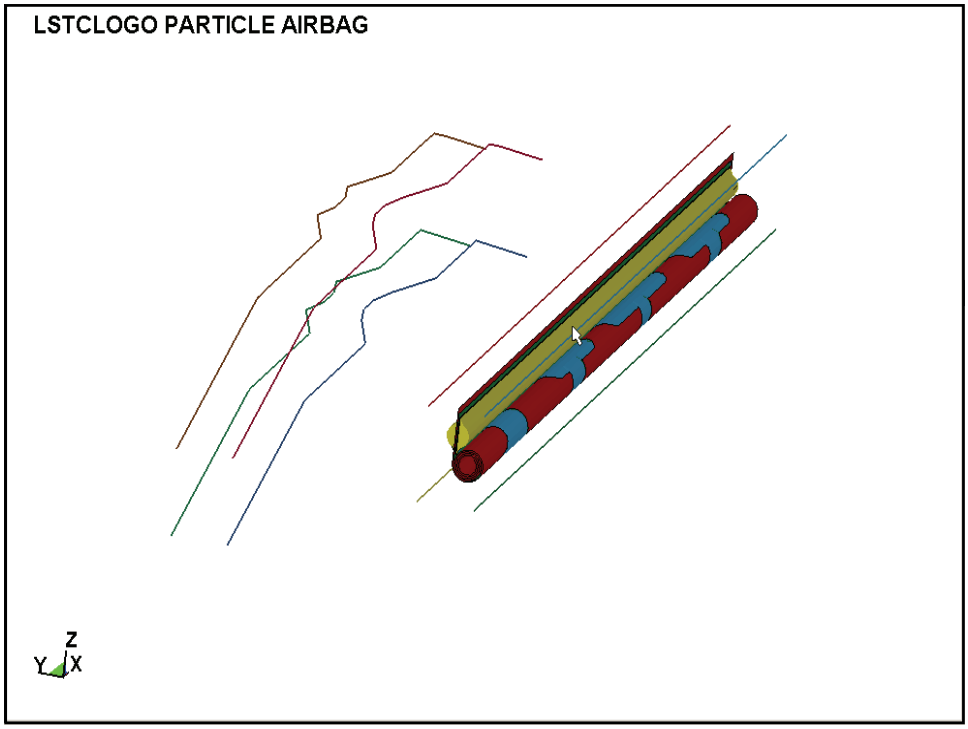
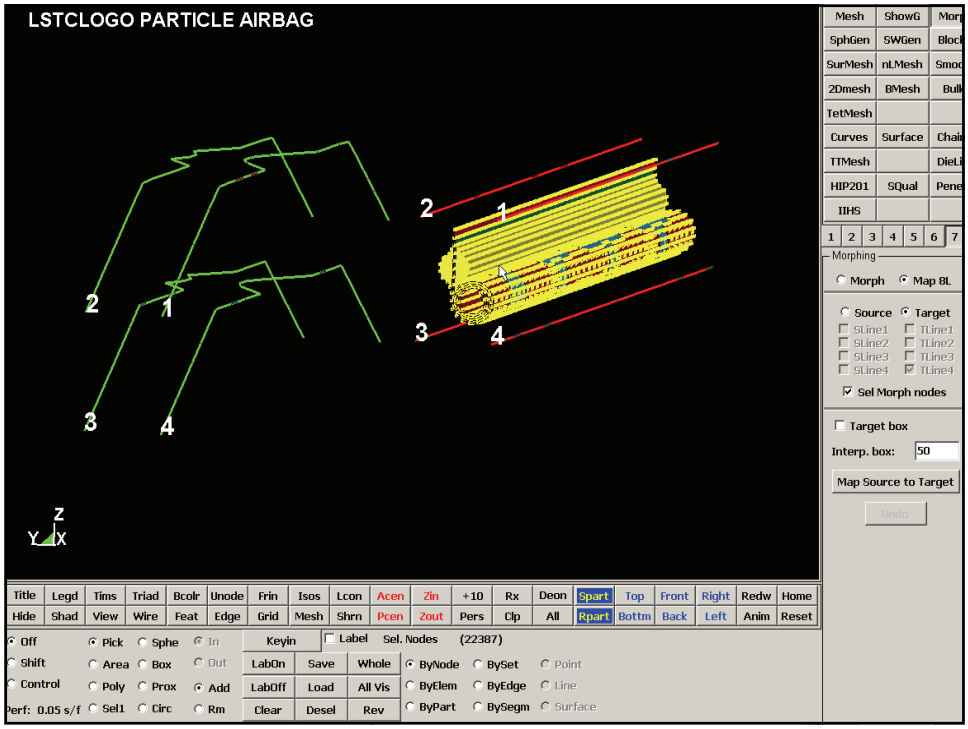
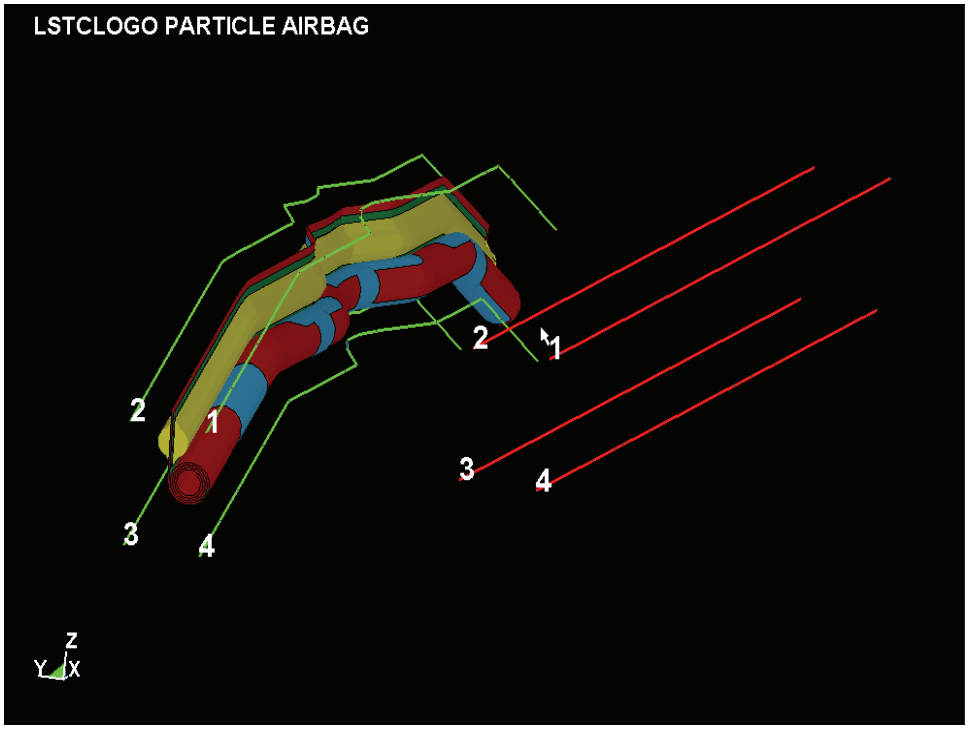
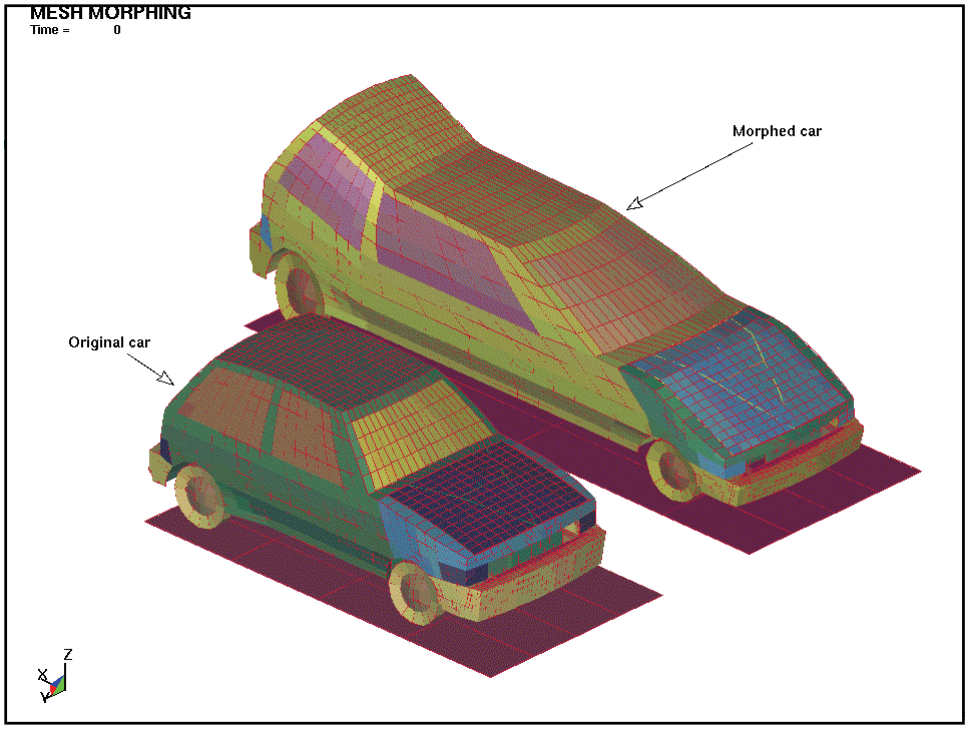
LSTCLOGO PARTICLE AIRBAG

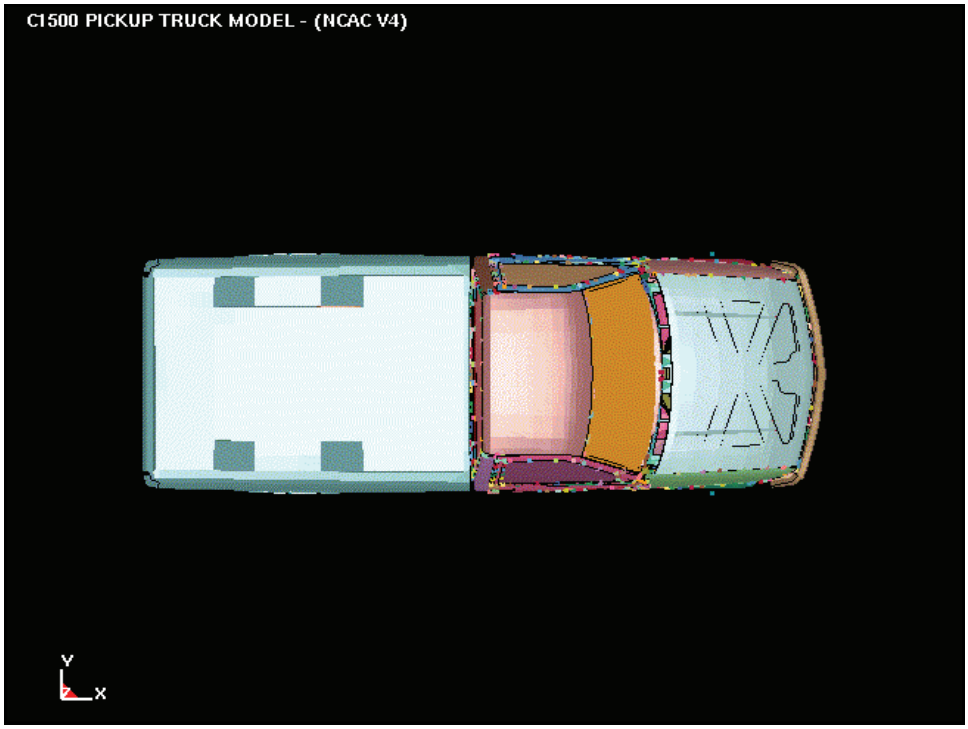







LSTCLOGO PARTICLE AIRBAG
2
1
3
4
2
1
3
4
Z
Y
X


MESH MORPHING
Time = 0
Morphed car
Original car
Z
X
Y



LS-PREPOST

Conclusions

- LS-prepost version 2.2 has become more stable and robust
- Significant progress has been made to include more capabilities for pre-processing
- Our main goal and objective is to provide new features to support the pre- and post-processing requirements of LS-DYNA
- We are continue to listen to users' suggestions and adapting new ideas

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