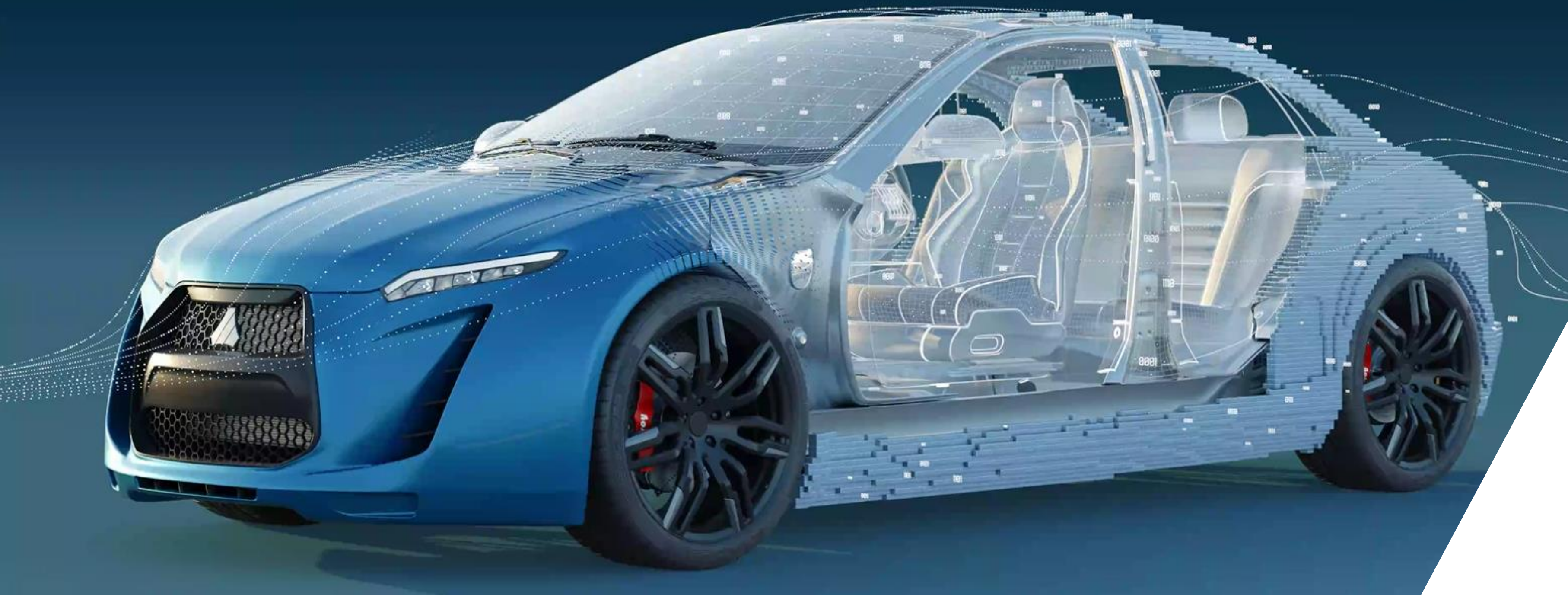
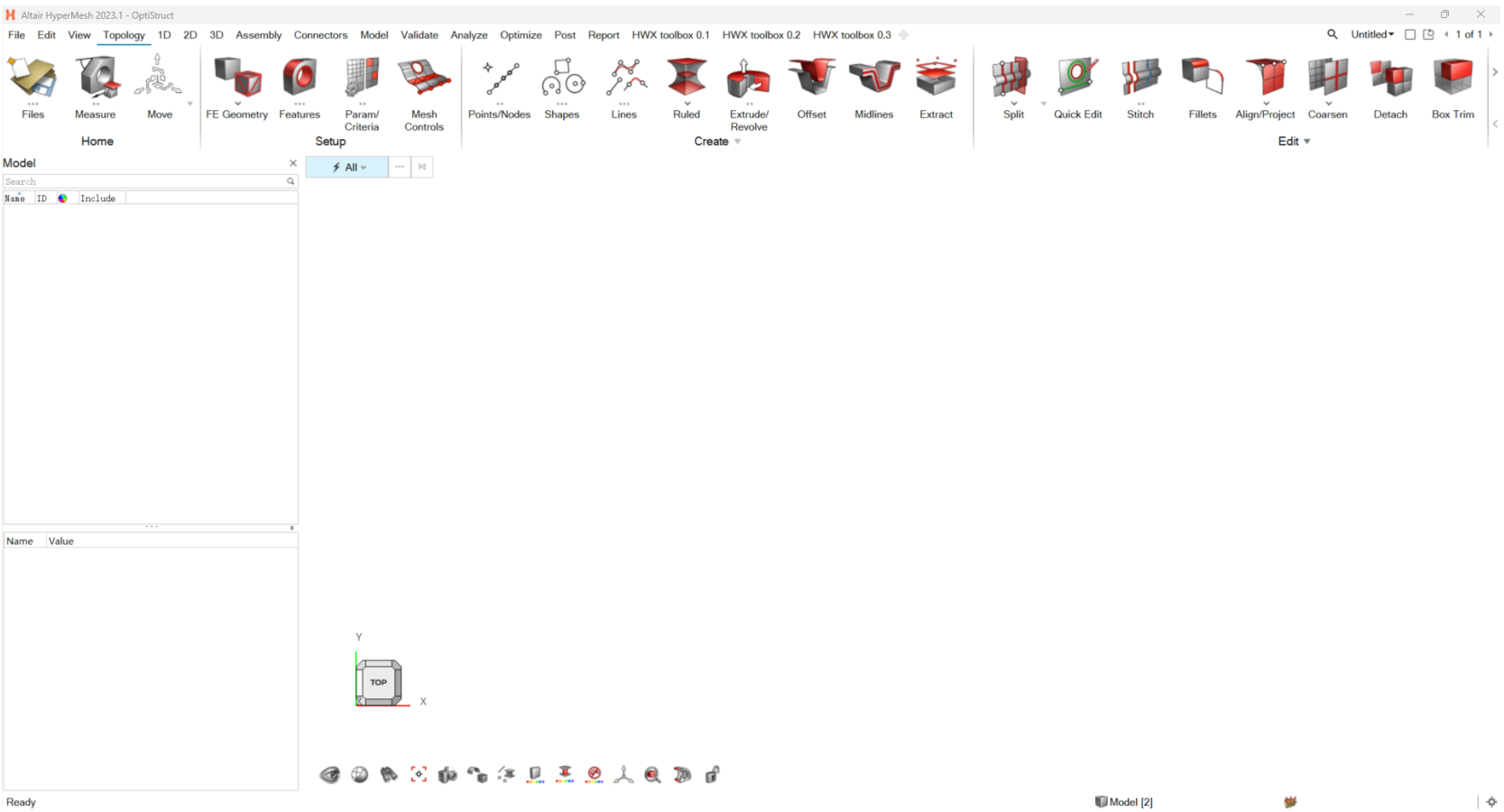
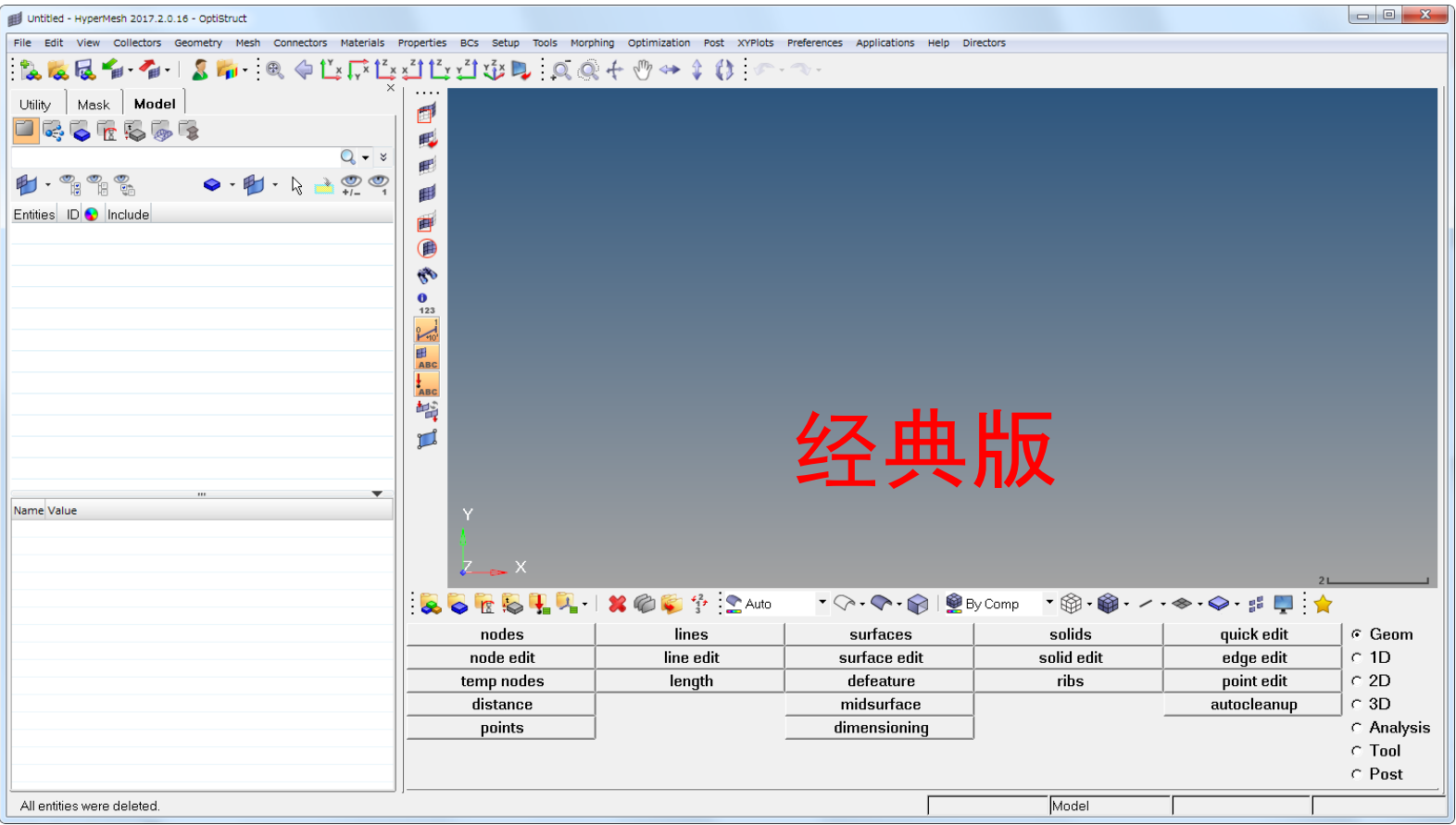




HYPERMESH新旧界面对应表V2023.1对应表



HyperMesh重新设计的用户界面，使其在HyperWorks平台上的使用更加直观和方便。



这份文件是一个对照说明，以帮助从经典的HyperMesh控制面板过渡到新的工具条。

CAD/几何	0D/1D单元	2D	3D单元	边界条件	一般功能		
创建node	质量单元的创建	创建平面/曲面网格	手动网格编辑	创建六面体网格	向量的生成	创建装配关系	确认从属关系
编辑node	joint单元创建	创建圆锥/圆柱形表面	单元的分割	壳单元之间的实体单元	局部坐标系的创建	改变组织关系	初始交叉穿透检查
临时节点	梁单元创建	创建球面	节点的替换	空间中的网格	节点的保留	改变颜色	ID号的显示
距离和角度测量	杆单元创建	创建圆环	单元的分离	通过拉伸创建	更改载荷类型	改变名称	重编号
创建点	刚性单元创建	创建相对应的区域	阶次的变更	通过旋转创建	约束条件	改变顺序	计算数量
创建线	RBE3单元创建	创建封闭式区域	单元类型的变更	沿线拉伸	MPC的建立	菜单的编辑	体积·面积·质量
编辑线	创建弹簧单元	通过线创建面		拉伸偏移单元	集中力	相关对象的显示	标签
线的长度	gap单元创建	通过拉伸创建		连接元	力矩	暂时性隐藏	网格变形
创建曲面	连接元创建	通过旋转创建		创建四面体网格	分布载荷	删除对象	剖面图
编辑曲面	焊点的创建	沿线拉伸网格/表面		网格的平滑	加速度载荷	移动	标题
简化形状	梁截面(HyperBeam)	单元的偏移		流体的边界层网格	温度载荷	旋转	摘要
中面抽取	1D单元网格的创建	连接元		手动网格编辑	接触的定义	缩放	设置网格条件
尺寸变化	1D单元的创建	复合材料的方向定义		单元的分割	接触面的定义	对称	创建部件
创建实体几何	向量的创建	创建中面网格		节点的替换	刚性体	投影	
编辑实体几何	局部坐标系的创建	自动网格划分		单元的分离	创建组	定位	
建立几何筋	手动创建单元	包络网格		阶次的变更	创建区块	更换轴	
经常使用的编辑工具	单元的分割	网格的平滑		单元类型的变更	非结构质量	单元质量检查	
编辑边	节点的替换	质量修正和节点的拖动			控制卡片	自由边检查	
编辑点	单元的分离	清理壳网格			输出请求	实体包壳	
自动清理	阶次的变更	网格的延长和压印			载荷步	提取特征线	
	单元类型的变更	网格重构			优化设置	法向	

Geom页面

创建/编辑几何

nodes	lines	surfaces	solids	quick edit	Geom 1D 2D 3D Analysis Tool Post
node edit	line edit	surface edit	solid edit	edge edit	
temp nodes	length	defeature	ribs	point edit	
distance		midsurface		autocleanup	
points		dimensioning			

Geom页面

nodes

node edit

temp nodes

distance

points

lines

line edit

length

surfaces

surface edit

defeature

midsurface

dimensioning

solids

solid edit

ribs

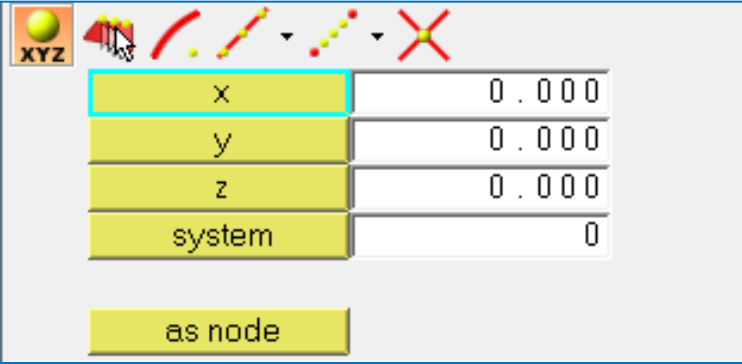
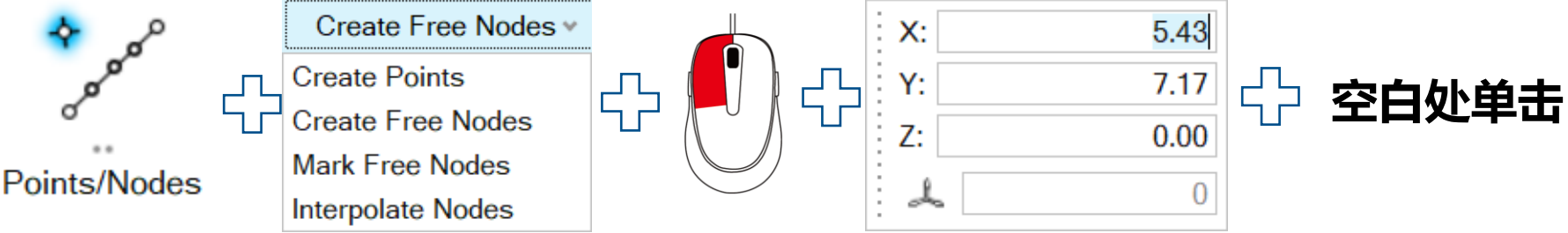
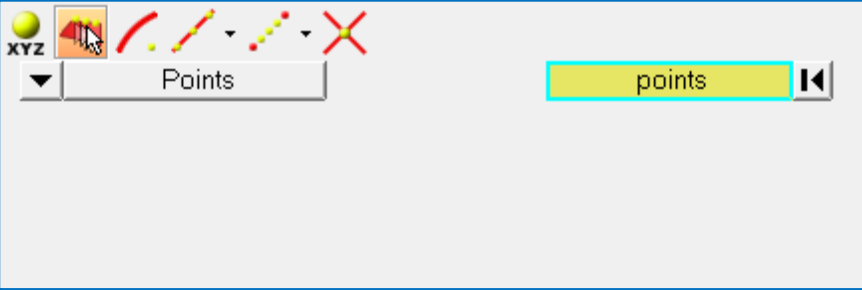
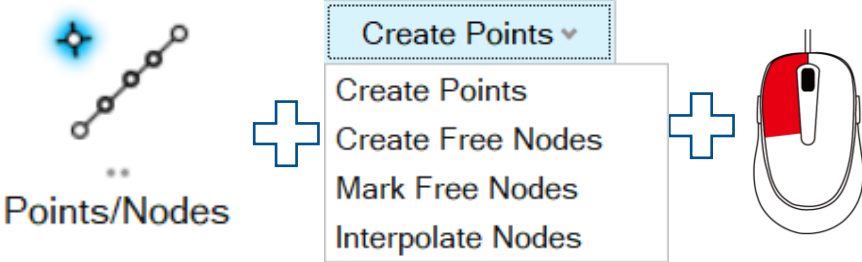
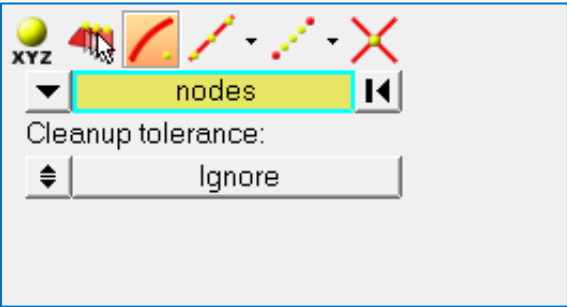
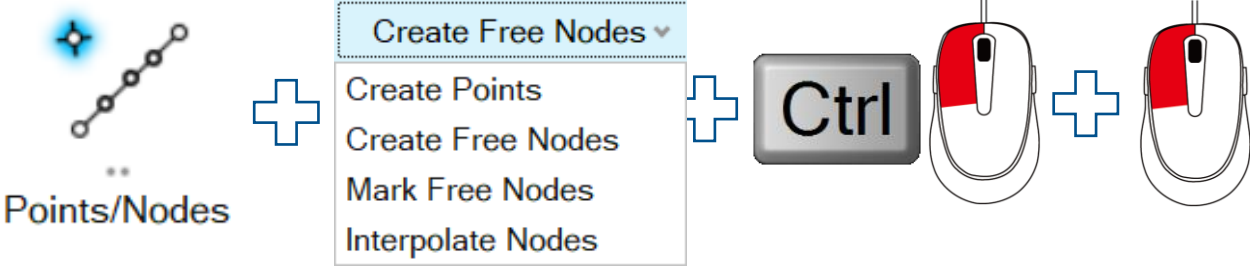
quick edit

edge edit

point edit

autocleanup

创建nodes 1/3

经典界面	新界面
XYZ 	Topology   在屏幕上点击，显示节点坐标输入栏。 双击现有节点，显示其坐标。
On Geometry 	Topology   点击一个点、面或线来创建一个节点
Arc Center 	Topology   Ctrl选择三个点，点击来创建节点

Geom

页面

nodes

node edit

temp nodes

distance

points

lines

line edit

length

surfaces

surface edit

defeature

midsurface

dimensioning

solids

solid edit

ribs

quick edit

edge edit

point edit

autocleanup

创建nodes 2/3

经典界面	新界面
Extract Parametric XYZ line U lower bound: 0 . 0 0 0 U upper bound: 1 . 0 0 0 Number of u nodes: 1 Parameterization: Arc Length	Topology Points/Nodes Extract Nodes Parametric 4 或
Extract on Line XYZ lines Number of nodes: 1 Bias style: Linear Bias intensity: 0 . 0 0 0	Topology Points/Nodes Extract Nodes Parametric 4 或
Interpolate Nodes XYZ node list Number of nodes between: 1 Bias style: Linear Bias intensity: 0 . 0 0 0	Topology Points/Nodes Interpolate Nodes Create Points Create Free Nodes Mark Free Nodes Interpolate Nodes Node List Node List Lines Locations Surfaces Number of nodes: 1 Bias intensity: 0.00 或 或

选择两个节点，并输入节点的数量

创建nodes 3/3

nodes

node edit

temp nodes

distance

points

lines

line edit

length

surfaces

surface edit

defeature

midsurface

dimensioning

solids

solid edit

ribs

quick edit

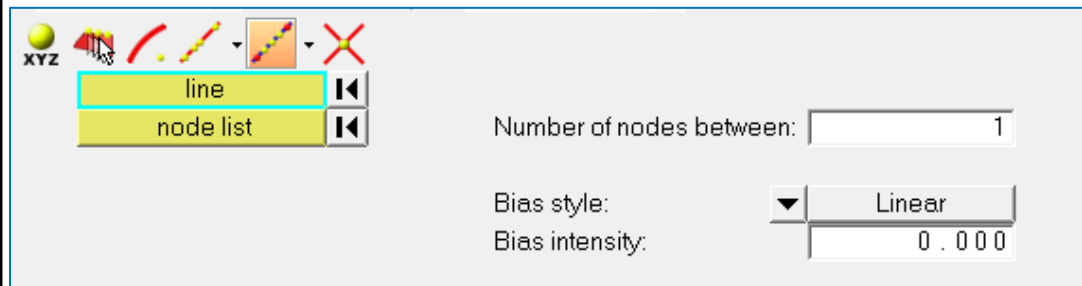
edge edit

point edit

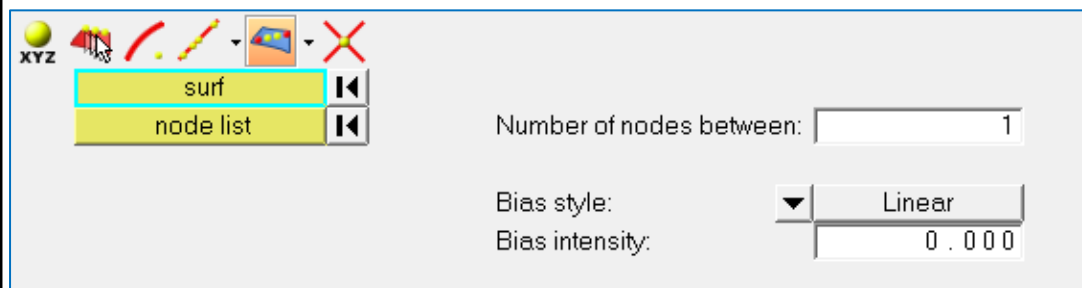
autocleanup

经典界面

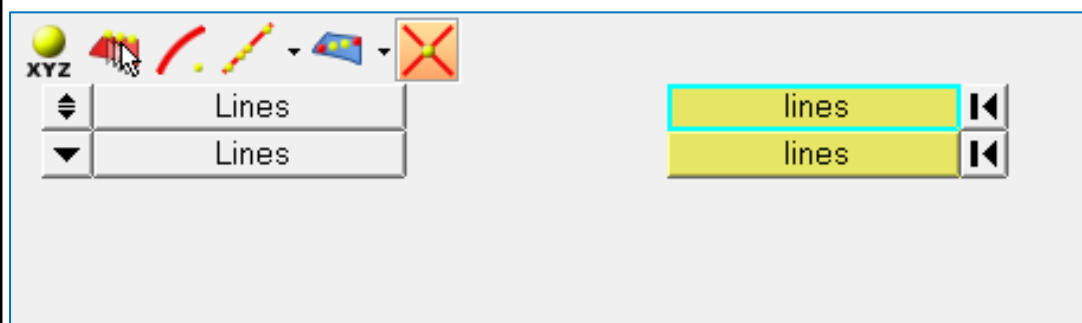
Interpolate on Line



Interpolate on Surface

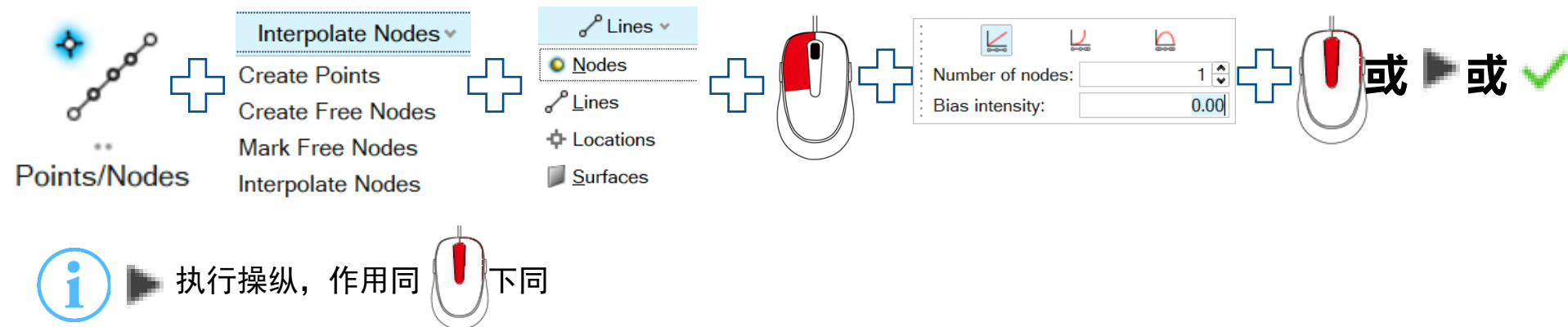


Intersect

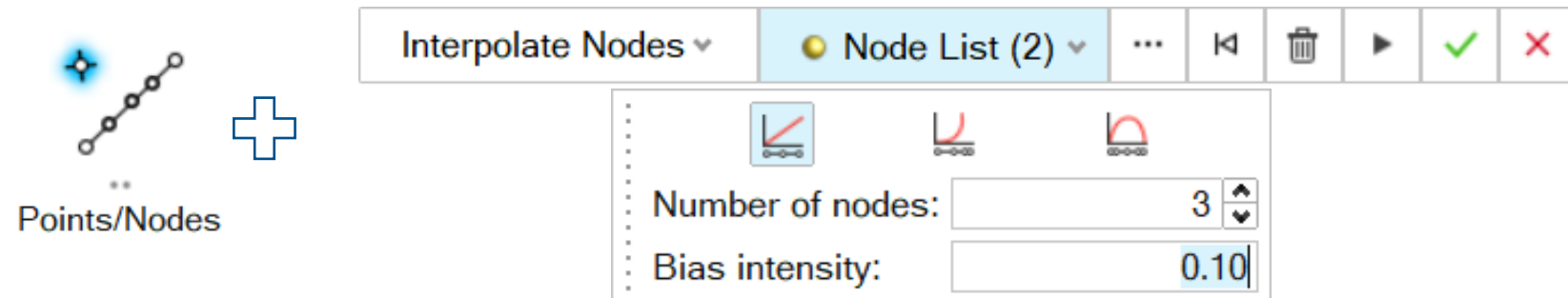


新界面

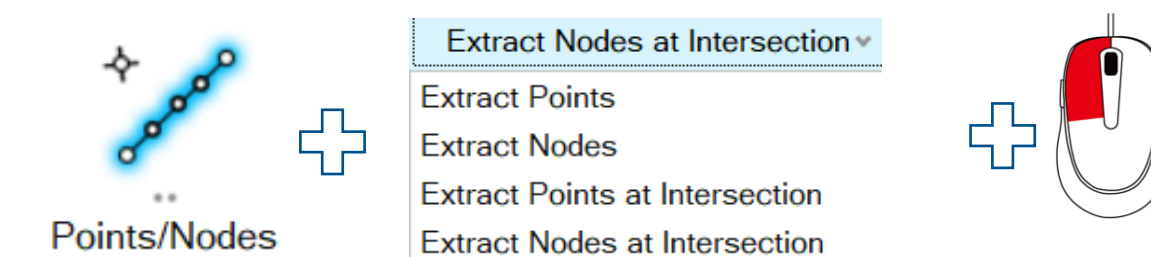
Topology



Topology



Topology



 点击交叉处的点来创建一个节点

Geom页面

- nodes
- node edit
- temp nodes
- distance
- points
- lines
- line edit
- length
- surfaces
- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

编辑nodes 1/2

经典界面	新界面
associate associate move node place node remap align node surf nodes tolerance = 0 . 1 0 0	2D 自动 Find 手动 Source ... Target Choose target Associate tolerance: 10.00 2D 3D Find 手动 Associate Source ... Target Choose target Associate tolerance: 10.00 如果关联的同时要移动节点到目标上，需要 Move nodes
move node associate move node place node remap align node nodes N1 N2 N3 step size = 0 . 1 0 0	Home Move 点击Z Interactive Nodes (1) ... Z: 0.00
place node associate move node place node remap align node destination surf node to place	Home Move Position Nodes (1) ... Source (1) Target (1)



Geom页面

nodes

node edit

temp nodes

distance

points

lines

line edit

length

surfaces

surface edit

defeature

midsurface

dimensioning

solids

solid edit

ribs

quick edit

edge edit

point edit

autocleanup

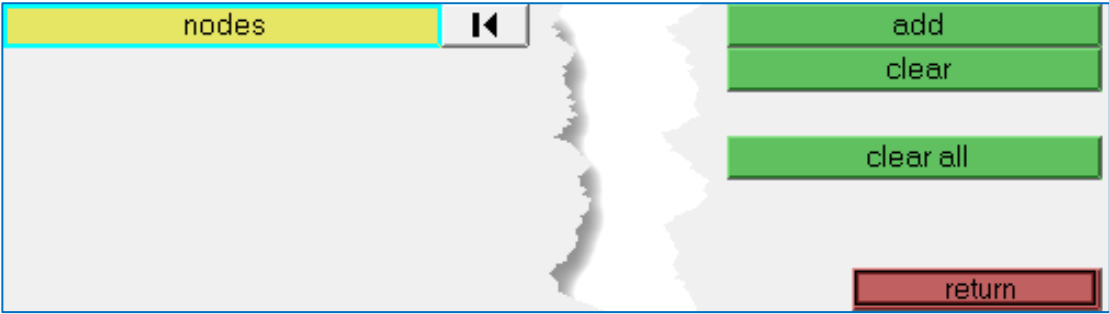
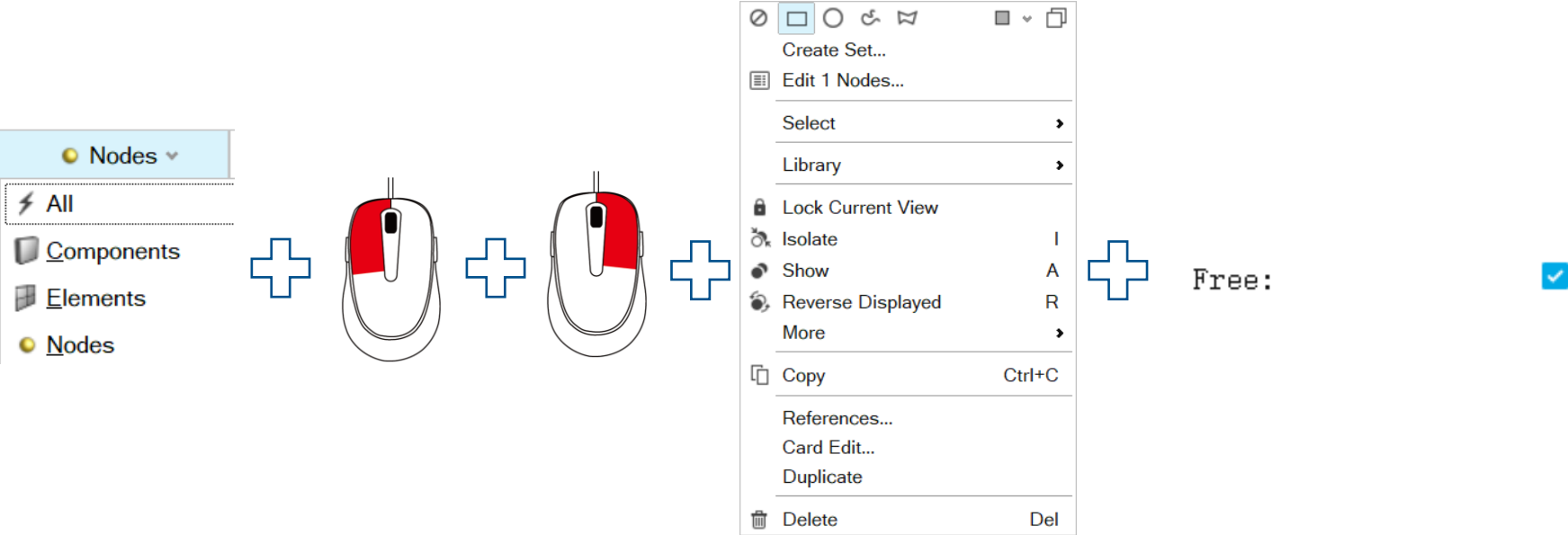
编辑nodes 2/2

经典界面	新界面
remap associate move node place node remap align node node list line list	Topology Align/Project Lines Source ... Target
align node associate move node place node remap align node 1st end: node 2nd end: node nodes	Topology Align/Project Lines Source ... Target

Geom页面

- nodes
- node edit
- temp nodes
- distance
- points
- lines
- line edit
- length
- surfaces
- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

temp nodes经典界面（临时节点的建立）

经典界面	新界面
temp nodes 	  Delete 用于删除一个节点。 当多个节点组合在一起形成临时节点时，选择（高级选择或框选）多个节点进行上述操作即可。



Geom页面

- nodes
- node edit
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- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

测量距离和角度1/2

经典界面	新界面
two nodes two nodes three nodes two points three points N1 N2 syst distance = 0 . 0 0 0 x dist = 0 . 0 0 0 y dist = 0 . 0 0 0 z dist = 0 . 0 0 0 nodes between = 1	Home Measure
three nodes two nodes three nodes two points three points N1 N2 N3 syst distance = 0 . 0 0 0 x dist = 0 . 0 0 0 y dist = 0 . 0 0 0 z dist = 0 . 0 0 0 angle = 0 . 0 0 0 radius = 0 . 0 0 0 nodes between = 1	Home Measure Ctrl
two points two nodes three nodes two points three points point 1 point 2 syst distance = 0 . 0 0 0 x dist = 0 . 0 0 0 y dist = 0 . 0 0 0 z dist = 0 . 0 0 0 points between = 1	Home Measure



Measure

Geom页面

- nodes
- node edit
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- surface edit
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- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

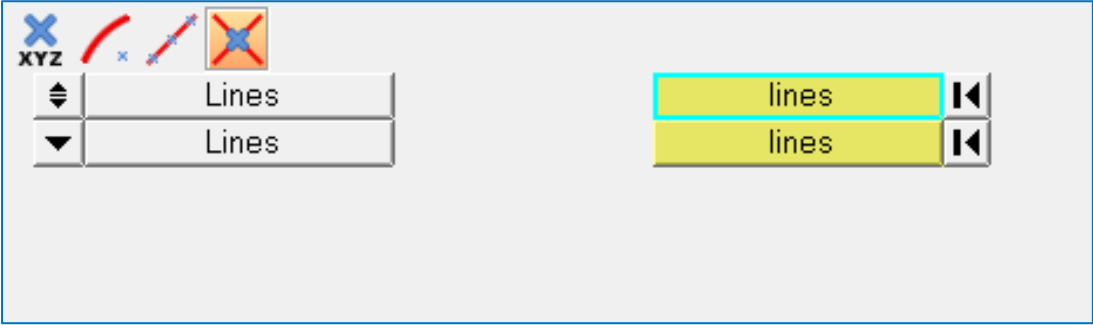
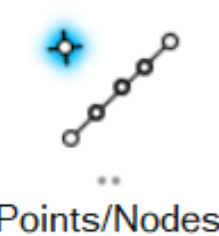
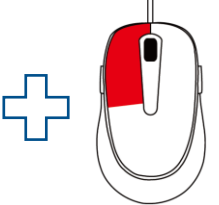
创建points 1/2

经典界面	新界面
XYZ XYZ x 0 . 0 0 0 y 0 . 0 0 0 z 0 . 0 0 0 system 0 as node	Topology Points/Nodes Create Points Create Points Create Free Nodes Mark Free Nodes Interpolate Nodes X: 5.43 Y: 7.17 Z: 0.00 0 空白处单击 i 在屏幕上点击，显示点的坐标输入栏。 双击现有的点以显示其坐标。
Arc Center XYZ nodes Cleanup tolerance: Ignore	Topology Points/Nodes Create Points Create Free Nodes Mark Free Nodes Interpolate Nodes Ctrl i 同时按住Ctrl键选择三个点， 点击创建一个点
Extract Parametric XYZ line U lower bound: 0 . 0 0 0 U upper bound: 1 . 0 0 0 Number of u points: 1 Parameterization: Arc Length	Topology Points/Nodes Extract Points Parametric 4 或

Geom页面

- nodes
- node edit
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- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

创建points 2/2

经典界面	新界面
Intersect 	Topology  Points/Nodes Create Points ▾ Create Points Create Free Nodes Mark Free Nodes Interpolate Nodes   点击交叉处的点，创建一个点。



Geom

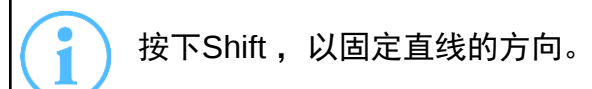
页面

- nodes
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- midsurface
- dimensioning
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- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

创建lines 1/9

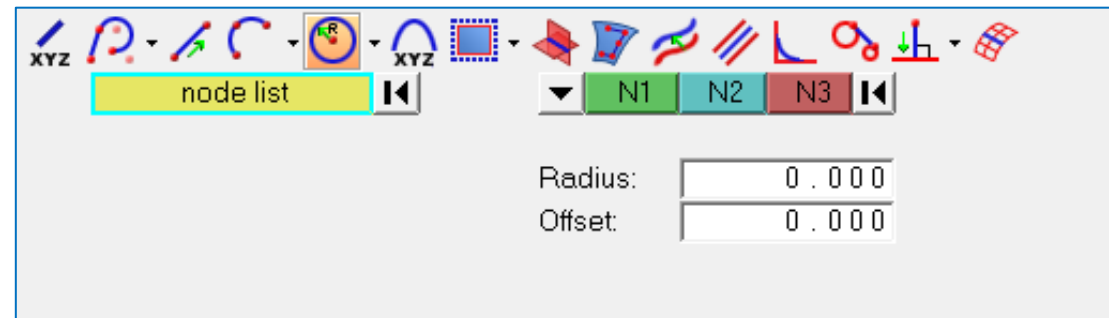
经典界面	新界面
XYZ XYZ Start point: x 0.000 y 0.000 z 0.000 as node End point: x 0.000 y 0.000 z 0.000 as node	Topology Interactive Interactive Extract Parametric Lines Extract at Intersection Drag Nodes 拖动 + + X: 15.000000 Y: 2.000000 Z: 0.000000 + Enter
Linear Nodes XYZ node list ☐ Closed line	Topology Interactive Interactive Extract Parametric Lines Extract at Intersection Drag Nodes 拖动 + +
Standard Nodes XYZ node list ☐ Closed line	Topology Lines + Node List (7) + Linear polyline





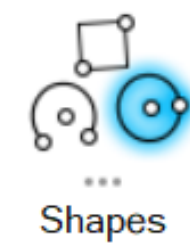
创建lines 4/9

经典界面



新界面

Topology



Circle by Center and Radius ▾

Circle by Center and Radius

Circle by 2 Points

Circle by 3 Points

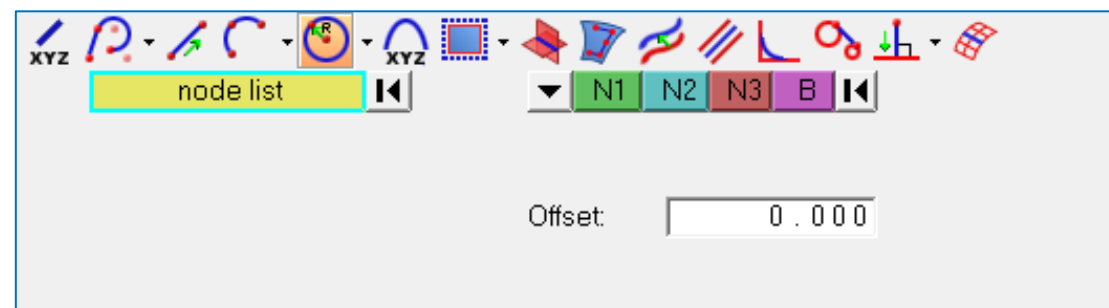


Enter



如果需要在指定平面创建圆，请使用Sketch/Arcs。

Circle Nodes and Vector



Topology



Circle by 2 Points ▾

Circle by Center and Radius

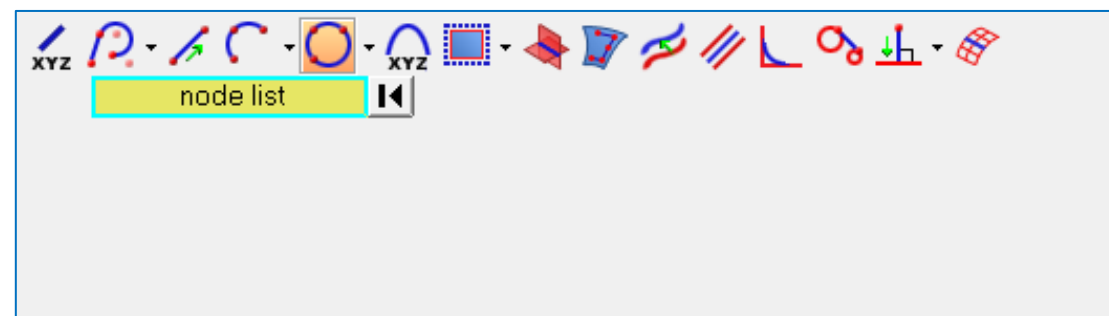
Circle by 2 Points

Circle by 3 Points



如果需要在指定平面创建圆，请使用Sketch/Arcs。

Circle Three Nodes



Topology



Circle by 3 Points ▾

Circle by Center and Radius

Circle by 2 Points

Circle by 3 Points



如果需要在指定平面创建圆，请使用Sketch/Arcs。

Geom页面

- nodes
- node edit
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- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

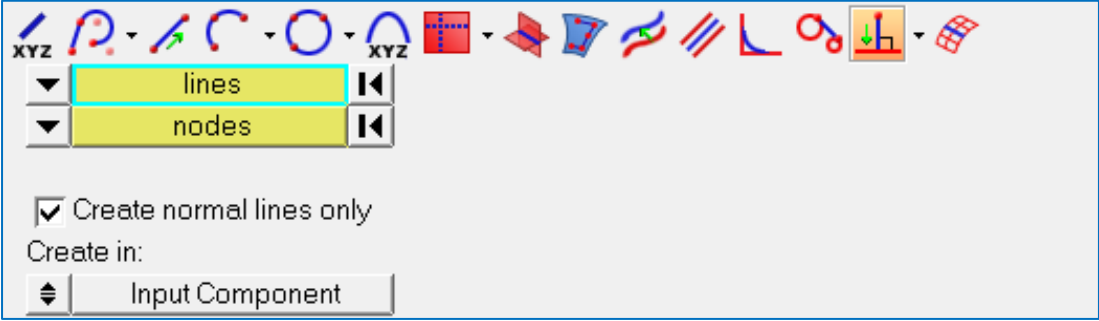
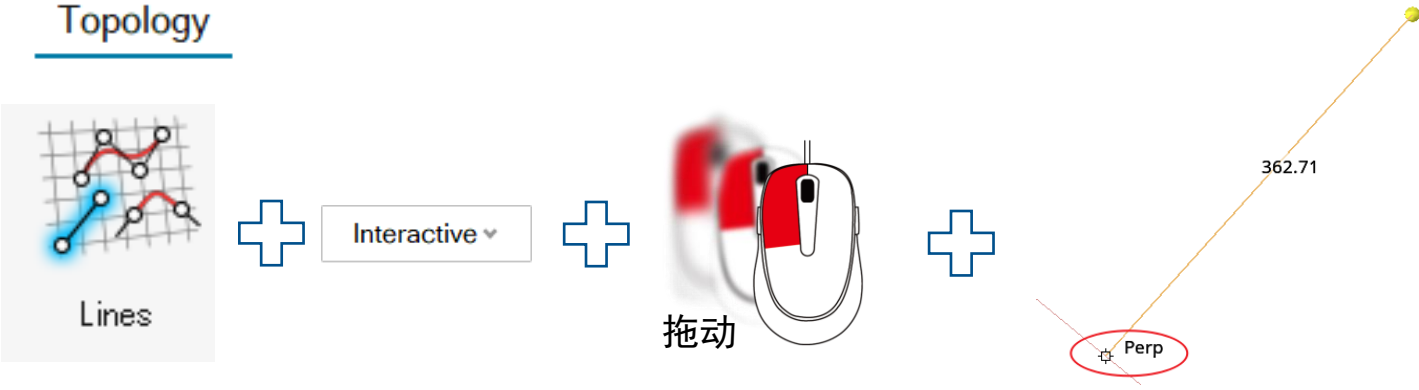
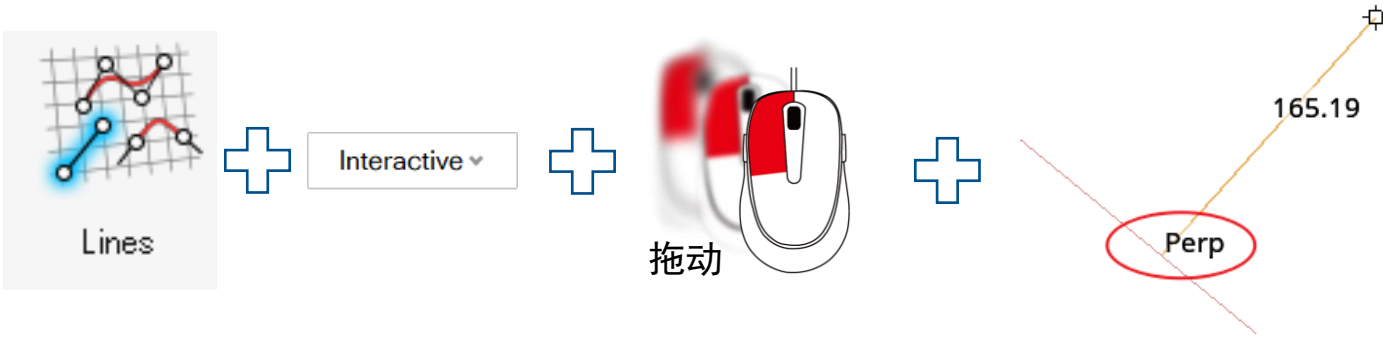
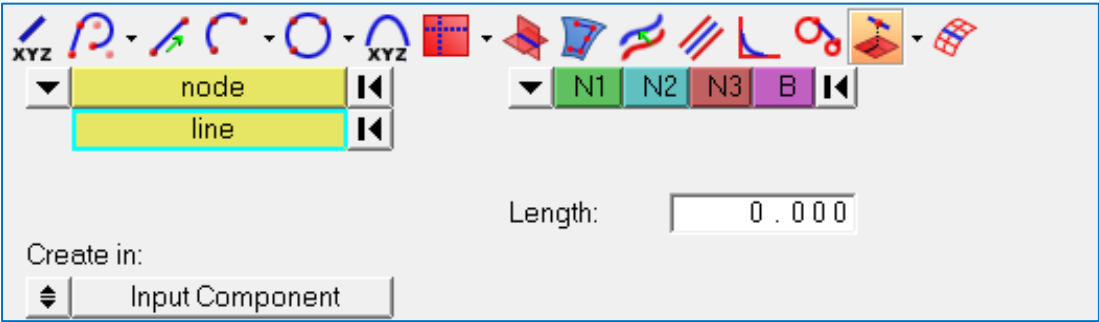
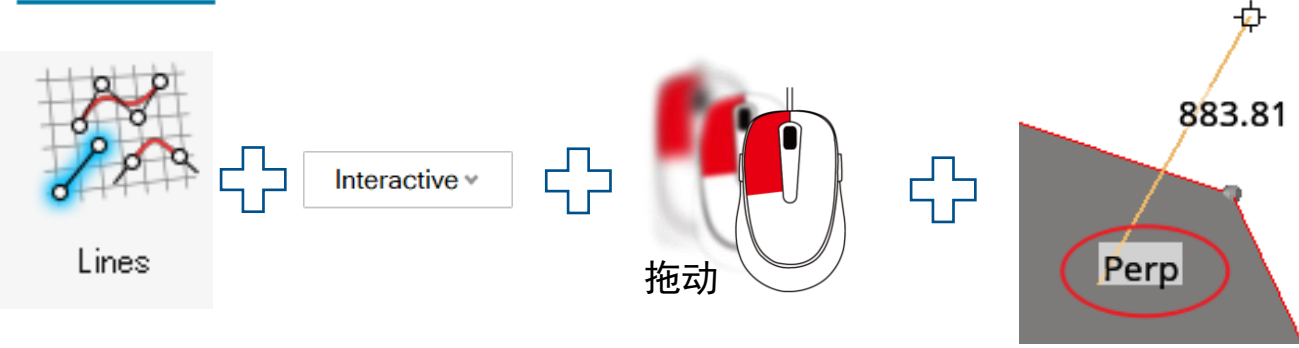
创建lines 5/9

经典界面	新界面
Conic Start point: x 0 . 0 0 0 y 0 . 0 0 0 z 0 . 0 0 0 as node End point: x 0 . 0 0 0 y 0 . 0 0 0 z 0 . 0 0 0 as node Tangent point: x 0 . 0 0 0 y 0 . 0 0 0 z 0 . 0 0 0 as node Ratio: Auto	Topology Lines + ≡ Node List (3) + Smooth polyline + ▶ ✓
Extract Edge surfs Create in: Original Component	闲置
Extract Parametric surf U lower bound: 0 . 0 0 0 U upper bound: 1 . 0 0 0 Number of u lines: 1 V lower bound: 0 . 0 0 0 V upper bound: 1 . 0 0 0 Number of v lines: 1 Create in: Surf Component	Topology Lines + ≡ Extract Parametric Lines + Surfaces (1) + Along U: 3 Along V: 3 Auto-imprint + ▶ ✓

Geom页面

- nodes
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- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

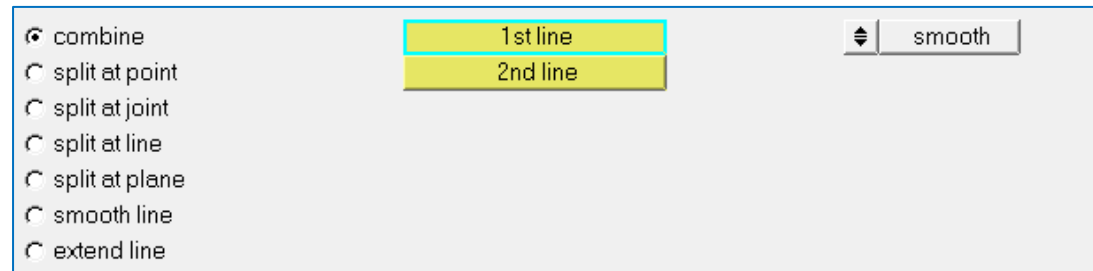
创建lines 8/9

经典界面	新界面
Normal to Geometry 	Topology 
Normal from Geometry 	Topology 
Normal 2D on Plane 	Topology 

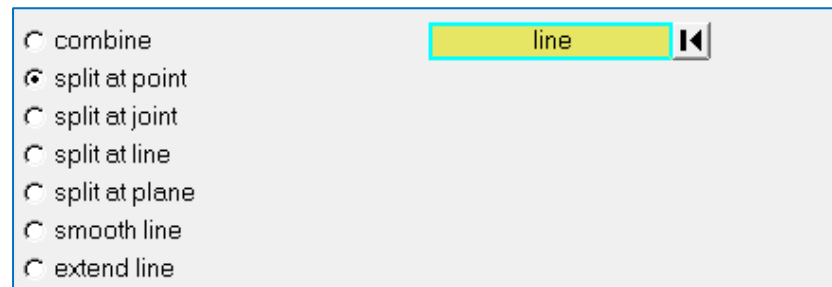
编辑line 1/3

经典界面

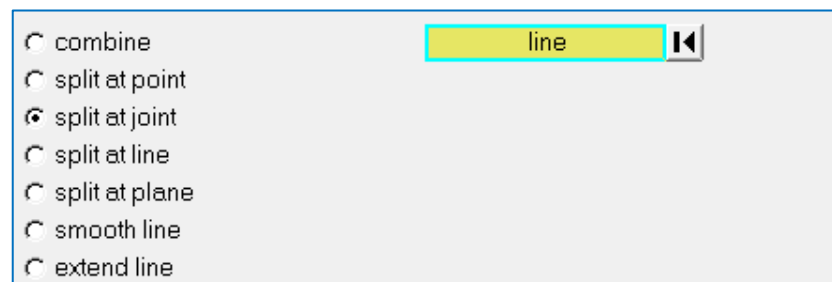
combine



split at point

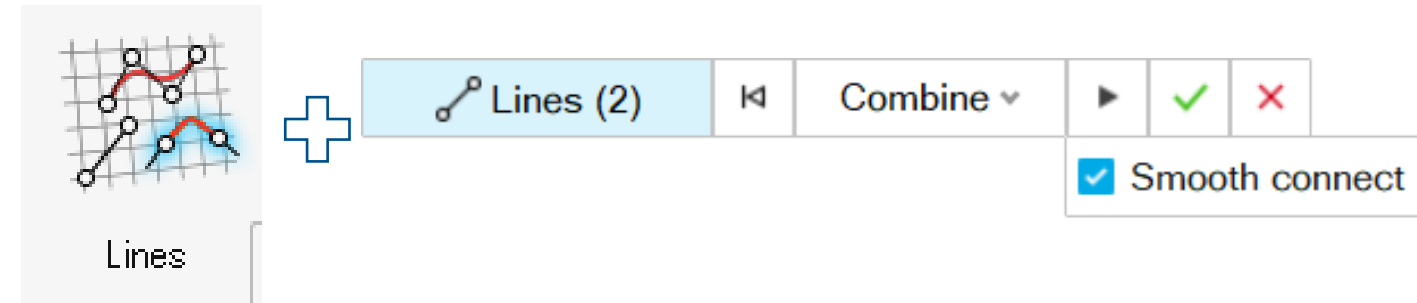


split at joint

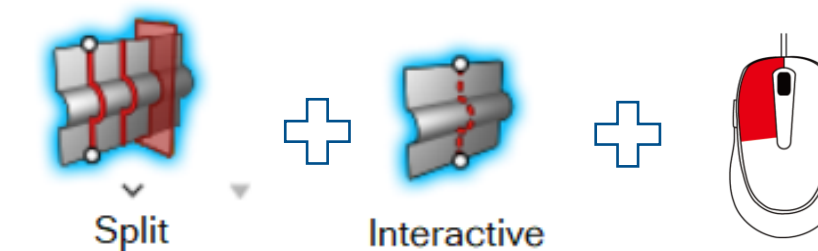


新界面

Topology

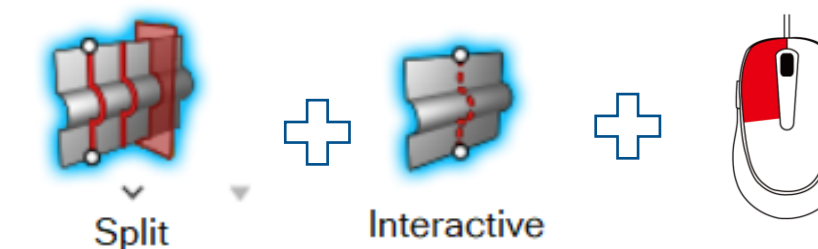


Topology



 点击鼠标滚轮意味着你已经点击了 ">分割“ 按钮

Topology



Geom页面

- nodes
- node edit
- temp nodes
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- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

编辑line 2/3

经典界面	新界面
split at line combine split at point split at joint split at line split at plane smooth line extend line lines cut line	Topology Split Lines Target (1) ▾ ... Lines (1) ... Split ☐ Trim intersecting lines Split Plane Target ▾ ... Tool Split ☐ Fill cut loops

Topology

Lines

Lines

Node List (7) ▾

Linear

Smooth

Lines

Combine ▾

Smooth connect

| split at plane combine split at point split at joint split at line split at plane smooth line extend line lines N1 N2 N3 B | |
| smooth line combine split at point split at joint split at line split at plane smooth line extend line lines smooth corners min tangent angle = 178.000 | |

Geom页面

- nodes
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- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

编辑line 3/3

经典界面	新界面
extend line combine split at point split at joint split at line split at plane smooth line extend line line distance = 0 . 0 0 0 follow curvature	Topology Lines Lines Target Extend Choose target

smooth line

extend line

line

distance =

0 . 0 0 0

follow curvature

Geom页面

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- point edit
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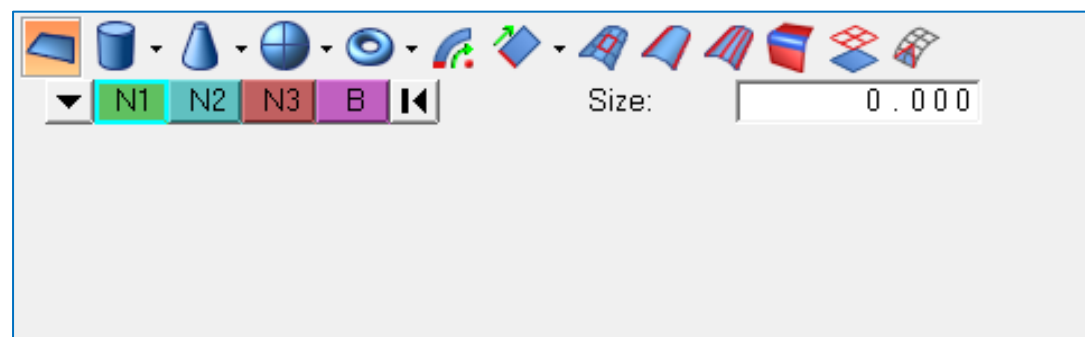
测量line的长度

经典界面	新界面
length lines length = 0 . 0 0 0 ☒ clear selection	Home  Measure Lines (1) Components Elements Solids Surfaces Assemblies Lines

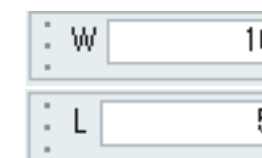
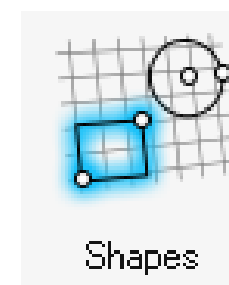
创建surfaces 1/8

经典界面

Square



Topology

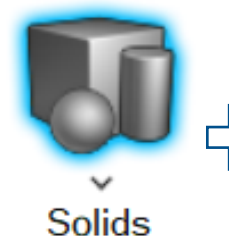


按住Shift键并拖动以生成一个正方形

Cylinder Full



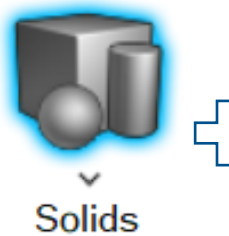
Topology



停用。

新界面

Solids/Cylinder + Split



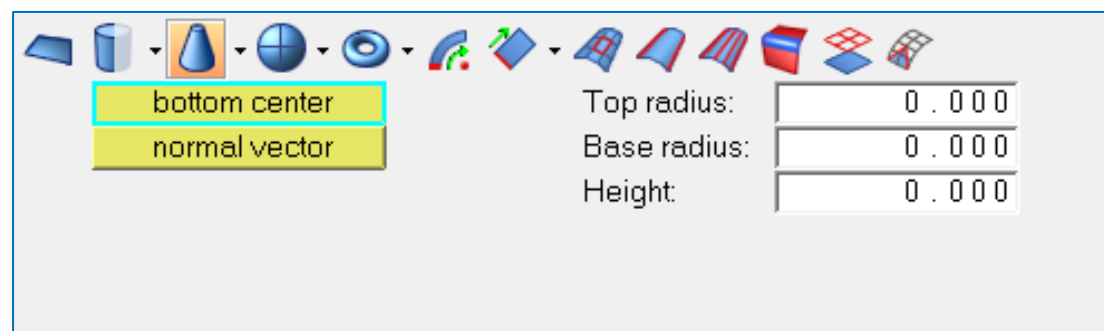
Split



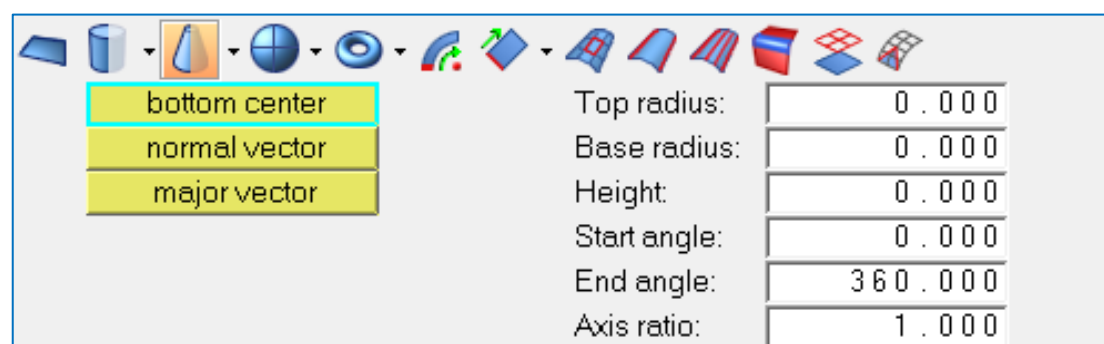
创建surfaces 2/8

经典界面

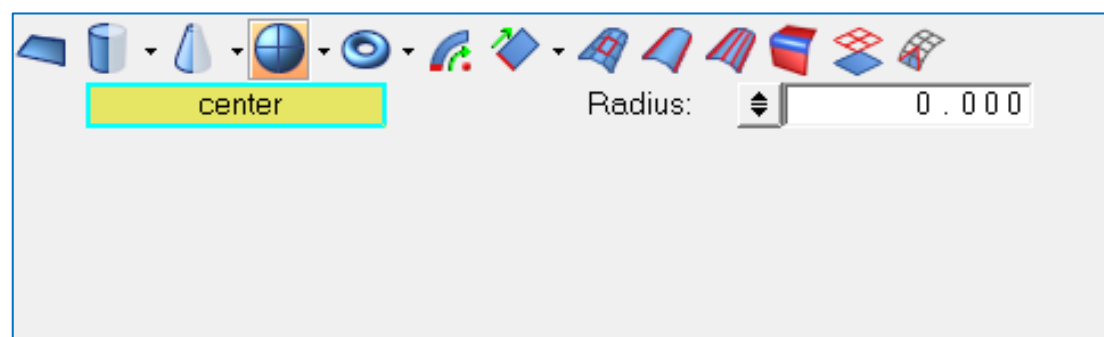
Cone Full



Cone Partial

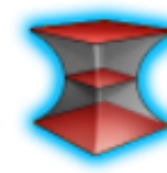


Sphere Center and Radius

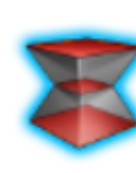


新界面

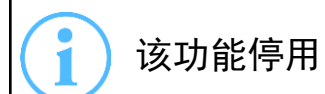
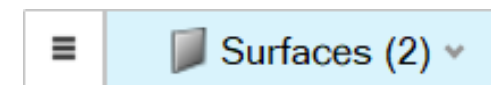
Topology



Ruled



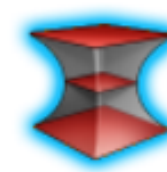
Linear



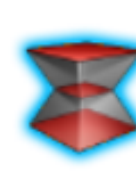
该功能停用

Ruled/Linear + Split

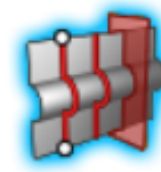
Topology



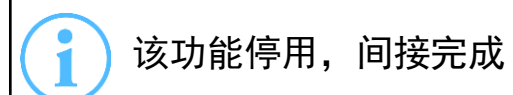
Ruled



Linear



Split

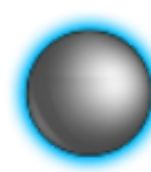


该功能停用，间接完成

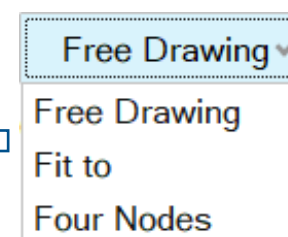
3D



Solids



Sphere



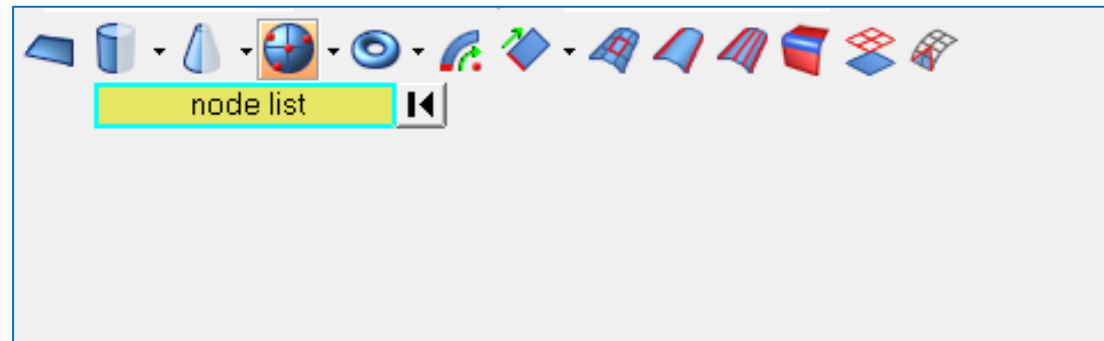
或



创建surfaces 3/8

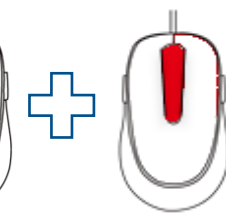
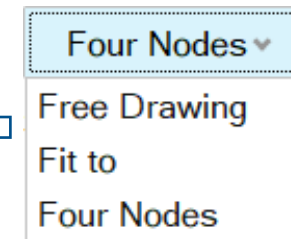
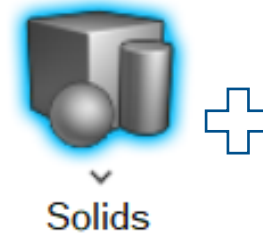
经典界面

Sphere Four Nodes



新界面

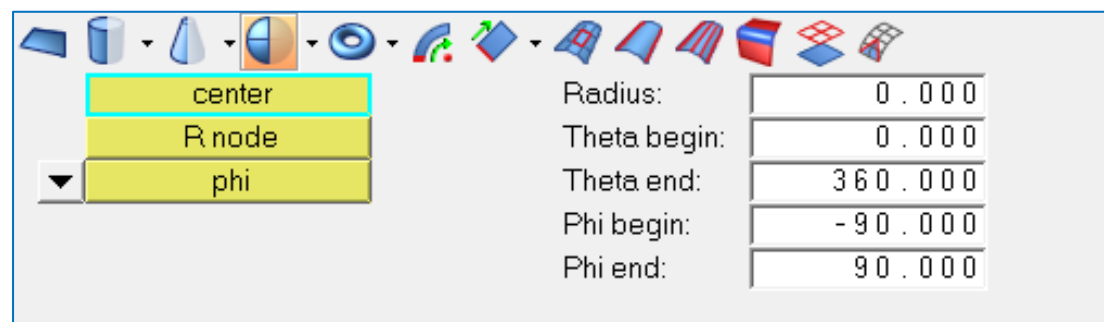
3D



或

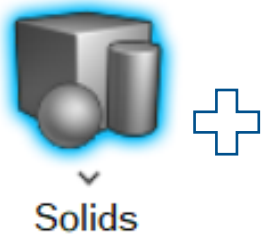


Sphere Partial



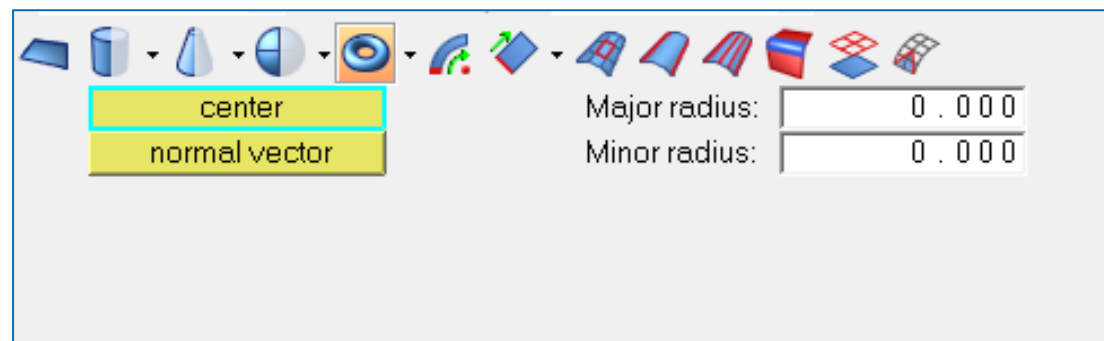
Solids/Sphere + Split

3D



 该功能停用，间接完成

Torus Center and Radius



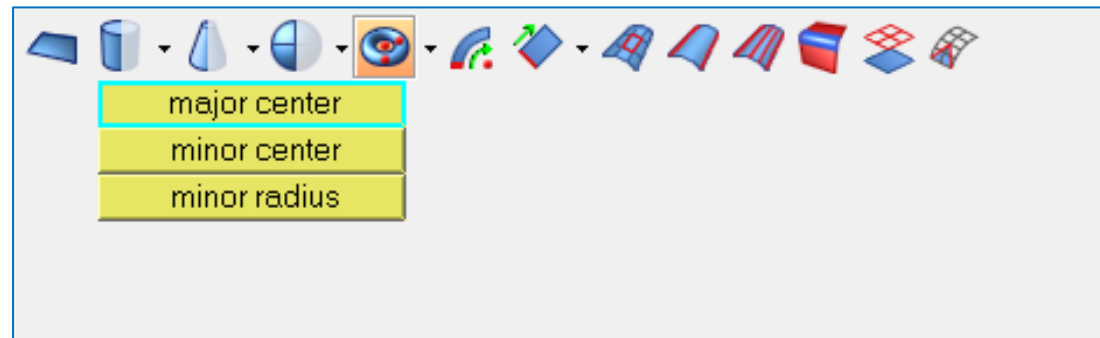
 停用



创建surfaces 4/8

经典界面

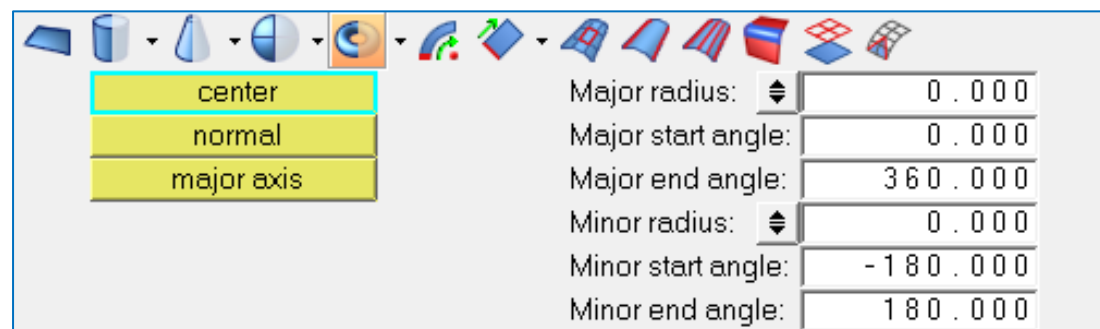
Torus Three Nodes



 停用

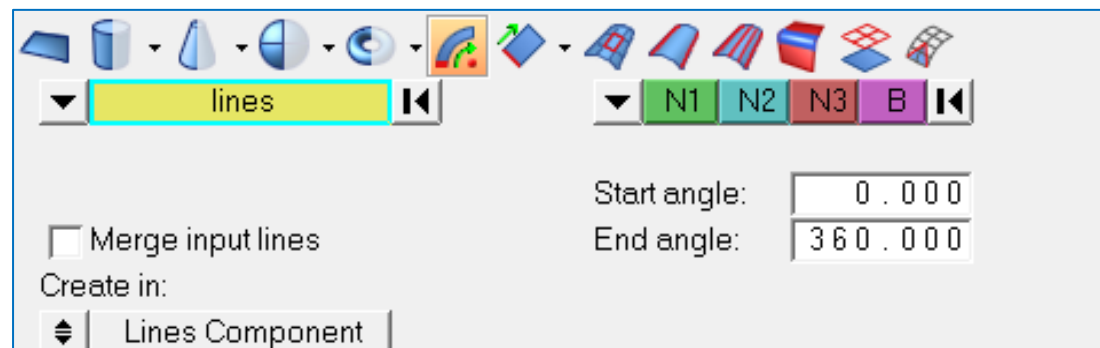
新界面

Torus Partial



 停用

Spin



Topology



Extrude/
Revolve



Surfaces (1)



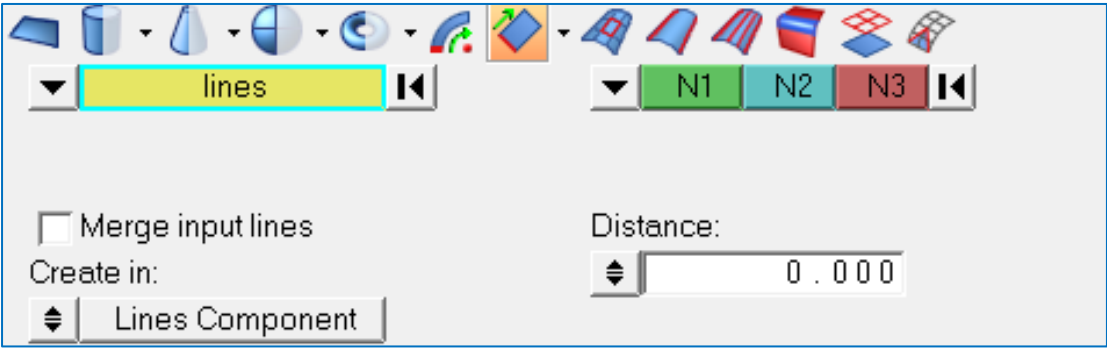
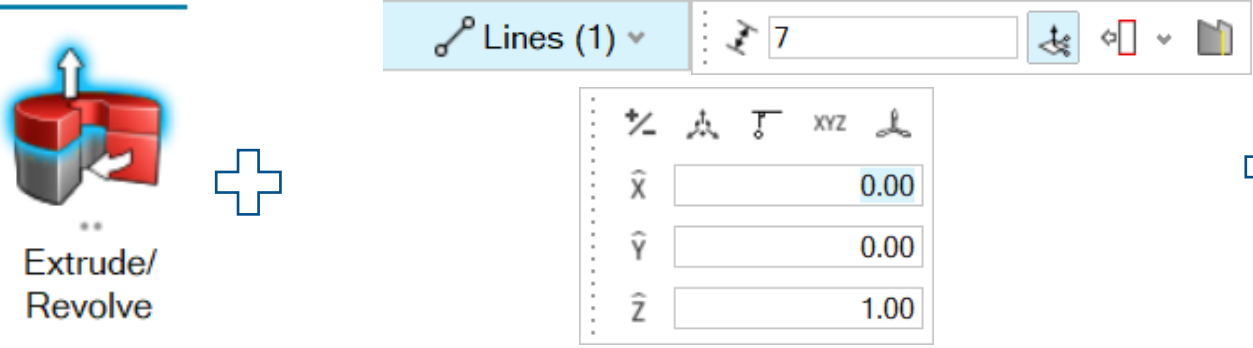
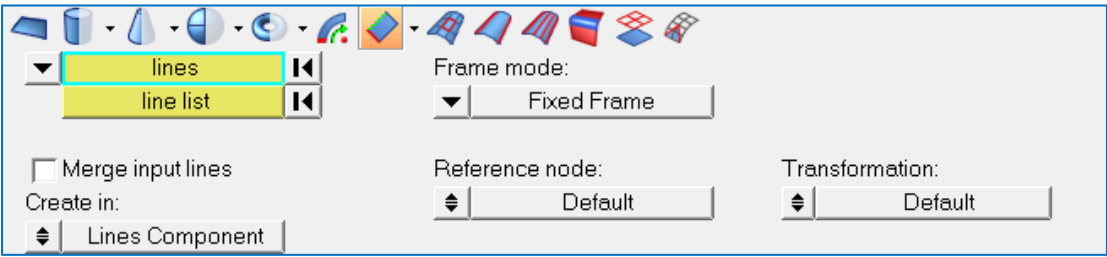
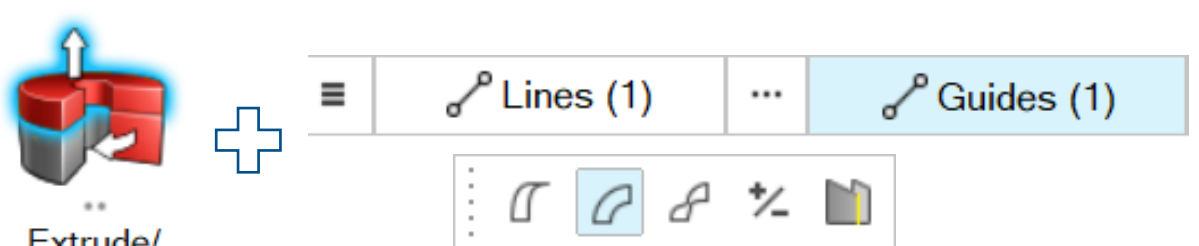
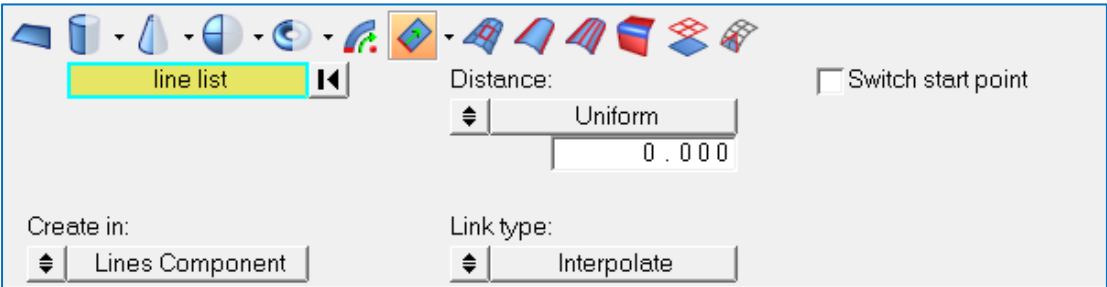
Axis



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- point edit
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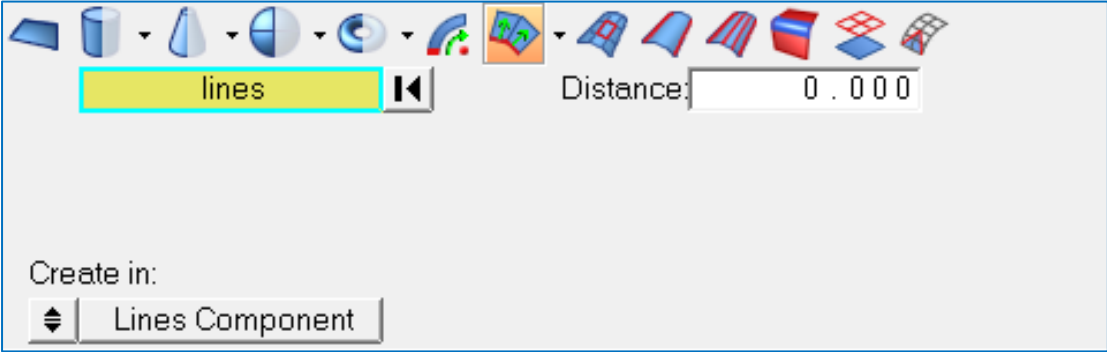
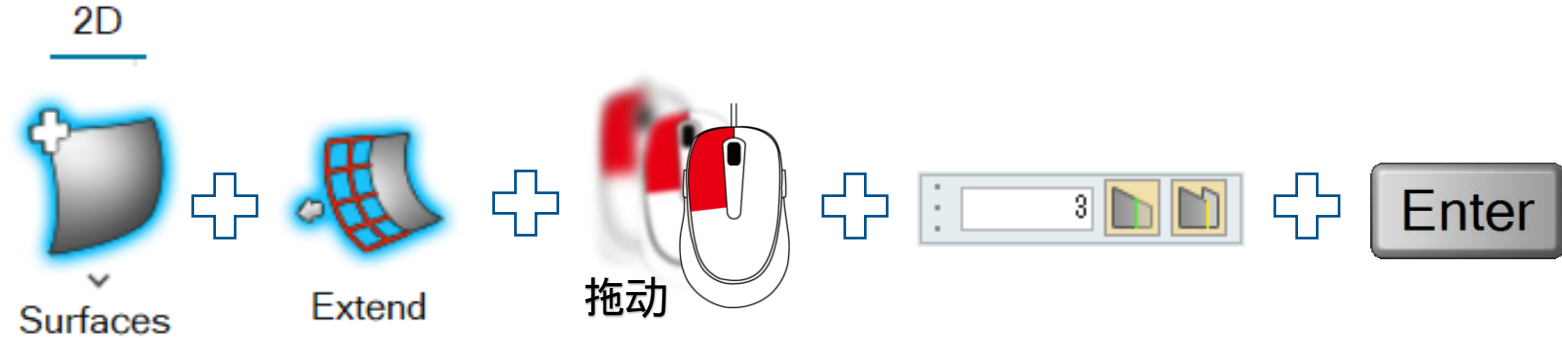
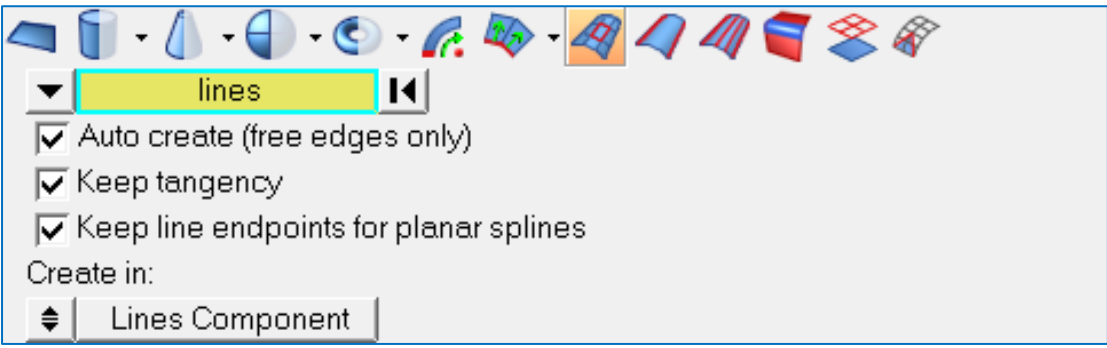
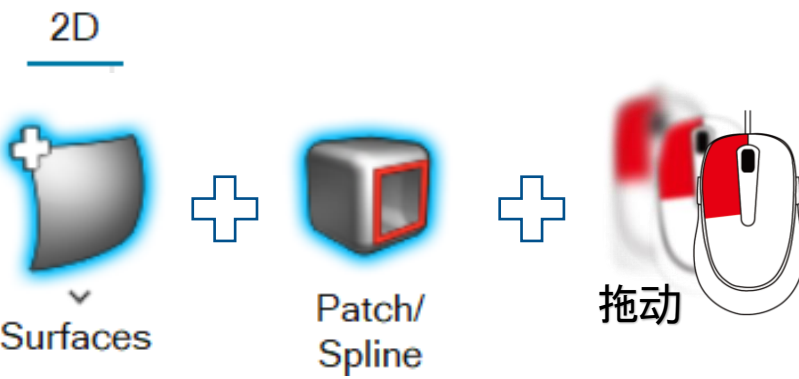
创建surfaces 5/8

经典界面	新界面
Drag along Vector 	Topology   或   拖动方向可以在  中进行更改
Drag along Line 	Topology   或 
Drag along Normal 	Topology 

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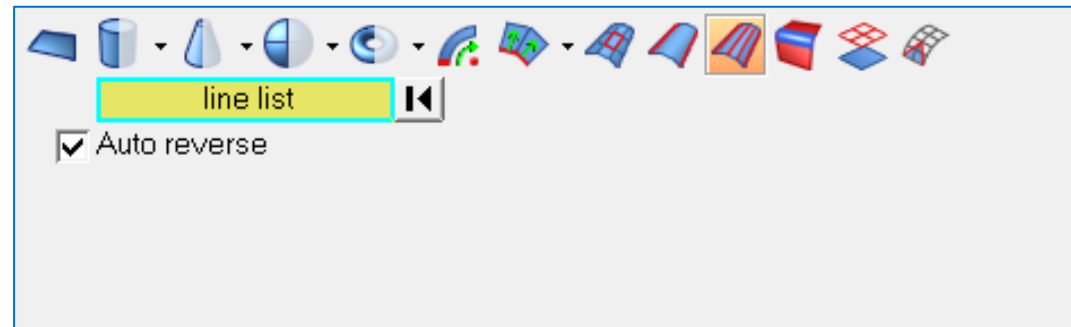
创建surfaces 6/8

经典界面	新界面
Drag along Normal from Surfaces 	
Spline/Filler 	
Ruled 	

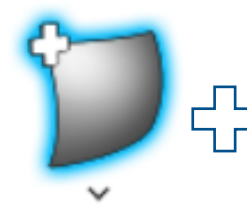
创建surfaces 7/8

经典界面

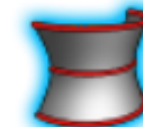
Skin



2D

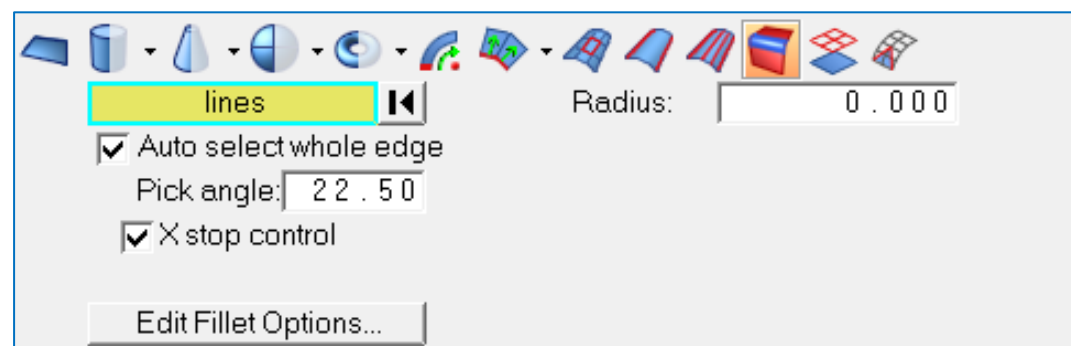


Surfaces



Skin

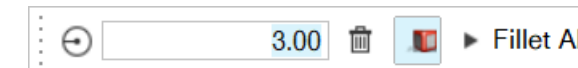
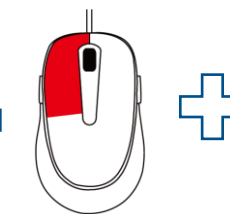
Fillet



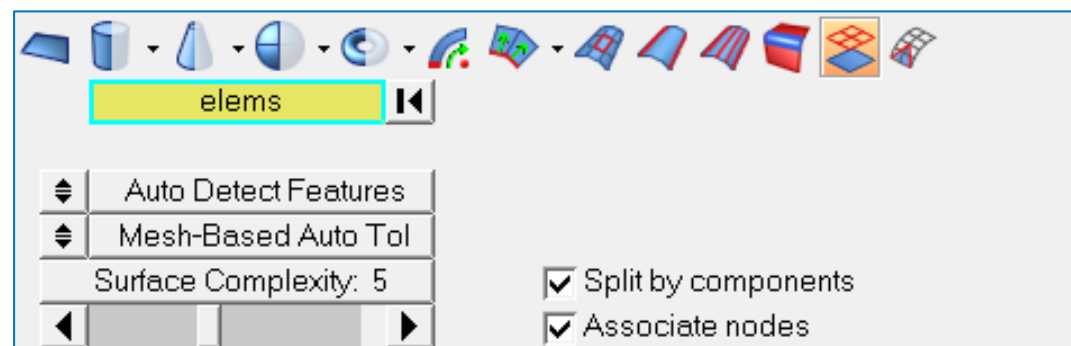
Topology



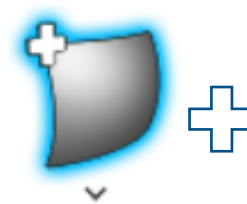
Fillet



From FE



2D



Surfaces

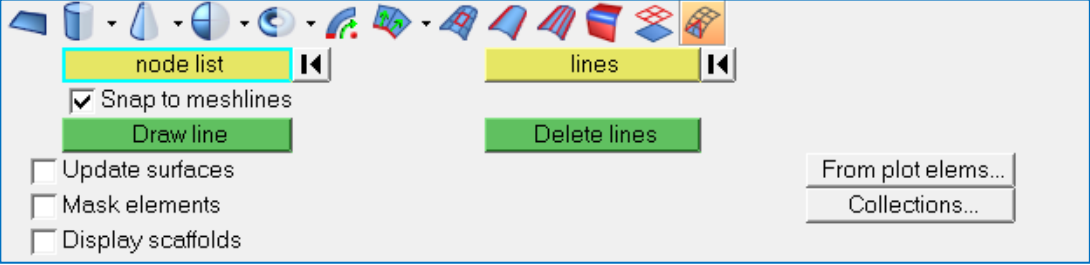


From FE

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创建surfaces 8/8

经典界面	新界面
Meshline 	 停用





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编辑surface 1/3

经典界面	新界面
trim with nodes trim with nodes two nodes trim with lines node trim with surfs/pl node untrim offset extend shrink multiple nodes surfs node list node normal to edge node lines	Topology Split Nodes Target (1) ... Tool (2) ▾ ... ◀ ▶ Split
trim with lines trim with nodes with cut line surfs trim with lines drag a cut line smooth line close line fill cuts trim with surfs/pl with lines surfs free lines along a vector entire surface N1 N2 N3 keep line endpoints with offset line all attached surfaces lines offset = 10.000 select closed loops	Topology Split Lines Target (1) ... ▾ Lines (1) ... ◀ ▶ Split Lines Offset Lines Graphical Line Trim by distance 信息 点击鼠标滚轮意味着你已经点击了 ▶ 这个按钮
trim with surf/plane trim with nodes with plane surfs trim with lines N1 N2 N3 B fill cuts trim with surfs/pl with surfs surfs trim both extend trimmer self intersecting surfs surfs	Topology Split Surfaces Plane Self intersecting surfs请使用Geometry>Stich Surfaces来缝合曲面。

编辑surface 2/3

经典界面

untrim

☐ trim with nodes at cursor ☐ trim with lines edge ☐ trim with surfs/pl ☒ untrim ☐ offset ☐ extend ☐ shrink	all trim lines of surfs surfs	selected trim lines of surfs lines ☐ shortcut ☐ keep vertices	internal trim lines lines
---	---	---	-------------------------------------

offset

☐ trim with nodes
☐ trim with lines
☐ trim with surfs/planes ☒ update eccentricity
☐ untrim ☐ remove degenerations
☒ offset
☐ extend
☐ shrink

extend

新界面

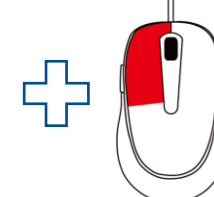
Topology



Defeature



Cuts/Edge Fillets



Selected trim lines of surfs 请使用上述方式
否则，当前，请使用菜单栏View=>Panels显示面板。

Topology



Surfaces

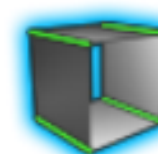


Offset

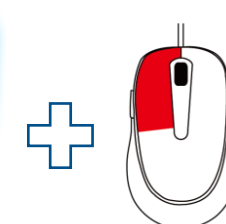
2D



Surfaces



Cross
Extend



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编辑surface 3/3

经典界面	新界面
shrink trim with nodes surfs trim with lines offset = 10.000 trim with surfs/plane untrim offset extend shrink	Split/Lines + Offset + Delete i 停用

shrink

Geom页面

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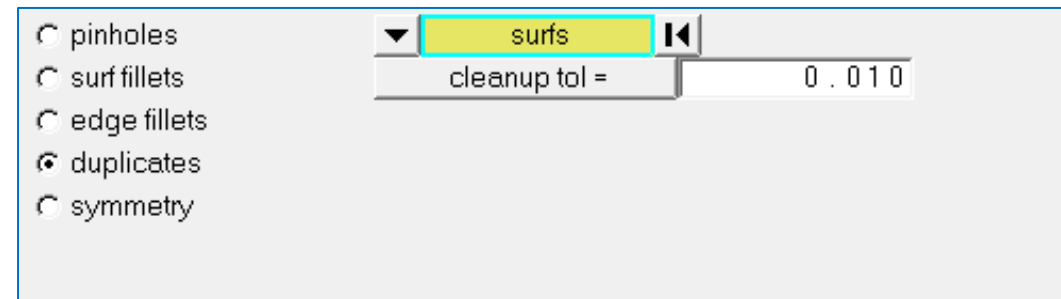
defeature经典界面（简化几何） 1/2

经典界面	新界面
pinholes pinholes surf fillets edge fillets duplicates symmetry surfs pinholes diameter < 0 . 1 0 0	Topology Defeature Holes Find Options Diameter: Minimum: 0.0 Maximum: 10.0 ☒ Surface holes Points at center: Fixed ☒ Solid holes Points at center: Fixed ☒ Pockets
surf fillets pinholes surf fillets edge fillets duplicates symmetry find fillets by profile lines find fillets in selected surfs min radius 5 . 0 0 0 max radius 1 5 . 0 0 0	Topology Defeature Fillets Options Radius: Minimum: 5.000000 Maximum: 15.000000 ☐ Use Parasolid
edge fillets pinholes surf fillets edge fillets duplicates symmetry surfs fillets min radius 5 . 0 0 0 max radius 2 0 0 . 0 0 0 min angle 1 5 . 0 0 0 all trim - intersect node node	Topology Defeature Cuts/Edge Fillets Options Minimum radius: 1.000000 Maximum radius: 10.000000 Minimum angle: 15.000000

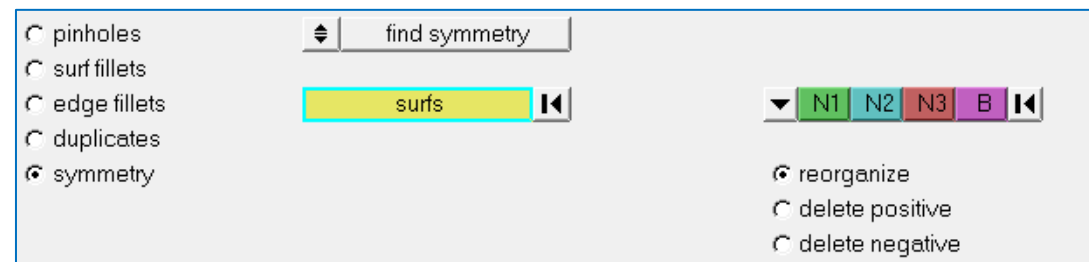
defeature经典界面（简化几何） 2/2

经典界面

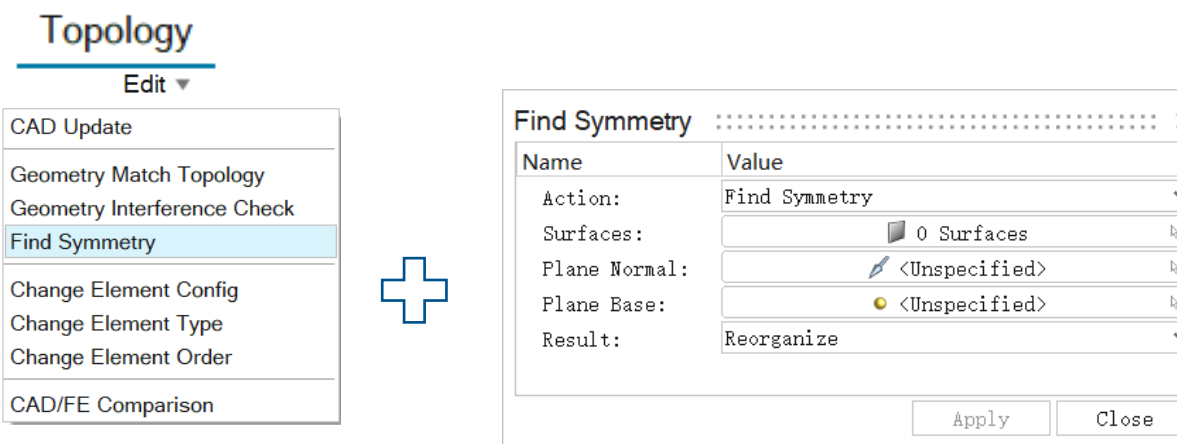
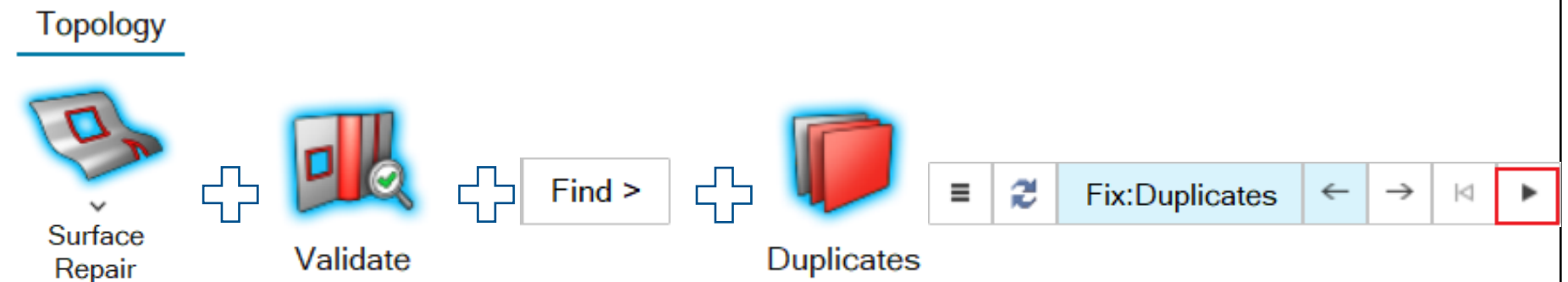
duplicates



symmetry



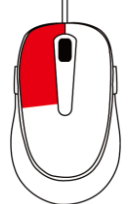
新界面



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midsurface经典界面（中面抽取） 1/4

经典界面	新界面
auto midsurface – auto extraction ▼ auto midsurface surfs auto extraction extraction options message options closed solid	2D  Midsurface  Automatic 
auto midsurface – extraction options ▼ auto midsurface offset+planes+sw auto extraction extraction options message options no thickness bounds max thickness10.000 extract by component result in Middle Surface use base surfaces allow rerun max R/T ratio20.000 thickness based stitc	2D  Midsurface  Automatic  Options Destination component:OriginalName.# Advanced ☒Mask input geometry ☐Extract across components ☐Clear existing plates Midsurface method:Planes + Sweeps + Offsets ☐Generate plates only Offset midsurface position:Align steps Align steps:Automatic User-specified:0.000000 ☐Use base surfaces Cleanup tolerance:Automatic Maximum R/T ratio:20.000000 Define thickness limits by:Limit ratio Thickness ratio:10.000000 Minimum thickness:0.000000 Maximum thickness:10.000000
auto midsurface – message options ▼ auto midsurface auto extraction extraction options message options Notify on: ☒plate type change ☒deleting plate information ☒pre-existing plates/base surfaces ☒plates/base information conflicts ☒unsuppressing edges between surfaces with differing plate information	 停用



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midsurface经典界面（中面抽取） 2/4

经典界面	新界面
interim edit tools – edit plates ▼ interim edit tools edit plates edit base surfaces edit collapsed lines show/edit all... review planar plat review sweep plat review offset plate	2D ▼ Midsurface + Edit Plates + + Planar Sweep Offset Transition Edge Ignored Undefined ► Update Midsurface
interim edit tools – edit base surfaces ▼ interim edit tools edit plates edit base surfaces edit collapsed lines use base surfaces	2D ▼ Midsurface + Base Surfaces + + 0.00 ✓ ⊗
interim edit tools – edit collapsed lines ▼ interim edit tools edit plates edit base surfaces edit collapsed lines allow rerun	i 停用

Geom页面

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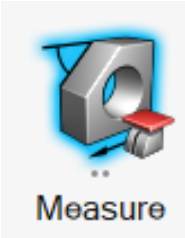
midsurface经典界面（中面抽取） 3/4

经典界面	新界面
final edit tools – surface pair final edit tools surface pair assign target imprint side1 surf side2 surf replace edge. extend surface extraction options ☒ use adjacent midsurfaces ☐ combine with adjacent midsurfaces result in Middle Surface 2D Midsurface Automatic Surfaces  i	
final edit tools – assign target final edit tools assign target imprint target location: as selected combined target surf point to offset point point to point accept target point between... remove target hold planarity 2nd click accept target equiv tol 0.01 i 停用	
final edit tools - imprint final edit tools imprint lines/surfs to imprint: surfs line exten by tangents surfs impi smart imprin keep line endpoints skip internal edges skip edges close to junctions min gap auto dete target surfaces: auto detect 2D Midsurface Pocket Imprint 	

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midsurface经典界面（中面抽取） 4/4

经典界面	新界面
review thickness ▼review thickness view thickness surfs average thickness0.000 max thickness:0.000 min thickness:0.000 assign thickness surfs new thickne1.000	 i 停用，用Measure间接实现
sort ▼sort sort Middle Surface comp into: ▼<~[o]riginal name> comp	2D  Midsurface +  Automatic +  Options Destination component: OriginalName.# ▼
	i 停用

Geom页面

- nodes
- node edit
- temp nodes
- distance
- points
- lines
- line edit
- length
- surfaces
- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

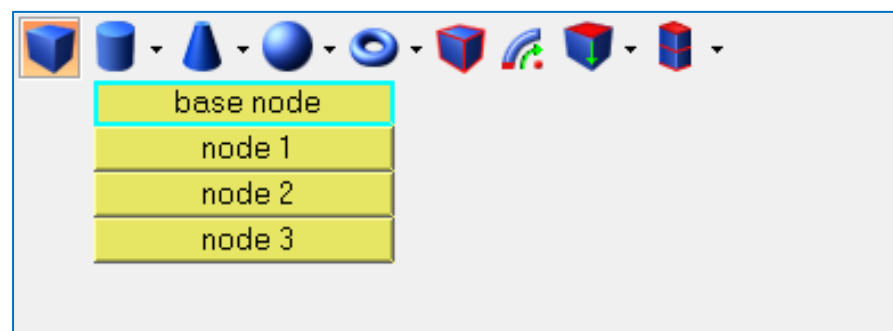
dimensioning经典界面（尺寸的变更）

经典界面	新界面
point 1 point 2 name = Dimension1 parameterization: ▼create parameter	Browser/Entity Editor

solids经典界面（创建实体几何） 1/6

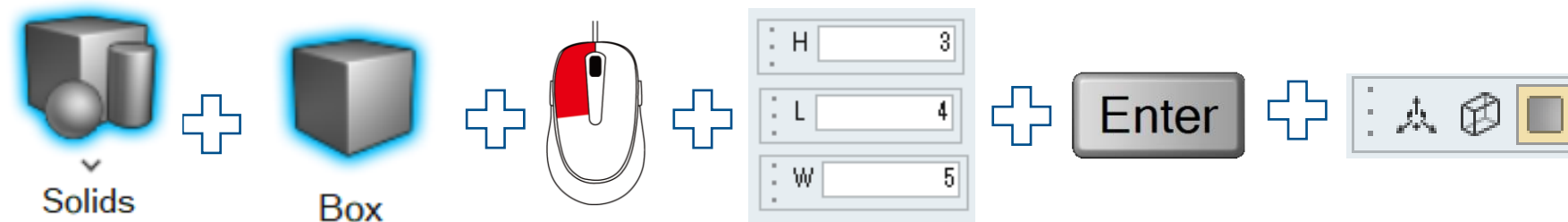
经典界面

Block

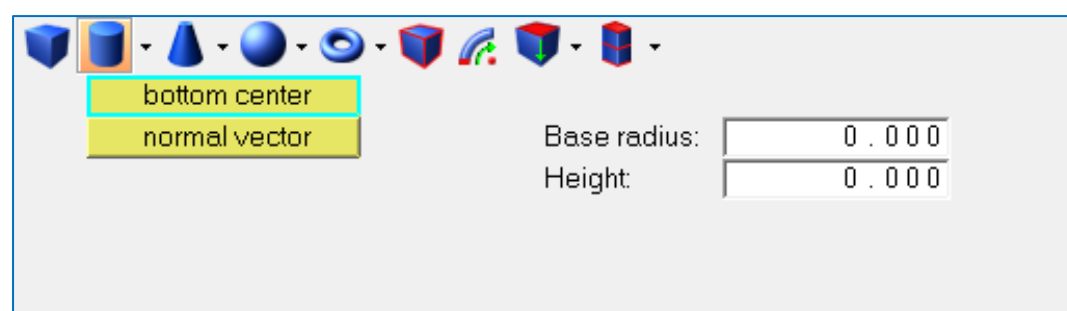


新界面

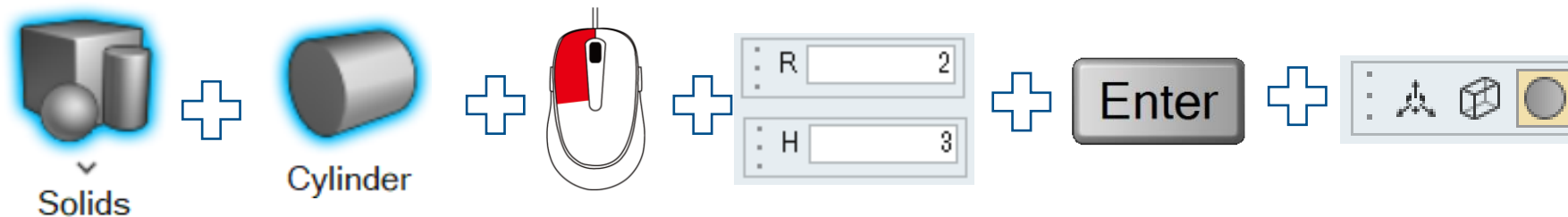
3D



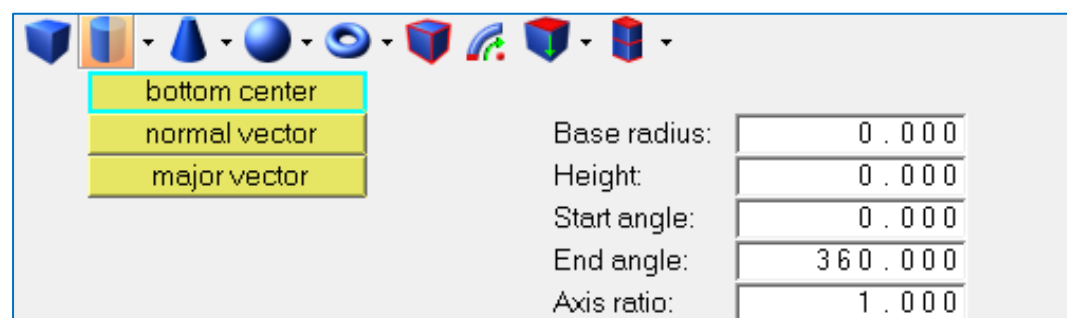
Cylinder Full



3D



Cylinder Partial



新界面

Cone Full











bottom center

normal vector

Top radius:

Base radius:

Height:

0 . 0 0 0

0 . 0 0 0

0 . 0 0 0

 停用

Cone Partial











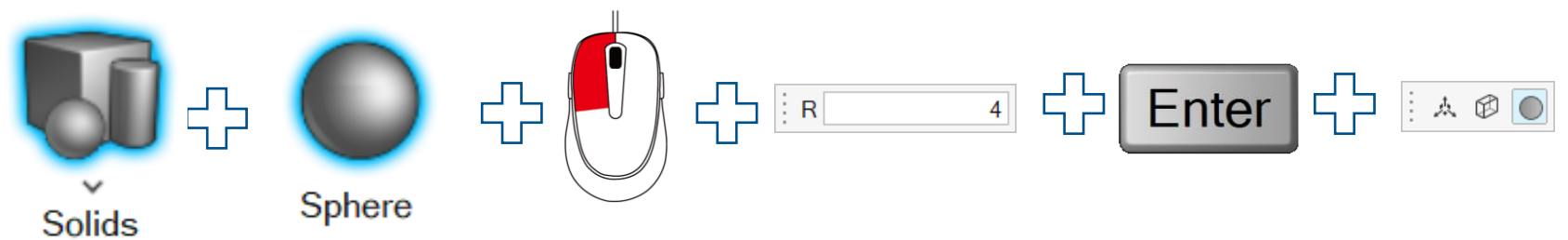
bottom center	Top radius:	0 . 0 0 0
normal vector	Base radius:	0 . 0 0 0
major vector	Height:	0 . 0 0 0
	Start angle:	0 . 0 0 0
	End angle:	3 6 0 . 0 0 0
	Axis ratio:	1 . 0 0 0

 停用

Sphere Center and Radius

center Radius: 0.000

3D



 如果不小心退出，双击即可重新编辑。

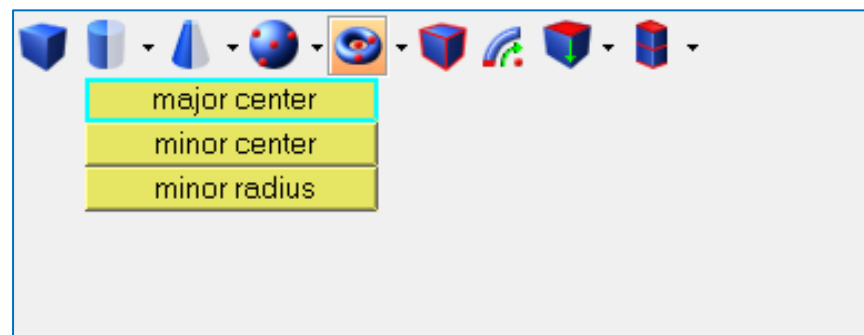
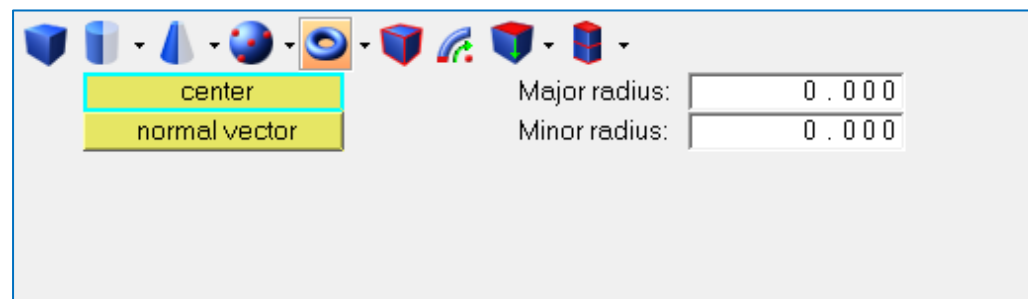
solids经典界面（创建实体几何） 3/6

经典界面

Sphere Four Nodes



us

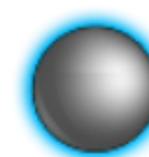


新界面

3D



Solids



Sphere



Four Nodes ▾

- Nodes



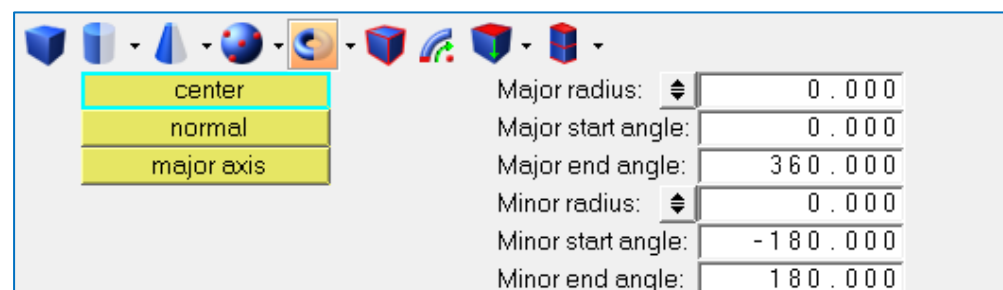
停用



停用

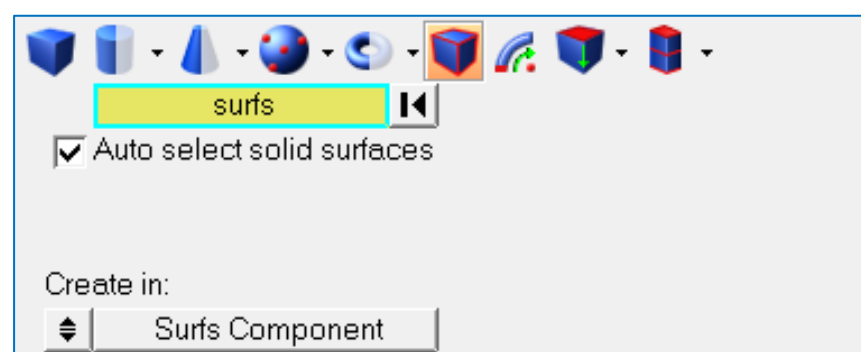


Torus Patial

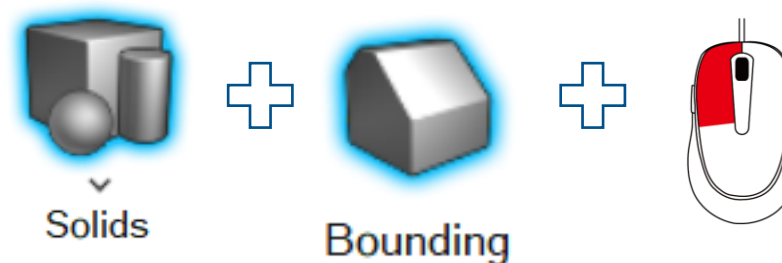


 停用

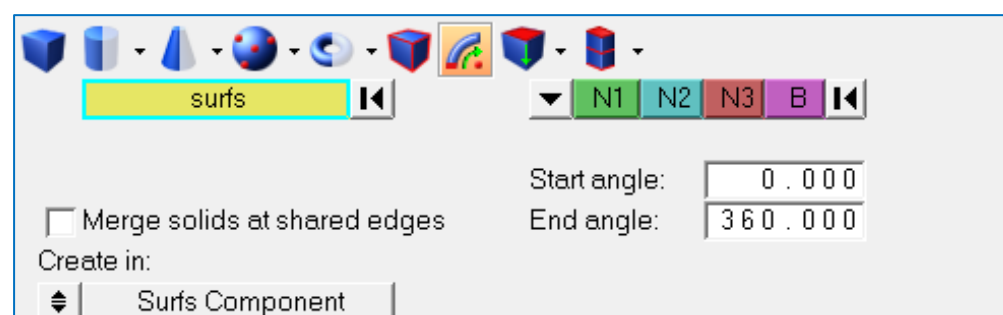
Bounding Surfaces



3D



Spin



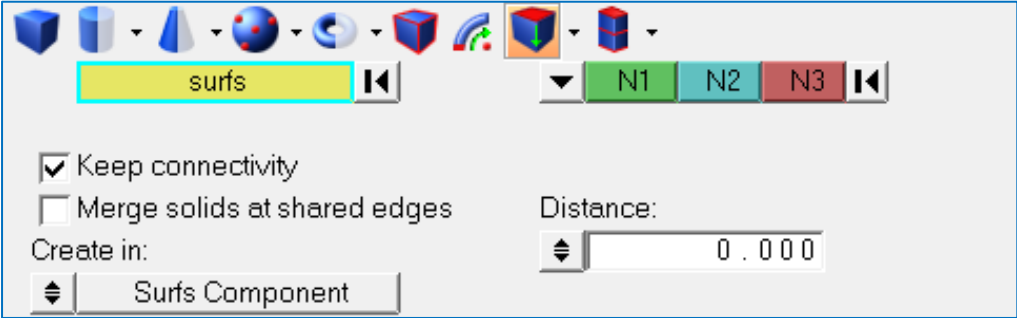
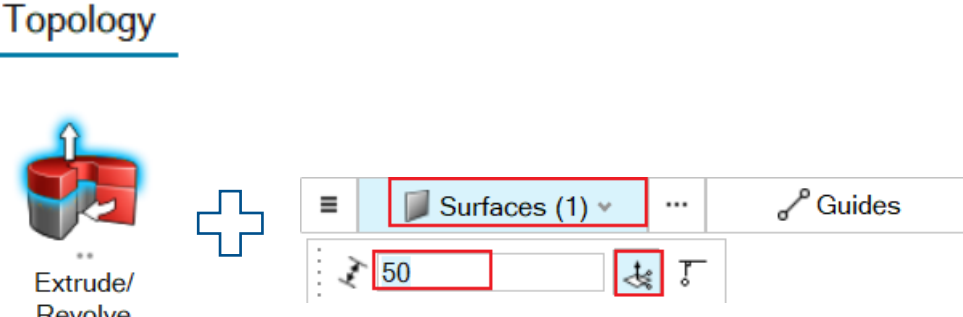
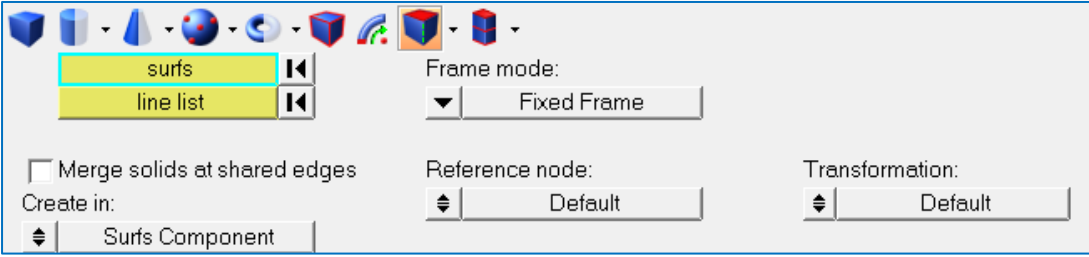
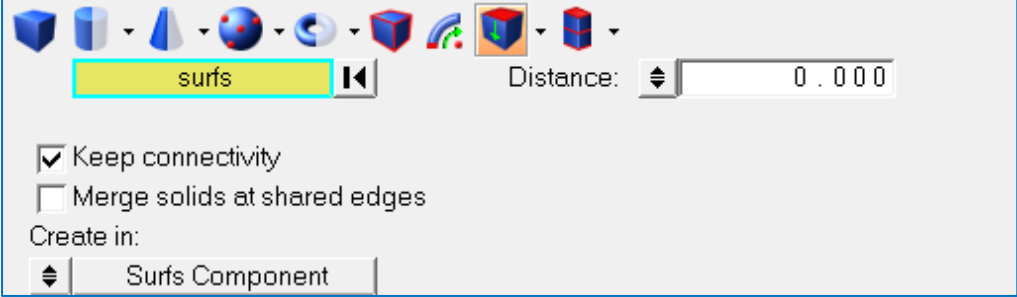
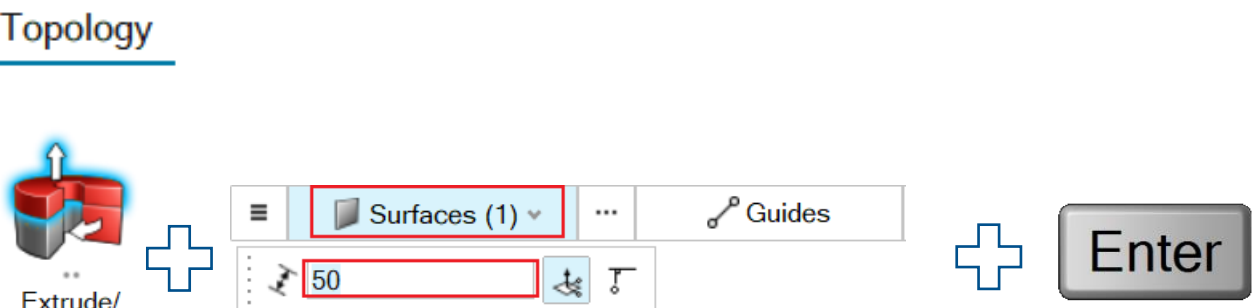
Topology



Geom页面

- nodes
- node edit
- temp nodes
- distance
- points
- lines
- line edit
- length
- surfaces
- surface edit
- defeature
- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

solids经典界面（创建实体几何） 5/6

经典界面	新界面
Drag along Vector 	Topology   拖动方向可以在  中更改
Drag along Line 	Topology 
Drag along Normal 	Topology 

solid edit经典界面（编辑实体几何） 1/2

经典界面

trim with nodes

☒ trim with nodes
☐ trim with lines
☐ trim with plane/surf
☐ merge
☐ detach
☐ boolean

☐ extend trimm

新界面

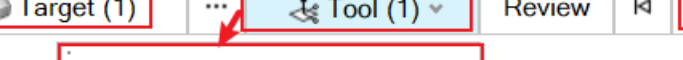
Topology



Split



Plane



Target (1) ... Tool (1) Review Split



$\hat{x}$	0.00
$\hat{y}$	0.26
$\hat{z}$	0.97

trim with lines

Trim tool options:

- Trim with nodes (selected)
- Trim with lines
- Trim with plane/surf
- Merge
- Detach
- Boolean

with cut line: solids

with bounding lines: lines

with sweep lines: by a vector (N1, N2, N3)

sweep to: sweep all

smooth line (checked)

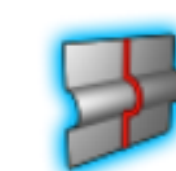
close line

extend trimm

Topology



Split



Lines



Target (1) ... Lines

Lines
Bounding Lines
Graphical Line

Split

☐ Extend trimme



点击鼠标滚轮意味着你已经点击了">分割“按钮

trim with plane/surf

☐ trim with nodes
 ☐ trim with lines
 ☒ trim with plane/surf
 ☐ merge
 ☐ detach
 ☐ boolean

with plane:

▼

solids

 ▶▶

▼

N1 N2 N3 B

 ▶▶

with surfs:

▼

solids

 ▶▶

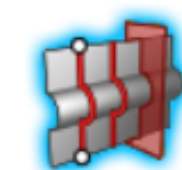
▼

surfs

 ▶▶

☒ extend trimm

Topology



Split



Plane



Surfaces



The screenshot shows the 'Tool (1)' dropdown menu open. The menu contains several tool icons and a table of values for X, Y, and Z coordinates. The 'Split' button is also visible.

	X	Y	Z
$\hat{x}$	0.00		
$\hat{y}$		0.26	
$\hat{z}$			0.97



solid edit经典界面（编辑实体几何） 2/2

经典界面

merge

☐ trim with nodes
 ☐ trim with lines
 ☐ trim with plane/surf
 ☒ merge
 ☐ detach
 ☐ boolean

to be merged:

solids

☐ remove scratches

merge by removal:

surfs

新界面

3D

Boolean

Combine

Surfaces (1)

Merge Solids

Combine All

Keep common interface

detach

☐ trim with nodes

☐ trim with lines

☐ trim with plane/surf

☐ merge

☒ detach

☐ boolean

detach:

solids



▼

from not selected

Topology



The image shows a close-up of the 'Detach' button, which is represented by a 3D cube icon and a plus sign. Below the button is the text 'Detach'. To the right of the button is a dropdown menu labeled 'Solids (1)'. The dropdown menu is open, showing a list of items. The first item is a 3D cube icon, which is highlighted with a red box. The second item is a 3D cube icon with a red outline, also highlighted with a red box. The third item is a 3D cube icon with a red outline, also highlighted with a red box. The fourth item is a 3D cube icon with a red outline, also highlighted with a red box. The dropdown menu is also highlighted with a red box.

boolean

☐ trim with nodes	operation type:	operation:
☐ trim with lines	☒ simple (combine all)	☒ A+B (union)
☐ trim with plane/surf	☐ advanced	☐ A*B (intersection)
☐ merge	A: solids	☐ A-B (remove B from A)
☐ detach	B: solids	☐ {A-B,B} (cut A with B)
☒ boolean	☐ swap A and B	

3D

Boolean Combine Subtract Intersect

Geom页面

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- edge edit
- point edit
- autocleanup

建立几何筋

经典界面

rib type: ▾triangular

rib start rnode

height = 0 . 0 0 0

profile pl ▾N1N2N3B⏮

rib end nnode

length = 0 . 0 0 0

plane po: ▾centered

width = 0 . 0 0 0

draft an 0 . 0 0 0

新界面

Topology

Create ▾

Ribs

Ribs

×

Name	Value
Rib Type:	Triangular ▾
Profile Position:	Centered ▾
Rib Start Node:	● <Unspecified> ↗
Rib End Node:	● <Unspecified> ↗
Reference Node:	● <Unspecified> ↗
Height:	0.0
Length:	0.0
Width:	0.0
Draft Angle:	0.0

ApplyClose

◀

▶

Geom页面

- nodes
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- edge edit
- point edit
- autocleanup

quick edit经典界面（编辑面，经常使用的编辑工具）

经典界面

split surf-node:	node	node	
split surf-line:	node	line	
washer split:	line(s)	offset valu	0 . 1 0 0
unsplit surf:	line(s)		
toggle edge:	line(s)	tolerance:	0 . 0 1 0
filler surf:	line(s)	☐ suppress edges	
delete surf:	surf(s)		

adjust/set densit	line(s)	line(s)
replace point:	point(s)	retain
add/remove poi	point(s)	
add point on line:	line(s)	no. of po 1
release point:	point(s)	
project point:	point(s)	line
trim-intersect:	node	node

新界面

Topology



Quick Edit

+

Split-Interactive

Split-Interactive

Washer Split

Trim-Intersect

Parametric

Toggle Edge

Replace Point

Filler Surface

edge edit经典界面（编辑边） 1/3

经典界面

toggle

☒ toggle at cursor
☐ (un)suppress **edge**
☐ replace
☐ equivalence cleanup tol = 0.010
☐ unsplit
☐ edge fillets
☐ by feature

(un)suppress

☐ toggle
☒ (un)suppress **lines** 
☐ replace
☐ equivalence breakangle = 30.000
☐ unsplit
☐ edge fillets
☐ by feature

replace

☐ toggle
☐ (un)suppress
☒ replace
☐ equivalence
☐ unsplit
☐ edge fillets
☐ by feature

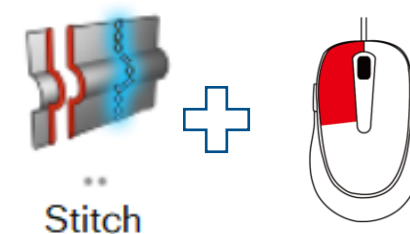
moved edge: line 

retained edge: line 

cleanup tol = 0 . 0 1 0

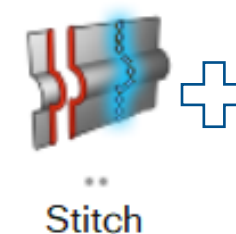
新界面

Topology



 使用左边的工具缝合边缘，右边的工具压缩边缘

Topology



Suppress:



Unsuppress: **Shift** 



Topology



edge edit经典界面（编辑边） 2/3

经典界面

equivalence

☐ toggle
☐ (un)suppress **surfs** 
☐ replace
☒ equivalence geometry stitching:  by component
☐ unsplit cleanup tol =  0.010
☐ edge fillets ☒ equiv free edges only
☐ by feature

unsplit

☐ toggle	at cursor	multiple edges
☐ (un)suppress	line	lines
☐ replace		
☐ equivalence		
☒ unsplit		
☐ edge fillets		
☐ by feature		

edge fillets

☐ toggle
 ☐ (un)suppress
 ☐ replace
 ☐ equivalence
 ☐ unsplit
 ☒ edge fillets
 ☐ by feature

surfs

fillets

min radius	5 . 000
max radius	200 . 000
min angle	15 . 000
▼ all	

trim - intersect

node

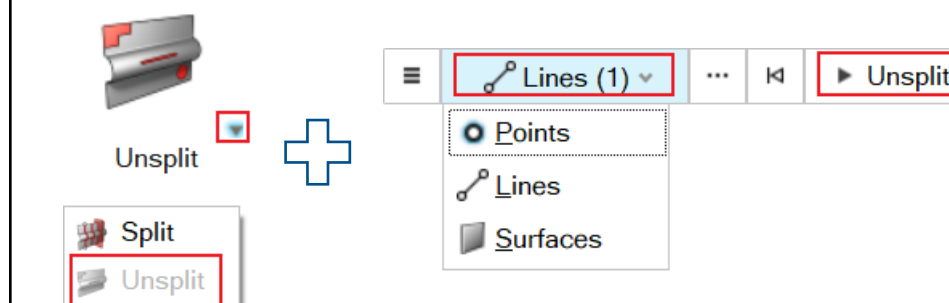
node

新界面

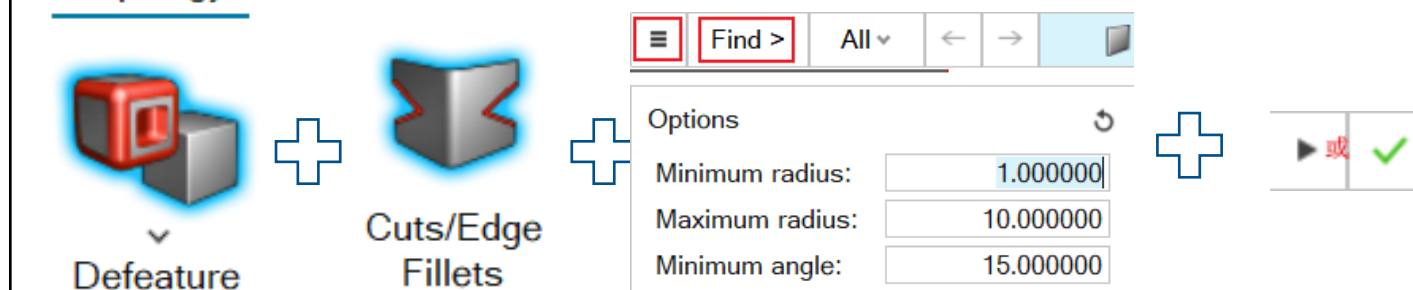
Topology



Topology



Topology



 ▶ 执行不退出  执行并退出该工具

edge edit经典界面（编辑边） 3/3

经典界面

by feature

新界面

Topology



Defeature



Batch



☰ Surfaces (1) ... ⏮ ▶ Auto Cleanup

Options ↻

Element size:

[Edit parameters](#)

[Edit criteria](#)



Geom页面

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- ribs
- quick edit
- edge edit
- point edit
- autocleanup

point edit经典界面（编辑点） 1/2

经典界面	新界面
add add at cursor point on edge edge # of pt1 on surfs surfs nodes cleanup t0.010	Topology Split + Interactive + 鼠标
suppress add at cursor point multiple points points save as free points breakangle = 30.000	Topology Split + Interactive + Shift 鼠标
replace add moved points suppress retained point replace release project	Topology Stitch + 拖动 鼠标

Geom页面

- nodes
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- surfaces
- surface edit
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- midsurface
- dimensioning
- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

point edit经典界面（编辑点） 2/2

经典界面	新界面
release add at cursor point suppress replace release project	Topology Stitch + Shift
project add points to edges points lines suppress replace release project points to surfs points surfs internal points onto its surfs surfs distance tolera 1 0 . 0 0 0 angle tolerance 3 0 . 0 0 0	Topology Imprint + Target Lines Elements Surfaces + + Source Points + + Imprint i 点击鼠标滚轮意味着你已经点击了 Imprint 这个按钮



Geom页面

- nodes
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- solids
- solid edit
- ribs
- quick edit
- edge edit
- point edit
- autocleanup

autocleanup经典界面（自动清理）

经典界面	新界面
surfs target elem size parameter = 2.8 Topology cleanup parameters: use current parametersedit parameters Elements quality criteria: use current criteriaedit criteria preserve edges	Topology Defeature Batch Surfaces (1) Auto Cleanup Options Element size: 163.436 Edit parametersEdit criteria

1D页面

0D/1D单元的生成

masses	bars	connectors	line mesh	edit element	Geom 1D 2D 3D Analysis Tool Post
--------	------	------------	-----------	--------------	--

1D页面

masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

linear 1d

vectors

systems

edit element

split

replace

detach

order change

config edit

elem types

masses经典界面（质量单元的创建）

经典界面

create

create

nodes

update

mass = 0.000

property =

system

elem types = CONM2

update

create

elems

update

mass = 0.000

property =

system

elem types = CONM2

新界面

1D

Masses 0D

+

Mass (0D) Elements

Name

Value

Auto Create:

Auto Create: ☒

Type:

CONM2

Nodes:

Nodes (1)

System:

<Unspecified>

Mass:

20.0

Create

Close

Browser/Entity Editor

Model

Search

Name

ID

Include

Components (3)

Curves (3)

Elements (404)

OD (1)

MASS (1)

CONN2 (1)

Elements 887 0

1D (1)

2D (402)

Name

Value

Solver Keyword:

CONM2

ID:

887

Include:

[Main Model]

Collector:

(3) auto1

Type:

CONM2

CID:

<Unspecified>

Mass:

1.0

G:

(956) Node

User Comments:

Hide In Menu/Export

CID_options:

☐

X1:

0.0

X2:

0.0

X3:

0.0

CONT:

☐

Metadata

1D页面

masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

linear 1d

vectors

systems

edit element

split

replace

detach

order change

config edit

elem types

joints经典界面（joint单元创建）

经典界面

create

create

update

joint type:

ball

first grid:

node

second grid:

node

FE

MBD

property =

update

create

update

elems

joint type:

ball

first grid:

node

second grid:

node

FE

MBD

property =

新界面

Model

Blocks

Boolean On Sets

Combine Rigids

Switch Rigids

Features

Fields

Joints

Parameters

Regions

RSpline

Contact Comparison

+

Joints

Name	Value
Joint Type:	Axial
Node 1:	<Unspecified>
Node 2:	<Unspecified>
Property:	<Unspecified>

CreateClose

Browser/Entity Editor

Model

Search

Name	ID	Include
Components (3)		
Curves (3)		
Elements (405)		
OD (1)		
1D (2)		
JOINT (1)		
RIGID (1)		
2D (402)		

Name	Value
Solver Keyword:	JOINTG AXIAL
ID:	888
Include:	[Main Model]
Collector:	(3) auto1
Type:	FE_AXIAL
Node 1:	(807) Node
Node 2:	(887) Node
Property:	(3) pjoint
GID1:	807
GID2:	887
Metadata	

1D页面

masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

linear 1d

vectors

systems

edit element

split

replace

detach

order change

config edit

elem types

markers经典界面（标记点的生成）

经典界面	新界面
create create update marker name = color location: node orientation: system edit	Model Browser/Entity Editor Create model空白处右键 Show All Reverse Paste Displayed Count Export Expand All Collapse All Close Entity Views Configure Browser Non-structural Mass Output Block Parameter Part Plot Ply Property Region Rigid Body Rigid Wall Sensor Set Set Segment Sensors (1) MARKER (1) sensor1 1 0 Name Solver Keyword: Name: ID: Color: Include: Card Image: MARKER sensor1 1 [Main Model] MARKER Sensor Definition GID: CID: (132) Node (1) System Metadata

1D页面

masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

linear 1d

vectors

systems

edit element

split

replace

detach

order change

config edit

elem types

bars经典界面（梁单元创建）

经典界面	新界面																												
bar2 node A node B pins a = 0 pins b = 0 property = elem types = CBEAM orientation: N1 N2 N3 offset a: ax = 0.000 ay = 0.000 az = 0.000 offset b: bx = 0.000 by = 0.000 bz = 0.000	1D Beams Beam (1D) Elements <table><thead><tr><th>Name</th><th>Value</th></tr></thead><tbody><tr><td>Auto Create:</td><td>☒</td></tr><tr><td>Type:</td><td>CBEAM</td></tr><tr><td>Linear 1D:</td><td>☐</td></tr><tr><td>Node A:</td><td><Unspecified></td></tr><tr><td>Node B:</td><td><Unspecified></td></tr><tr><td>Orientation Type:</td><td>Direction - Basic</td></tr><tr><td>Direction:</td><td>0, 0, 1</td></tr><tr><td>Property:</td><td><Unspecified></td></tr><tr><td>Pin Release A:</td><td>0</td></tr><tr><td>Pin Release B:</td><td>0</td></tr><tr><td>Offset Method:</td><td>Displacement</td></tr><tr><td>Offset A:</td><td>0, 0, 0</td></tr><tr><td>Offset B:</td><td>0, 0, 0</td></tr></tbody></table> CreateClose	Name	Value	Auto Create:	☒	Type:	CBEAM	Linear 1D:	☐	Node A:	<Unspecified>	Node B:	<Unspecified>	Orientation Type:	Direction - Basic	Direction:	0, 0, 1	Property:	<Unspecified>	Pin Release A:	0	Pin Release B:	0	Offset Method:	Displacement	Offset A:	0, 0, 0	Offset B:	0, 0, 0
Name	Value																												
Auto Create:	☒																												
Type:	CBEAM																												
Linear 1D:	☐																												
Node A:	<Unspecified>																												
Node B:	<Unspecified>																												
Orientation Type:	Direction - Basic																												
Direction:	0, 0, 1																												
Property:	<Unspecified>																												
Pin Release A:	0																												
Pin Release B:	0																												
Offset Method:	Displacement																												
Offset A:	0, 0, 0																												
Offset B:	0, 0, 0																												
update elems pins a = 0 pins b = 0 property = elem types = CBEAM orientation: N1 N2 N3 offset a: ax = 0.000 ay = 0.000 az = 0.000 offset b: bx = 0.000 by = 0.000 bz = 0.000	1D Edit Beam Align Orient Offset Pins																												

1D页面

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- markers
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- gaps
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- detach
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- config edit
- elem types

rods经典界面（杆单元创建）

经典界面	新界面
create create node update node property = elem types = CWELD	1D Beams + Lines (1) ... ◀ Edit Element Category ▶ ✓ ✗ Element Size: 10 Exit Line Mesh × Name Value Category: Rod (1D) ▼ Type: CROD ▼ Property: <Unspecified> ⏶ Close
update create elems update property = elem types = CWELD	1D Edit Beam + Align Orient Offset Pins



经典界面

create

☒ create independent: node ☒ dof1 ☒ dof4
☐ update dependent: ▼ node ☒ dof2 ☒ dof5
☐ combine ☒ dof3 ☒ dof6

☐ attach dependent nodes as a set

elem types = RBE 2

新界面

update

☐ create	☒ elems	☒ dof1	☒ dof4
☒ update		☒ dof2	☒ dof5
☐ combine	☒ dof	☒ dof3	☒ dof6
	☐ connectivity		
	☐ switch		
	☐ attach/detach set		
	☐ elem type		

选择过滤器-Element

图形区选择Element

Collector: (1) auto1
 Independent Node: (515) Node
 Dependent Nodes: 3 Nodes
 Dependent DoFs: 123456
 User Comments: Hide In Menu/Export
 ALPHA: 0.0
Metadata

Close

combine

☐ create

☐ update

☒ combine

combine rigids with:

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joints

markers

bars

rods

rigids

rbe3

springs

gaps

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spotweld

HyperBeam

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linear 1d

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systems

edit element

split

replace

detach

order change

config edit

elem types

rbe3经典界面（RBE3单元创建）

经典界面	新界面																										
create create dependent: calculate node independent: nodes dependent dofs: dof1 dof2 dof3 dof4 dof5 dof6 weight = 1 . 0 0 0 elem types = RBE 3	Model RBE3s Rigids RBE3s Rigid Body RBE3 Elements <table><thead><tr><th>Name</th><th>Value</th></tr></thead><tbody><tr><td>Auto Create:</td><td>☒</td></tr><tr><td>Type:</td><td>RBE3</td></tr><tr><td>Calculate dependent node:</td><td>☐</td></tr><tr><td>Dependent node:</td><td><Unspecified></td></tr><tr><td>Independent node(s):</td><td>0 Nodes</td></tr><tr><td>Independent DOF:</td><td>123</td></tr><tr><td>Dependent DOF:</td><td>123456</td></tr><tr><td>Independent WT:</td><td>1.0</td></tr><tr><td>ALPHA:</td><td>0.0</td></tr></tbody></table> Create Close	Name	Value	Auto Create:	☒	Type:	RBE3	Calculate dependent node:	☐	Dependent node:	<Unspecified>	Independent node(s):	0 Nodes	Independent DOF:	123	Dependent DOF:	123456	Independent WT:	1.0	ALPHA:	0.0						
Name	Value																										
Auto Create:	☒																										
Type:	RBE3																										
Calculate dependent node:	☐																										
Dependent node:	<Unspecified>																										
Independent node(s):	0 Nodes																										
Independent DOF:	123																										
Dependent DOF:	123456																										
Independent WT:	1.0																										
ALPHA:	0.0																										
update create elem update calculate node connectivity dofs weight factors elem type dependent: calculate node independent: nodes	Elements (1) ... 选择过滤器-Element Create Set... Edit 1 Elements... 图形区选择Element Edit Elements <table><thead><tr><th>Name</th><th>Value</th></tr></thead><tbody><tr><td>Solver Keyword:</td><td>RBE3</td></tr><tr><td>ID:</td><td>1596</td></tr><tr><td>Include:</td><td>[Main Model]</td></tr><tr><td>Collector:</td><td>(1) auto1</td></tr><tr><td>Type:</td><td>RBE3</td></tr><tr><td>Dependent DOF:</td><td>123456</td></tr><tr><td>REFGRID:</td><td>(549) Node</td></tr><tr><td>Independent Nodes:</td><td>3 Nodes</td></tr><tr><td>User Comments:</td><td>Hide In Menu/Export</td></tr><tr><td>UM:</td><td>☐</td></tr><tr><td>RBE3_ALPHA:</td><td>☐</td></tr><tr><td>Metadata</td><td></td></tr></tbody></table> Close	Name	Value	Solver Keyword:	RBE3	ID:	1596	Include:	[Main Model]	Collector:	(1) auto1	Type:	RBE3	Dependent DOF:	123456	REFGRID:	(549) Node	Independent Nodes:	3 Nodes	User Comments:	Hide In Menu/Export	UM:	☐	RBE3_ALPHA:	☐	Metadata	
Name	Value																										
Solver Keyword:	RBE3																										
ID:	1596																										
Include:	[Main Model]																										
Collector:	(1) auto1																										
Type:	RBE3																										
Dependent DOF:	123456																										
REFGRID:	(549) Node																										
Independent Nodes:	3 Nodes																										
User Comments:	Hide In Menu/Export																										
UM:	☐																										
RBE3_ALPHA:	☐																										
Metadata																											

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masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

linear 1d

vectors

systems

edit element

split

replace

detach

order change

config edit

elem types

springs经典界面（创建弹簧单元）

经典界面

create

create

node

update

node

dof1

dof2

dof3

dof4

dof5

dof6

orientation:

▼

no vector

property =

elem types =

CELAS1

update

create

elems

dof1

dof2

dof3

dof4

dof5

dof6

orientation:

▼

no vector

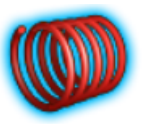
property =

elem types =

CELAS1

新界面

1D



Springs 1D

+

Spring (1D) Elements

Name	Value
Auto Create:	☒
Type:	CELAS1
Linear 1D:	☐
Node A:	<Unspecified>
Node B:	<Unspecified>
Property:	<Unspecified>
C1 (dof):	0
C2 (dof):	0

Create

Close

选择过滤器-Element

Elements (1)

...

⏮

+

右键 Create Set...

Edit 1 Elements...

+

图形区选择Element

Edit Elements

Name	Value
Solver Keyword:	CELAS1
ID:	1597
Include:	[Main Model]
Collector:	(1) auto1
Type:	CELAS1
G1:	(501) Node
G2:	(458) Node
Property:	<Unspecified>
C1:	0
User Comments:	Hide In Menu/Export
C2:	0
Metadata	

Close

◀

▶

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gaps经典界面（gap单元创建）

经典界面	新界面																																				
create create from node update to node node-node orientation: nodes-elems default property = elem type = CGAP (G)	1D  Gaps 1D + Gap (1D) Elements <table><thead><tr><th>Name</th><th>Value</th></tr></thead><tbody><tr><td>Auto Create:</td><td>☒</td></tr><tr><td>Type:</td><td>CGAP</td></tr><tr><td>Linear 1D:</td><td>☐</td></tr><tr><td>Node A:</td><td><Unspecified></td></tr><tr><td>Node B:</td><td><Unspecified></td></tr><tr><td>Orientation Type:</td><td>Default</td></tr><tr><td>Property:</td><td><Unspecified></td></tr></tbody></table> CreateClose	Name	Value	Auto Create:	☒	Type:	CGAP	Linear 1D:	☐	Node A:	<Unspecified>	Node B:	<Unspecified>	Orientation Type:	Default	Property:	<Unspecified>																				
Name	Value																																				
Auto Create:	☒																																				
Type:	CGAP																																				
Linear 1D:	☐																																				
Node A:	<Unspecified>																																				
Node B:	<Unspecified>																																				
Orientation Type:	Default																																				
Property:	<Unspecified>																																				
update create elems update orientation: property = elem type = CGAP (G)	Elements (1) ... ⏮ + 右键 Create Set... ⏮ Edit 1 Elements... + 选择过滤器-Element 图形区选择Element Edit Elements <table><thead><tr><th>Name</th><th>Value</th></tr></thead><tbody><tr><td>Solver Keyword:</td><td>CGAP</td></tr><tr><td>ID:</td><td>1598</td></tr><tr><td>Include:</td><td>[Main Model]</td></tr><tr><td>Collector:</td><td>(1) auto1</td></tr><tr><td>Type:</td><td>CGAP</td></tr><tr><td>GA:</td><td>(201) Node</td></tr><tr><td>GB:</td><td>(370) Node</td></tr><tr><td>G0:</td><td><Unspecified></td></tr><tr><td>Direction:</td><td>0, 0, 0</td></tr><tr><td>Property:</td><td><Unspecified></td></tr><tr><td>User Comments:</td><td>Hide In Menu/Export</td></tr><tr><td>X1:</td><td></td></tr><tr><td>X2:</td><td></td></tr><tr><td>X3:</td><td></td></tr><tr><td>CID Options:</td><td>BLANK</td></tr><tr><td>CID:</td><td></td></tr><tr><td>Metadata</td><td></td></tr></tbody></table> Close	Name	Value	Solver Keyword:	CGAP	ID:	1598	Include:	[Main Model]	Collector:	(1) auto1	Type:	CGAP	GA:	(201) Node	GB:	(370) Node	G0:	<Unspecified>	Direction:	0, 0, 0	Property:	<Unspecified>	User Comments:	Hide In Menu/Export	X1:		X2:		X3:		CID Options:	BLANK	CID:		Metadata	
Name	Value																																				
Solver Keyword:	CGAP																																				
ID:	1598																																				
Include:	[Main Model]																																				
Collector:	(1) auto1																																				
Type:	CGAP																																				
GA:	(201) Node																																				
GB:	(370) Node																																				
G0:	<Unspecified>																																				
Direction:	0, 0, 0																																				
Property:	<Unspecified>																																				
User Comments:	Hide In Menu/Export																																				
X1:																																					
X2:																																					
X3:																																					
CID Options:	BLANK																																				
CID:																																					
Metadata																																					



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connectors经典界面（连接元创建）

经典界面

connectors

organize	spot	add links	compare	connector options
find	bolt	unrealize	quality	
mask	seam	mesh edit		
delete	area			
translate	apply mass			
numbers	fe absorb			
renumber				

新界面

Connectors



Connectors



Controls



Point



Fastener



Line



Area



Attachment



Connect

Create ▾

Attachments

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spotweld经典界面（焊点的创建） 1/2

经典界面	新界面
using geom using geom all surfs surfs using nodes using elems switch nodes surfs-surfs lines-surfs element config: weld weld location : nodes property = search tolerance = 0 . without systems	停用
using nodes using geom indep: node dep: node using nodes using elems switch nodes node-node nodes-nodes element config: weld weld location : move dep node property = without systems	Connectors Point + Nodes (2) spotweld Connector Control Manager Search Point Q Name Type Name ID Include Style Type General Solver Tolerance MCF File System Name Engineering name Analysis Pitch Pitch Option Distribution Option Value spotweld 1 [Main Model] spot weld optistruct 10.0 no system Spot Weld ☐ use pitch linear + ▶ ✓
using elems using geom all elems elems using nodes using elems switch nodes elems-elems element config: weld weld location : nodes property = search tolerance = 0 . without systems attach to shell elems	Connectors Point + Nodes (2) spotweld Connector Control Manager Search Point Q Name Type Name ID Include Style Type General Solver Tolerance MCF File System Name Engineering name Analysis Pitch Pitch Option Distribution Option Value spotweld 1 [Main Model] spot weld optistruct 10.0 no system Spot Weld ☐ use pitch linear + ▶ ✓

停用

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spotweld经典界面（焊点的创建） 2/2

经典界面	新界面
switch nodes using geom using nodes using elems switch nodes elems	停用

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HyperBeam经典界面（梁截面的生成） 1/2

经典界面	新界面
shell section shell section solid section standard section generic section edit section section utils lines Create Node at Centroid Create Node at Shear Center merge tol = 0.010 cross section plane: fit to entities section base node: shear center orientation vector: auto-orient part gen: auto	1D Shell Section Planar entities Lines (2)
solid section shell section solid section standard section generic section edit section section utils lines Create Node at Centroid Create Node at Shear Center merge tol = 0.010 cross section plane: fit to entities section base node: shear center orientation vector: auto-orient first order	1D Solid Section Inf Planar entities Lines (2)
standard section shell section solid section standard section generic section edit section section utils standard section library: HYPER BEAM standard section type: thinwalled box	1D Beam Sections Create Beam Section Name Value Name: beamsection6 ID: 6 Include: [Main Model] Collector: (1) auto1 Config: Standard Section Type: L Parameter Definitions Dimension DIM1: 6.0 Dimension DIM2: 6.0 Thickness DIM3: 0.5 Thickness DIM4: 1.0 Neutral Axis Geometr... Local Properties Neutral Axis Section... Warping Properties Principal Properties Metadata Close

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HyperBeam经典界面（梁截面的生成） 2/2

经典界面	新界面
generic section shell section solid section standard section generic section edit section section utils	1D Beam Sections + Create Beam Section Name Value Name: beamsection1 ID: 1 Include: [Main Model] Collector: (1) autol Config: Generic Neutral Axis Geometr... Area: 0.0 Centroid Local Yc: 0.0 Centroid Local Zc: 0.0 MoI Centroidal Iy: 0.0 MoI Centroidal Iz: 0.0 MoI Centroidal Iyz: 0.0 Radius of Gyration: 0.0 Maximum Coordinate E... 0.0 Maximum Coordinate E... 0.0 Local Properties Neutral Axis Section... Close
edit section shell section solid section standard section generic section edit section section utils beamsect	ModelPartBeam Sections + Search Beam Sections Q NameIDIncludeConfig beamsect beamsect beamsect beamsect 右键 Select DuplicateCtrl + D RenameF2 Rename by ID ReviewQ ReverseR HideH IsolateI ShowA More References Edit in HyperBeam CutCtrl + X CopyCtrl + C
section utils shell section solid section standard section generic section edit section section utils mark referenced/unreferenced	



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line mesh经典界面（1D单元网格的创建）

经典界面

lines

segment is whole line

element size = 10.000

add elems to current component

element config: rod

property =

新界面

1D



Line Mesh

+

Lines (1)

Edit Element Category

Exit

Element Size: 1

Line Mesh

Name	Value
Category:	Beam (1D)
Type:	CBEAM
Orientation Type:	Direction - Basic
Direction:	0, 0, 1
Property:	(4) PBEAM
Pin Release A:	0
Pin Release B:	0
Offset A:	0, 0, 0
Offset B:	0, 0, 0

Close

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linear 1d经典界面（1D单元的创建）

经典界面



新界面

1D



Beams

+

Beam (1D) Elements

Name	Value
Auto Create:	☒
Type:	CEBEAM
Linear 1D:	☒
Elms A:	0 Elements
Elms B:	0 Elements
Density A-B:	1
Orientation Type:	Direction - Basic
Direction:	0, 0, 1
Property:	<Unspecified>
Pin Release A:	0
Pin Release B:	0
Offset Method:	Displacement
Offset A:	0, 0, 0
Offset B:	0, 0, 0

CreateClose

其他类型的单元（Acoustics, Axysymmetrics; Beams; Bonds; Contacts; Electrics; Gaps; Gaskets; Generals; Joints; Links; Masses; Plots; Rods; Seat Belts; Shells; Springs; Surfaces; Thermals）也是勾选linear 1D选项。

vectors经典界面（向量的创建）

经典界面	新界面																																															
create																																																
create update vector creation method: base & magnitude base nodes: nodes vector size % = 25.000 ☒ label vector ☐ autoscale global system magnitude = 1.000 N1 N2 N3	Model V .. Vectors + Base and Magnitude Two Nodes Cross Product Line Tangent Surface Normal																																															
update																																																
create vectors update vector update method: base & magnitude base nodes: nodes vector size % = 25.000 ☒ label vector ☐ autoscale global system magnitude = 1.000 N1 N2 N3	+ 双击要更新的Vector Edit Vectors <table><tr><th>Name</th><th>Value</th></tr><tr><td>ID:</td><td>1</td></tr><tr><td>Include:</td><td>[Main Model]</td></tr><tr><td>Components:</td><td>1, 0, 0</td></tr><tr><td>Magnitude:</td><td>1.0</td></tr><tr><td>Collector:</td><td>(1) auto1</td></tr><tr><td>Start Node:</td><td>(13) Node</td></tr><tr><td>End Node:</td><td><Unspecified></td></tr><tr><td>System:</td><td><Unspecified></td></tr><tr><td colspan="2">Metadata</td></tr></table> Close	Name	Value	ID:	1	Include:	[Main Model]	Components:	1, 0, 0	Magnitude:	1.0	Collector:	(1) auto1	Start Node:	(13) Node	End Node:	<Unspecified>	System:	<Unspecified>	Metadata		Model V .. Vectors 或 Part Model Vectors Search Vectors <table><tr><th>Name</th><th>ID</th><th>Include</th></tr><tr><td>Vectors</td><td>1</td><td>0</td></tr></table> <table><tr><th>Name</th><th>Value</th></tr><tr><td>ID:</td><td>1</td></tr><tr><td>Include:</td><td>[Main Model]</td></tr><tr><td>Components:</td><td>1, 0, 0</td></tr><tr><td>Magnitude:</td><td>1.0</td></tr><tr><td>Collector:</td><td>(1) auto1</td></tr><tr><td>Start Node:</td><td>(13) Node</td></tr><tr><td>End Node:</td><td><Unspecified></td></tr><tr><td>System:</td><td><Unspecified></td></tr><tr><td colspan="2">Metadata</td></tr></table>	Name	ID	Include	Vectors	1	0	Name	Value	ID:	1	Include:	[Main Model]	Components:	1, 0, 0	Magnitude:	1.0	Collector:	(1) auto1	Start Node:	(13) Node	End Node:	<Unspecified>	System:	<Unspecified>	Metadata	
Name	Value																																															
ID:	1																																															
Include:	[Main Model]																																															
Components:	1, 0, 0																																															
Magnitude:	1.0																																															
Collector:	(1) auto1																																															
Start Node:	(13) Node																																															
End Node:	<Unspecified>																																															
System:	<Unspecified>																																															
Metadata																																																
Name	ID	Include																																														
Vectors	1	0																																														
Name	Value																																															
ID:	1																																															
Include:	[Main Model]																																															
Components:	1, 0, 0																																															
Magnitude:	1.0																																															
Collector:	(1) auto1																																															
Start Node:	(13) Node																																															
End Node:	<Unspecified>																																															
System:	<Unspecified>																																															
Metadata																																																

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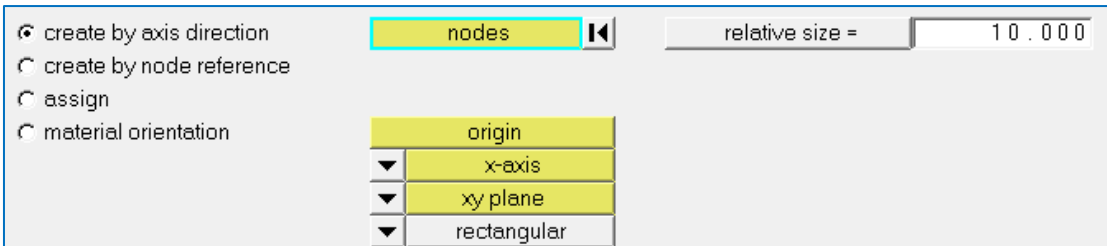
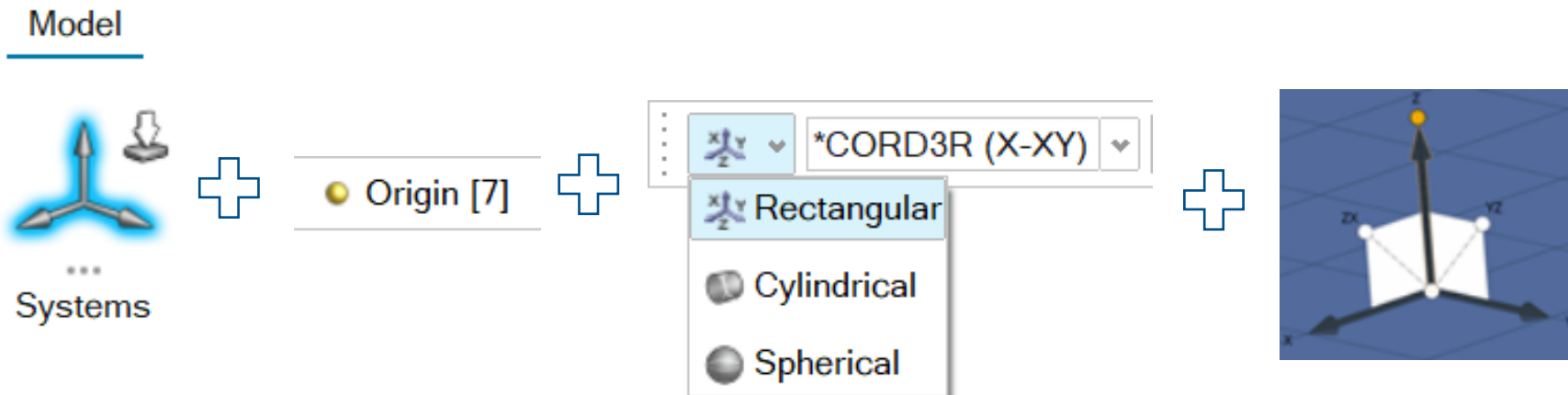
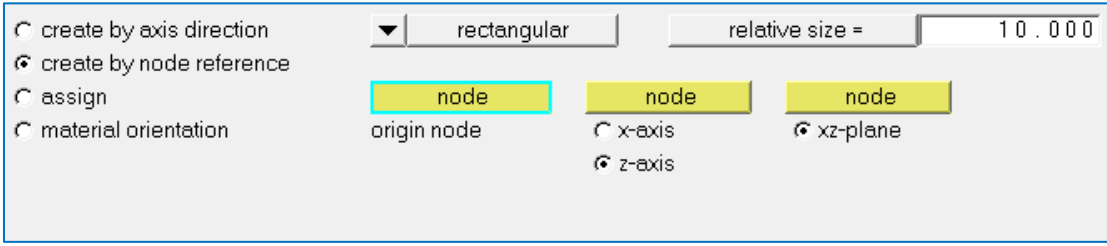
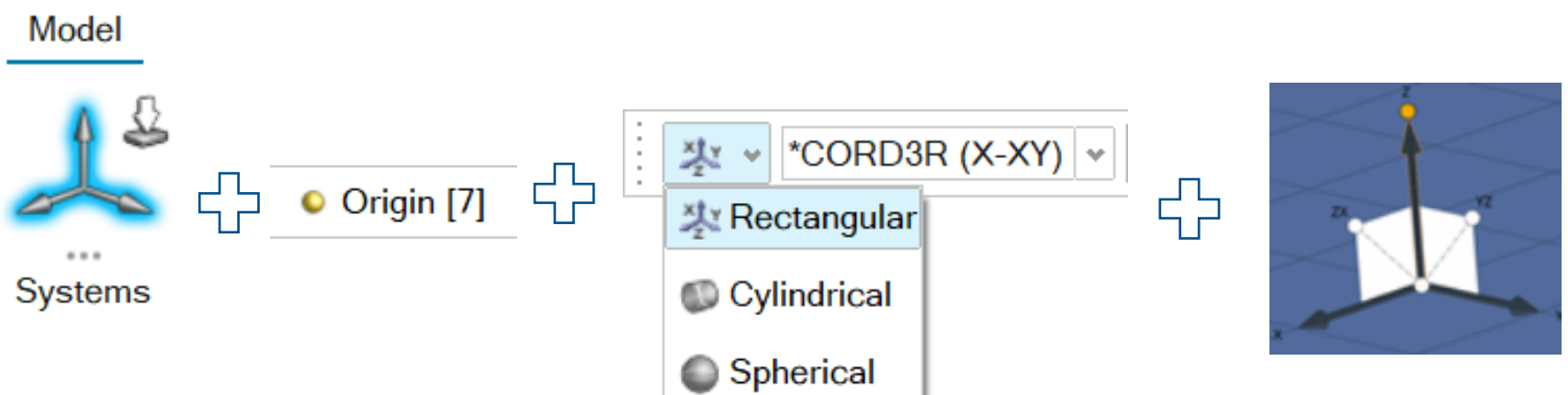
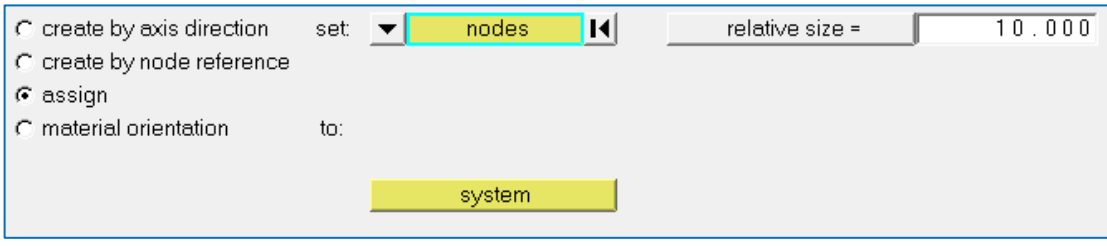
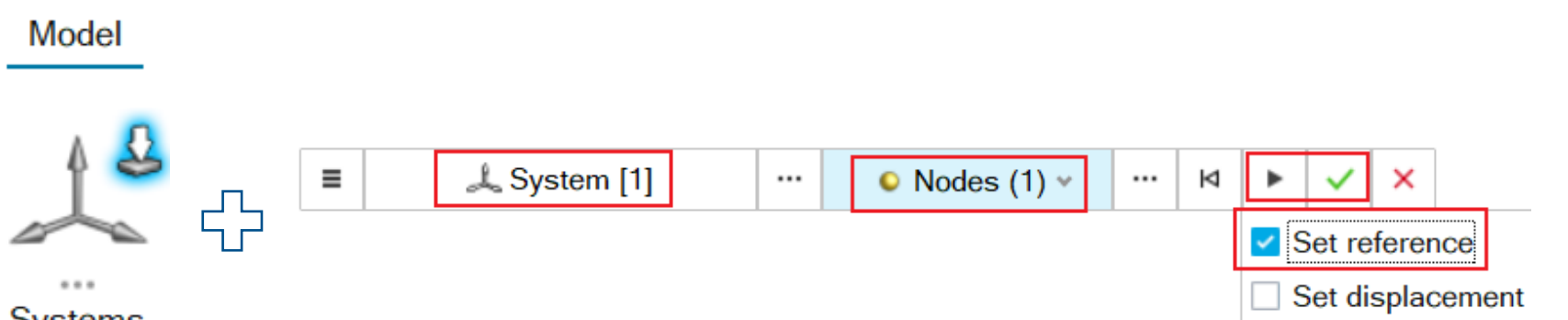
detach

order change

config edit

elem types

systems经典界面（局部坐标系的创建） 1/2

经典界面	新界面
create by axis direction 	Model 
create by node reference 	Model 
assign 	Model 



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systems经典界面（局部坐标系的创建） 2/2

经典界面	新界面
material orientation create by axis direction elems relative size = 10.000 create by node reference assign Material orientational method: by system id join lines material orientation by system id color system	Ctrl +F 搜索：Orientation Material Reference Orientation NormalsReference OrientationReview Entities: Elements X direction method: Vector X vector: Vector Z direction method: Element normal ApplyClearCancel

- 1D页面
- masses
- joints
- markers
- bars
- rods
- rigids
- rbe3
- springs
- gaps
- connectors
- spotweld
- HyperBeam
- line mesh
- linear 1d
- vectors
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- edit element
- split
- replace
- detach
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- config edit
- elem types

edit element经典界面（单元的建立、結合、分割）

经典界面	新界面
create create combine split node list plot tria quad auto order tetra pyramid penta hex elem types = CQUAD4	2D Edit Elements + Create
combine create combine split elems combine to quad tolerance = 1.000 auto comb = 4	2D Edit Elements + Split + Combine Elements (2) Combine
split create combine split displayed elems Splitting line: points Consider 1Ds also	2D Edit Elements + Split

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split经典界面（单元的分割） 1/2

经典界面	新界面
plate elements plate elements elems split all sides Split all connected 1D Use inferred surface if no geometry exists	2D Edit Elements Split Plate Elements (1) Midpoint Split To Quads Split
solid elements plate elements elems split into hexas	2D Edit Elements Split Solid Elements (1) Hexas Split
Hexa/quad elements plate elements solid elements hex/quad elements refine elements propagate to: all elem edges by node pairs: node list split edges layers = 2 exponential growth rate= 1.000 elems to original comp	2D Edit Elements Split Layer Node List (2) Split Elements Split No. of layers 2 0.00 Add Split Select Elements

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split经典界面（单元的分割） 2/2

经典界面	新界面
refine elements plate elements elems solid elements hexa elements refine elements Split all connected 1D refine to target element size target element edge length = 1 0 . 0 0 0	2D Refine Auto Quads Box Manual

新界面

Replace

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detach经典界面（单元的分离）

经典界面	新界面
detach detach elements: elems offset new nodes offset = 0 . 0 0 0 detach all detach from wall	Topology Detach + Elements (27) ... From Nodes ... 0.00
detach from detach elements: elems offset new nodes offset = 0 . 0 0 0 detach all detach from: elems	Topology Detach + Elements (27) ... From Elements (2) ... 0.00
detach from wall surrounding elements: elems offset new nodes offset = 0 . 0 0 0 detach ends wall elements: elems	Topology Detach + Elements (27) ... From Wall (2) ... 0.00

1D页面

masses

joints

markers

bars

rods

rigids

rbe3

springs

gaps

connectors

spotweld

HyperBeam

line mesh

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vectors

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edit element

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replace

detach

order change

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order change经典界面（阶次的变更）

经典界面	新界面
change to 1st change to 1st elems change to 2nd	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To first order Elements (16)
change to 2nd change to 1st elems change to 2nd midside nodes at exact midpoint	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To second order Elements (16)

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config edit经典界面（改变单元的配置）

经典界面

config edit

elems

new config =

新界面

Change config to

1D - Bar2

Elements (61)

...

⏮

⏭

✓

1D - Bar2

1D - Bar3

1D - Gap

1D - Ice

1D - Joint

1D - Mass

1D - Plot

1D - Rbe3

1D - Rigid

1D - Rigidlink

1D - Rod

1D - Spring

1D - Spring3

1D - Spring4

1D - Weld

1D - Xelem

2D - Quad4

2D - Quad8

2D - Tria3

2D - Tria6

3D - Hex8

3D - Hex20

3D - Penta6

3D - Penta15

3D - Pyramid5

3D - Pyramid13

3D - Tetra4

3D - Tetra10

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

+

Y

TOP

X

1D页面

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elem types经典界面（单元类型的变更）

经典界面

1D

1D

2D & 3D

mass = CONM2

plot = PLOTTEL

weld = RBAR

rbe2 = RBE2

rbe3 = RBE3

spring = CELAS1

bars = CBEAM

gap = CGAP (G)

rod = CWELD

ice = RSPLINE

update

review

elems

default colors

return

新界面

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

1D config

Elements (10)

Bars: CBEAM

Gap: CGAP

Ice: RSPLINE

Plot: PLOTTEL

Rbe3: RBE3

Spring: CELAS1

Mass: CONM2

Rbe2: RBE2

Rod: CWELD

Weld: RBAR

2D & 3D

1D

2D & 3D

tria3 = CTRIA3

quad4 = CQUAD4

tetra4 = CTETRA

pyramid5 = CPYRA

penta6 = CPENTA

hex8 = CHEXA

tria6 = CTRIA6

quad8 = CQUAD8

tetra10 = CTETRA

pyramid13 = CPYRA

penta15 = CPENTA

hex20 = CHEXA

update

review

elems

default colors

return

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

2D config

Elements (25)

Quad4: CQUAD4

Quad8: CQUAD8

Tria3: CTRIA3

Tria6: CTRIA6

3D config

Elements (279)

Hex8: CHEXA

Hex20: CHEXA

Penta6: CPENTA

Penta15: CPENTA

Pyramid5: CPYRA

Pyramid13: CPYRA

Tetra4: CTETRA

Tetra10: CTETRA

2 D页面

壳单元的创建

planes	ruled	connectors	automesh	edit element	Geom 1D 2D 3D Analysis Tool Post
cones	spline	HyperLaminate	shrink wrap	split	
spheres	skin	composites	smooth	replace	
torus	drag		qualityindex	detach	
	spin		elem cleanup	order change	
	line drag		mesh edit	config edit	
	elem offset			elem types	

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planes经典界面（创建平面/曲面网格）

经典界面	新界面
trimmed trimmed lines mesh, keep surf square calculate plane keep line endpoints	2D Surfaces Patch/Spline 鼠标图标 Patch Find ← → ⏮ ▶ ✓ 选择line Mesh
square trimmed N1N2N3B mesh, keep surf square size = 0.000	Topology 鼠标图标 鼠标图标 鼠标图标 鼠标图标 2D General 2D Mesh

新界面

 停用

2D页面

planes

cones

spheres

torus

ruled

spline

skin

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shrink wrap

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detach

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config edit

elem types

spheres经典界面（创建球面）

经典界面	新界面
full sphere full sphere center mesh, keep surf four points radius = 0.000 user controlled	3D Solids + Sphere + R 3 + Enter
four points full sphere node list mesh, keep surf four points user controlled	3D Solids + Sphere + Four Nodes Free Drawing Fit to Four Nodes Nodes create bounding surfa + 
user controlled full sphere center mesh, keep surf four points r user controlled angle angle type: theta radius = 0.000 theta start = 0.000 theta end = 360.000 phi start = -90.000 phi end = 90.000	i 停用



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torus经典界面（创建圆环）

经典界面	新界面
full torus ☒ full torus ☐ user controlled ☐ three points center normal vector ▼ mesh, keep surf minor radius = 0.000 major radius = 0.000	i 停用
user controlled ☐ full torus ☒ user controlled ☐ three points center normal vector major vector ▼ mesh, keep surf minor radius = 0.000 major radius = 0.000 minor start = -180.000 minor end = 180.000 major start = 0.000 major end = 360.000	i 停用
three points ☐ full torus ☐ user controlled ☒ three points major center minor center minor radius ▼ mesh, keep surf	i 停用



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ruled经典界面（创建壳的网格/面）

经典界面	新界面
ruled line list line list surface only auto reverse	Topology Ruled Lines (2) Guides Select guides Preview Create Create ring surfs Mesh

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spline经典界面（创建壳的网格/面）

经典界面	新界面
spline lines mesh, keep surf keep tangency keep line endpoints for planar splines	2D Surfaces Patch/Spline Spline Find Lines Mesh

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drag经典界面（通过拉伸创建网格/曲面）

经典界面	新界面
drag geom drag geom node list distance = -1.000 mesh, keep surf y-axis	Topology Extrude/Revolve Node List (20) Guides 20 Mesh Enter i 拖动的方向可以在 中更改
drag elems drag geom elems 2d elem: 3d elem faces by nodes: nodes y-axis elems to current cor distance = -1.000 on drag = 2 bias style: linear bias intensity = 0.000	3D Hex Source (90) Guide Target Equivalence 1.00 T 8.00 i 拖动的方向可以在 中更改

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spin经典界面（通过旋转创建网格/曲面）

经典界面	新界面
spin geoms spin geoms node list angle = 0.000 spin elems mesh, keep surf N1N2N3B	Topology Extrude/Revolve + Node List (4) Axis 30.00 Mesh
spin elems spin geoms 2d elems: elems 3d elem faces by nodes: nodes N1N2N3B elems to current cor angle = 0.000 on spin = 0 bias style: linear bias intensity = 0.000	Topology Extrude/Revolve + Elements (19) Axis 30.00 1

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line drag经典界面（沿线拉伸网格/表面）

经典界面	新界面
drag geoms drag geom drag: node list use default vector drag elems along: line list mesh, w/o surf	Topology Extrude/Revolve + Node List (5) Guides 20 Mesh + Enter +
drag elems drag geom drag: elems use default vector drag elems along: line list on drag = 0 bias style: linear bias intensity = 0.000	3D Hex + Source (64) + Guides (1) Add + 10 Density value Element size +

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elem offset经典界面（通过偏移创建和修改单元） 1/2

经典界面	新界面
solid layers solid layers elems to offse elems shell layers elems shell offset along geom t thicken shells surfs thin solids Use Set distr thick number of layers = 1 initial offset = 0.000 total thickness = 1.000 linear or no biasing bias intensity = 0.000 elements to current co CFD corners	Topology Offset Options Layer type: Solid layers Elements (48) Layers 2 6.00 Enter
shell layers solid layers elems to offse elems shell layers elems shell offset along geom t thicken shells surfs thin solids Use Set distr thick number of layers = 1 initial offset = 0.000 total thickness = 1.000 linear or no biasing bias intensity = 0.000 elements to current co CFD corners	Topology Offset Options Layer type: Shell layers Elements (48) Layers 2 6.00 Enter
shell offset solid layers elems to offse elems shell layers elems shell offset along geom t distance = 1.000 thicken shells surfs thin solids Use Set distr thick CFD corners	Topology Offset Options Layer type: Shell offset Elements (48) 8.00 Enter

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elem offset经典界面（通过偏移创建和修改单元） 2/2

经典界面	新界面
thicken shells solid layers elems to offse elems shells are on the midsu shell layers along geom t thickness = 1.000 thicken shells surfs thin solids Use Set distr thick elements to current col CFD corners	Topology Offset Options Layer type: Thicken shell Elements (48) 8.00 Enter
thin solids solid layers thin solid m solids number of layers = 1 shell layers element size= 0.000 shell offset element type = mixed thicken shells linear or no biasing thin solids bias intensity = 0.000 elements to current col auto detect	3D Thin Solids Find Thin Solid (1) Source (1) Target (1) Mesh Options Source mesh type: Batchmesh Source mesh method: Element size Element size: 10.000000 Source element type: Mixed Number of layers: 1 Biasing method: Linear Biasing intensity: 0 Element organisation: Original component Advanced ect source and target 10.00 Mesh

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connectors 经典界面（连接元的创建）

经典界面

organize	spot	add links	compare	connector options
find	bolt	unrealize	quality	
mask	seam	mesh edit		
delete	area			
translate	apply mass			
numbers	fe absorb			
renumber				

新界面



Connectors



Controls



Point



Fastener



Line



Area



Attachment



Connect

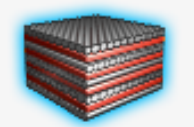
Create ▾

Attachments

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HyperLaminate经典界面（复合材料的生成和编辑）

经典界面	HyperLaminate File Edit Tools View Help Laminate browser Material MAT1 MAT2 MAT8 Laminates PCOMP PCOMPG HLS loadcases In-plane loads In-plane strains Design Variable DESVAR Define/Edit material Material: Color: E: G: NU: RHO: A: TREF: ST: SC: SS:
新界面	Model  Composites + Composite 推荐使用基于模型浏览器的层状模型

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composites经典界面（对复合壳单元的方向指定）

经典界面	新界面
element normals element norma displayed 2D elems color display display material orientation adjust ply directions display adjusted only reverse orientation: auto use feature angle return	ModelCompositePart Search NameIDProductIndexOrientationThicknessMaterialS Create Orient Absorb Show All Expand All Collapse All Element Normals Material Reference Orientation Material Reference Review Ply Normals Ply Orientation Review + Material Reference Orientation NormalsReference OrientationReview Elements Operation:Display Display:Vector Vector scaling:Auto Vector size:1 ApplyClearCancel
material orientation element norma comps size =0.000 assign material orientation reset ply directions join lines Material orientation method: by system id system colo review return	ModelCompositePart Search NameIDProductIndexOrientationThicknessMaterialS Create Orient Absorb Show All Expand All Collapse All Element Normals Material Reference Orientation Material Reference Review Ply Normals Ply Orientation Review + Material Reference Orientation NormalsReference OrientationReview Entities X direction method:Vector X vector:Vector Z direction method:Element normal ApplyClearCancel
ply directions element normals size =0.000 review material orientation reset ply directions join lines ply based model ply = colo return	ModelCompositePart Search NameIDProductIndexOrientationThicknessMaterialS Create Orient Absorb Show All Expand All Collapse All Element Normals Material Reference Orientation Material Reference Review Ply Normals Ply Orientation Review + Orientation Review Elemental systemNodal systemOrientationMaterial systemPly directionsPly normals Select ply ply Options Fiber orientation Drape fiber orientation System Display options Visibility:☒ X☒ Y☐ Z Color Fiber orientation: Drape fiber orient: System: Scaling options AutoSize:1 ApplyDefaultClearClear AllClose

Ctrl+F搜索：Material Reference Orientation

Ctrl+F搜索：Material Reference Orientation

Ctrl+F搜索：Orientation Review

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midmesh经典界面（创建中面网格）

经典界面	新界面
create create edit edge edit face rebuild mesh... thickness map... comparison... elems elem size: 2.000 destination com midmesh.# ☒ ignore flat edges ☐ flatten connections ☒ suppress proximity edges facto 0.50 * element size ☒ combine non-manifold edges fa 0.50 * element size ☒ defeature openings with width < 1.00	2D Midmesh + Automatic
edit edge create edit edge edit face rebuild mesh... thickness map... comparison... create mid edge: node node ☒ guides lines lines split by two nodes: node node split by node-edge: shortest path node edge delete edge T-edge align: edge surfs by geom edge align node path line path replace node... edit element... edges... delete... align nodes... project...	推荐新界面的工作流程 2D Midmesh + Automatic Repair/ Fill Create Midedge Topology Edit Align Inspect
edit face create edit edge edit face rebuild mesh... thickness map... comparison... fill face: select loop ☒ delete 1D repair face: elems detect intersections: elems align face: elems surfs ☐ offset ☐ lock boundary nodes replace node... edit element... delete... project...	推荐新界面的工作流程 2D Midmesh + Automatic Repair/ Fill Create Midedge Topology Edit Align Inspect

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automesh经典界面（自动创建/重划分壳单元） 1/2

经典界面	新界面
size and bias surfs size and bias batchmesh/QI optimize edge deviation surface deviation rigid body mesh interactive element size = 10.000 mesh type: mixed elems to surf comp first order keep connectivity flow: align map: size skew link opposite edges with auto	2D General 2D Mesh + Create Density Biasing Face Edit
batchmesh/QI optimize surfs batchmesh size and bias batchmesh/QI optimize edge deviation surface deviation rigid body mesh element size: parameters file: browse criteria file: browse keep connectivity preserve edges...	2D BatchMesher Midmesh BatchMesher CFD 2D Mesh General 2D Mesh Panel Mesh Rigid Body Mesh + Surfaces Mesh Options Element size: 10.000000 Edit parameters Edit criteria
edge deviation surfs size and bias batchmesh/QI optimize edge deviation surface deviation rigid body mesh interactive min elem size = 0.500 max elem size = 10.000 max deviation = 0.100 max angle = 15.000 mesh type: mixed elems to surf comp first order keep connectivity flow: align map: size skew link opposite edges with auto	2D General 2D Mesh + Create + Options Element size: 0.2 Mesh type: Auto-decide Element type: Mixed Element order: First Treatment to connected mesh: Keep Active mesh mode: Interactive Element organization: Surface component Adaptive mesh Curvature based refinement: Method: Edge deviation Minimum size factor: 0.100000 Maximum deviation factor: 0.100000 Max angle: 25.000000

请从图标的右边▼切换

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automesh经典界面（自动创建/重划分壳单元） 2/2

经典界面	新界面
surface deviation ▼surfs size and bias batchmesh/QI optimize edge deviation surface deviation rigid body mesh element size = 10.000 growth rate = 1.230 min elem size = 0.500 max deviation = 0.100 max feature ang = 15.000 mesh type: mixed elems to surf comp first order keep connectivity closed volume proximity free edge deviation refine... show refined	2D General 2D Mesh + Create + Options Element size: 10.000000 Mesh type: Auto-decide Element type: Mixed Element order: First Treatment to connected mesh: Keep Active mesh mode: Automatic Element organization: Surface component Adaptive mesh Curvature based refinement: Method: Surface deviation Minimum size factor: 0.100000 Maximum deviation factor: 0.100000 Span angle: 25.000000 Growth rate: 1.230000 Closed volume proximity Free edge deviation Advanced
rigid body mesh ▼surfs size and bias batchmesh/QI optimize edge deviation surface deviation rigid body mesh min elem size = 0.500 max elem size = 10.000 max deviation = 0.100 max feature ang = 15.000 mesh type: mixed elems to surf comp first order	2D Rigid Body Mesh + Options Element size: 10.000000 Element order: First Element type: Mixed Element organization: Surface component Minimum size factor: 0.100000 Maximum deviation factor: 0.100000 Feature angle: 15.000000 i 请从图标的右边▼切换

rigid body mesh

▼surfs

size and bias

batchmesh/QI optimize

edge deviation

surface deviation

rigid body mesh

min elem size = 0.500

max elem size = 10.000

max deviation = 0.100

max feature ang = 15.000

mesh type: mixed

elems to surf comp

first order

2D页面

- planes
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- spin
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- config edit
- elem types

shrink wrap经典界面（包络网格的生成）

经典界面

comps

features

tight wrap

patch holes

element size =

10.000

☐ generate solid mesh

mesh orientation

global system

2D

Surface Mesh

Adaptive Wrap

EM Lattice

Facets from Nodes

Shrink Wrap

Shrink Wrap

Name	Value
Entities:	Components
Element size:	10.0
Method:	Tight wrap
Mesh orientation:	Global
Feature edges:	☐
Patch hole:	☐
Generate solid mesh:	☐

Mesh

Close

2D网格 从右边的▼中切换

2D页面

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smooth经典界面（网格的平滑）

经典界面

plates

plates

smooth:

elems

iterations = 1

solids

anchor:

nodes

autodecide

solids

plates

elems

iterations = 1

solids

新界面

2D

Edit Elements

+

Smooth

+

Elements (6)

Smooth

Auto

Fix Size

Fix Shape

Fix Angle

Q.I. Warn

Q.I. Good

Q.I. Ideal

3D

Edit

Solid Mesh Optimization

Mesh Boolean

Split

Unsplit

Stitch

Suppress

Align/Project

Solid Mesh Optimization

Input selection: Elements

Tetras	Heaps	Second order elements
Check item	On	
Aspect ratio	1.00	5.000
Tetra collapse	1.00	0.100
Volume skew	1.00	0.950
Skew	1.00	60.000
Volume aspect ratio	1.00	5.000
Minimum size	2.00	0.200
Maximum size	1.00	30.000

Triangles: # Fix all Edge swap Remesh

Constraints: Fixed tetras: Elements Feature line: Elements Anchor nodes: Nodes Refinement box: Components

Fix shell component boundaries

Maximum iteration: 0

Feature angle: 95.0

On geometry: Maximum node movement/element size: 0.1

Away from geometry: Maximum node movement/element size: 0.01

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qualityindex经典界面（检查和修改亮网的单元质量）

经典界面

qualityindex

page 1

fail

% fail

worst

fail value

threshold

Element patchi

start

☒ min size

0

0.00

2.0

2 . 0 0 0

☒ max size

0

0.00

20.0

2 0 . 0 0 0

☒ aspect ratio

0

0.00

5.0

5 . 0 0 0

☒ warpage

0

0.00

15.0

1 5 . 0 0 0

☒ skew

0

0.00

40.0

4 0 . 0 0 0

☒ jacobian

0

0.00

0.60

0 . 6 0 0

comp. QI =

failed =

% failed =

display thresholds:

ideal

good

warn

fail

worse

page 2

fail

% fail

worst

fail value

threshold

Element patchi

start

☒ max angle quad

0

0.00

140.0

1 4 0 . 0 0 0

☒ min angle quad

0

0.00

40.0

4 0 . 0 0 0

☒ max angle tria

0

0.00

120.0

1 2 0 . 0 0 0

☒ min angle tria

0

0.00

30.0

3 0 . 0 0 0

☐ chordal dev.

☒ taper

0

0.00

0.60

0 . 6 0 0

comp. QI =

failed =

% failed =

display thresholds:

ideal

good

warn

fail

worse

page 3

fail

% fail

worst

fail value

threshold

Element patchi

start

☒ # of trias

0

0.00

15.0

comp. QI =

failed =

% failed =

display thresholds:

ideal

good

warn

fail

worse

page 4

edit criteria...

color legend:

ideal

good

warn

fail

worst

☒ display summary legend

☐ allow to move fixed and shared nodes

☐ set max failed elements to save

summary file:

s u m m a r y

browse...

summary

place node

smooth

along surface

Element p

start

next

prev

+

-

modify hole &

split/collapse

☐ allow movement out of

comp. QI = 0.00

QI settings

swap edge

drag tria elem

☒ move midnodes

failed = 0

qi undo

qi redo

node optimize

split quad elem

display thresh

% failed = 0.0

save failed

element optimi

combine tria el

ideal

good

warr

fail

worse

abort

return

新界面

2D

Edit Elements

+

Smooth

Move

Split

Replace

Density

Create

Origin

Associate

2D

Auto Quality I

+

Elements (69)

...

anchors

...

Review

Auto Quality

Options

↻

Edit parameters

Edit criteria

☒ Consider affected elements only

☒ Use adjacent element layers

Number of layers: 2

Remeshing

单元自动修正

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elem cleanup经典界面（壳网格的清理）

经典界面	新界面
elem cleanup elems feature edges anchor nodes ☒ consider only affected elems ☒ use adjacent elem layers ☒ keep connectivity with 1D/3D by remesh : ☐ elems failing QI check ☐ reduce tria elems edit criteria... edit parameters...	2D Auto Quality I Elements (69) Options edit parameters edit criteria ☒ Consider affected elements only ☒ Use adjacent element layers Number of layers: 2 Remeshing Review Auto Quality

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mesh edit经典界面（网格的延长和压印）

经典界面	新界面
imprint imprint source:comps extend destination:comps remesh:layers 2 remain:both max distance elems to destination com create patch between im feature angle:30.000 settings:auto detect projection:normal to destination anchor node:nodes 2D Imprint + Target (1) ... Source (1) ... Anchors ... Imprint	2D Imprint + Target ... Source ... Anchors ... Imprint Select elements to imprint. Elements Nodes Node List Select Elements Use anchors

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split经典界面（单元的分割） 1/2

经典界面	新界面
plate elements plate elements elems ▼ split all sides solid elements hexa elements refine elements Split all connected 1D Use inferred surface if no geometry exists	2D Edit Elements + Split + Plate Elements (1) Midpoint Split To Quads Split
solid elements plate elements elems ▼ split into hexas solid elements hexa elements refine elements	2D Edit Elements + Split + Solid Elements (1) Hexas Split
Hexa/quad elements plate elements solid elements hex/quad elements refine elements propagate to: all elem edges by node pairs: node list split edges layers = 2 exponential growth rate = 1.000 elems to original comp	2D Edit Elements + Split + Layer Node List (2) Split Elements Split No. of layers 2 0.00 Add Split Select Elements

2D页面

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split经典界面（单元的分割） 2/2

经典界面	新界面
refine elements plate elements solid elements hexa elements refine elements elems Split all connected 1D refine to target element size target element edge length = 10.000	2D Refine Auto Quads Box Manual

2D页面

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detach经典界面（单元的分离）

经典界面	新界面
detach detach detach from detach from wall detach elements: elems offset new nodes offset =0.000 detach all	Topology Detach + Elements (27) ... From Nodes ... ▶ ✓ 0.00 ▶
detach from detach detach from detach from wall detach elements: elems offset new nodes offset =0.000 detach all detach from: elems	Topology Detach + Elements (27) ... From Elements (2) ... ▶ ✓ 0.00 ▶
detach from wall detach detach from detach from wall surrounding elements: elems offset new nodes offset =0.000 detach ends wall elements: elems	Topology Detach + Elements (27) ... From Wall (2) ... ▶ ✓ 0.00 ▶

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- config edit
- elem types

order change经典界面（阶次的变更）

经典界面	新界面
change to 1st change to 1st elems change to 2nd	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To first order Elements (16)
change to 2nd change to 1st elems change to 2nd midside nodes at exact midpoint	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To second order Elements (16)



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- elem types

config edit经典界面（单元配置的变更）

经典界面

config edit

elems

new config =

新界面

Change config to

1D - Bar2

Elements (61)

...

⏮

⏭

✓

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

+

Y

TOP

X

1D - Bar2

1D - Bar3

1D - Gap

1D - Ice

1D - Joint

1D - Mass

1D - Plot

1D - Rbe3

1D - Rigid

1D - Rigidlink

1D - Rod

1D - Spring

1D - Spring3

1D - Spring4

1D - Weld

1D - Xelem

2D - Quad4

2D - Quad8

2D - Tria3

2D - Tria6

3D - Hex8

3D - Hex20

3D - Penta6

3D - Penta15

3D - Pyramid5

3D - Pyramid13

3D - Tetra4

3D - Tetra10

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elem types经典界面（单元类型的变更）

经典界面

1D

1D

mass =

CONM2

2D & 3D

plot =

PLOTEL

weld =

RBAR

rbe2 =

RBE2

rbe3 =

RBE3

spring =

CELAS1

bars =

CBEAM

gap =

CGAP (G)

rod =

CWELD

ice =

RSPLINE

update

review

elems

default colors

return

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

1D config

Elements (10)

...

⏮

⏭

✓

Bars: CBEAM

Gap: CGAP

Ice: RSPLINE

Plot: PLOTEL

Rbe3: RBE3

Spring: CELAS1

Mass: CONM2

Rbe2: RBE2

Rod: CWELD

Weld: RBAR

2D & 3D

1D

tria3 =

CTRIA3

2D & 3D

quad4 =

CQUAD4

tetra4 =

CTETRA

pyramid5 =

CPYRA

penta6 =

CPENTA

hex8 =

CHEXA

tria6 =

CTRIA6

quad8 =

CQUAD8

tetra10 =

CTETRA

pyramid13 =

CPYRA

penta15 =

CPENTA

hex20 =

CHEXA

update

review

elems

default colors

return

Topology

Edit

CAD Update

Geometry Match Topology

Geometry Interference Check

Find Symmetry

Change Element Config

Change Element Type

Change Element Order

CAD/FE Comparison

2D config

Elements (25)

...

⏮

⏭

✓

Quad4: CQUAD4

Quad8: CQUAD8

Tria3: CTRIA3

Tria6: CTRIA6

3D config

Elements (279)

...

⏮

⏭

✓

Hex8: CHEXA

Hex20: CHEXA

Penta6: CPENTA

Penta15: CPENTA

Pyramid5: CPYRA

Pyramid13: CPYRA

Tetra4: CTETRA

Tetra10: CTETRA

3D页面

创建实体单元

solid map	drag	connectors	tetramesh	edit element	Geom
linear solid	spin		smooth	split	1D
solid mesh	line drag		CFD tetramesh	replace	2D
	elem offset			detach	3D
				order change	Analysis
				config edit	Tool
				elem types	Post

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

solid map经典界面（创建实体单元） 1/2

经典界面	新界面
general general line drag linear solid ends only one volume multi solids source geom: surf elems dest geom: surf (none) along geom: surfs (none) along parameters: elem size= 10.000 along bias style: linear intensity= 0.000 smooth des apply orthogonality to along	3D Hex Source Guide Target Equivalence
line drag general line drag linear solid ends only one volume multi solids along geom: lines (none) along parameters: elem size= 10.000 along bias style: linear intensity= 0.000 smooth des	3D Hex Source (1) Guide [1L] Target Equivalence
linear solid general line drag linear solid ends only one volume multi solids along geom: (none) along parameters: elem size= 10.000 along bias style: linear intensity= 0.000 apply orthogonality to along	Topology Offset Elements (16) Layers 2 10.00

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

solid map经典界面（创建实体单元） 2/2

经典界面	新界面
ends only general line drag linear solid ends only one volume multi solids source geom: surf dest geom: surf elems to drag: elems elems to match: (none) along parameters: elem size= 10.000 along bias style: linear intensity= 0.000 smooth des apply orthogonality to along 3D Hex + Source (86) Guide Target (1) Equivalence	one volume general line drag linear solid ends only one volume multi solids volume to mesh solid source hint surfs dest hint surfs elems to solid/surf comp along parameters: elem size= 10.000 along bias style: linear intensity= 0.000 smooth des apply orthogonality to along 3D Map + Find Mappable Solid Source Target Mesh

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

linear solid经典界面（在两个壳单元之间创建实体单元）

经典界面	新界面
from: elems alignment: N1 N2 N3 distribute layers density = 1 to: elems alignment: N1 N2 N3 bias style: linear bias intensity = 0.000	3D Hex + Source (500) Guide Target (500) Equivalence 10 Mesh Density value Element size

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

solid mesh经典界面（在五面体和六面体体积空间中创建网格）

经典界面	新界面
start region: lines end region: lines connecting: lines	
	i 停用



3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

drag经典界面（通过拉伸创建网格/曲面）

经典界面	新界面
drag geom drag geom node list distance = -1.000 mesh, keep surf y-axis drag elems	Topology Extrude/Revolve Surfaces Lines Nodes Surfaces Guides mouse icon
drag elems drag geom 2d elem: elems distance = -1.000 3d elem faces by nodes: on drag = 2 nodes bias style: linear bias intensity = 0.000 y-axis elems to current cor drag elems	3D Hex Source Surfaces Elements Facets Guide Guides Lines Nodes Elements Surfaces Facets Add mouse icon

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

spin经典界面（通过旋转创建网格/曲面）

经典界面	新界面
spin geoms spin geoms node list angle = 0.000 spin elems mesh, keep surf N1 N2 N3 B	Topology Extrude/Revolve + Surfaces Axis ▶ ▶ ✓ ✗
spin elems spin geoms 2d elems: angle = 0.000 spin elems elems 3d elem faces by nodes: on spin = 0 nodes bias style: linear bias intensity = 0.000 N1 N2 N3 B elems to current cor	Topology Extrude/Revolve + Elements (44) Axis ▶ ▶ ✓ ✗ z 270.0 ... 1



3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

line drag经典界面（沿线拉伸网格/曲面）

经典界面	新界面
drag geoms drag geom drag: node list use default vector drag elems along: line list mesh, w/o surf	Topology Extrude/Revolve + Surfaces Lines Nodes Surfaces Guides + 
drag elems drag geom drag: elems use default vector drag elems along: line list on drag = 0 bias style: linear bias intensity = 0.000	3D Hex + Source Surfaces Elements Facets Guide + Guides Lines Nodes Elements Surfaces Facets Add + 

3D页面

- solid map
- linear solid
- solid mesh
- drag
- spin
- line drag
- elem offset
- connectors
- tetramesh
- smooth
- CFD tetramesh
- edit element
- split
- replace
- detach
- order change
- config edit
- elem types

elem offset经典界面（通过偏移创建和修改单元） 2/2

经典界面	新界面
thicken shells solid layers elems to offse elems shells are on the midsu shell layers along geom t thickness = 1.000 thicken shells surfs thin solids Use elements to current col CFD corners Set distr thick	Topology Offset Options Layer type:Thicken shell Elements (48) 8.00 Enter
thin solids solid layers thin solid m solids number of layers = 1 shell layers element size= 0.000 shell offset element type = mixed thicken shells linear or no biasing thin solids bias intensity = 0.000 elements to current col auto detect	3D Thin Solids FindThin Solid (1)Source (1)Target (1)Mesh Options Source mesh type:Batchmesh Edit parameters Edit criteria Source mesh method:Element size Element size:10.000000 Source element type:Mixed Number of layers:1 Biasing method:Linear Biasing intensity:0 Element organisation:Original component Advanced ect source and target 10.00 Mesh

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

connectors 经典界面（创建连接元）

经典界面

organize	spot	add links	compare	connector options
find	bolt	unrealize	quality	
mask	seam	mesh edit		
delete	area			
translate	apply mass			
numbers	fe absorb			
renumber				

新界面


Connectors


Controls


Point


Fastener


Line


Area


Attachment


Connect

Create ▾

Attachments

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

tetramesh 经典界面（创建四面体网格） 1/2

经典界面	新界面
Tetra mesh Tetra mesh Tetra remesh Volume tetra Tetramesh parameters Refinement box Fixed trias/quads to tetra mesh ▼comps Simple Pyramid Float trias/quads to tetra mesh ▼comps remesh ☒ fix comp boundaries ☒ update input shells mesh to current comp Anchor nodes: nodes	3D Tet + Create + Components (1) ... 10.00 ► Mesh

3D页面

- solid map
- linear solid
- solid mesh
- drag
- spin
- line drag
- elem offset
- connectors
- tetramesh
- smooth
- CFD tetramesh
- edit element
- split
- replace
- detach
- order change
- config edit
- elem types

tetramesh 经典界面（创建四面体网格） 2/2

经典界面

Tetramesh parameters

Tetra mesh

Tetra remesh

Volume tetra

Tetramesh parameters

Refinement box

Max tetra size:0.000

Optimize Mesh Quality

Standard

Min tetra size:0.000

Number of layers2

fill voids

fix midnode

sm

Pyramid transition ratio:0.800

Elem quality target:none

Refinement bo

comps

新界面

3D

Tet

+

Create

或

Topology

Mesh Controls

+

MeshControls

Mesh Control (2)

BatchMesher (0)

Surface Mesh (0)

Edge Layers

Adaptive Wrap (0)

Volume Mesh (0)

Model

Refinement

Region (0)

Create

Mesh

Reject

References

Name

ID

Config

Enabled

Entity Sele

Entities

Core Mesher

Core Mesh

Tetra Mesh

Line node seeding

Fixed

Element Size Limits

None

Quality

Normal

Tetra Mesh Method

Delau

Growth Rate

1.3

Tetramesh heigh..

1.0

Use Number of Layers

Advanced

Tetra Quality

Volume Setup

Anchor Node

Refinement box

Tetra mesh

Tetra remesh

Volume tetra

Tetramesh parameters

Refinement box

Define r

By Center & Sizes

center

sx:0.000

sy:0.000

sz:0.000

Refinement size:0.000

freehand edit

3D

Tet

+

Remesh

+

Elements

框选

或

Topology

Mesh Controls

+

MeshControls

Mesh Control (1)

BatchMesher (0)

Surface Mesh (0)

Edge Layers

Adaptive Wrap (0)

Volume Mesh (0)

Refinement Zone (1)

meshcontrol1

Refinement Zone 1

Region (0)

右键create

Name

Value

meshcontrol1

1

Refinement Zone

Enabled for Volume Mesh

Enabled for Surface M...

Enabled for Wrapping ...

Refinement

Element Size

10.0

Shape

Box

Define Refinemen...

By Center and Size

Center

0, 0, 0

X Size

0.0

Y Size

0.0

Z Size

0.0

Metadata



3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

smooth 经典界面（网格的平滑）

经典界面

plates

plates

smooth: elems

iterations = 1

solids

anchor: nodes

autodecide

solids

plates

elems

iterations = 1

solids

新界面

2D

Edit Elements

+

Smooth

+

Elements (6)

Auto

Smooth

Auto

Fix Size

Fix Shape

Fix Angle

Q.I. Warn

Q.I. Good

Q.I. Ideal

3D

Edit

Solid Mesh Optimization

Mesh Boolean

Split

Unsplit

Stitch

Suppress

Align/Project

+

Solid Mesh Optimization

Input selection: Elements

Tetras	Heaps	Second order elements
Check item	On	
Aspect ratio	1.00	5.000
Tetra collapse	1.00	0.100
Volume skew	1.00	0.950
Skew	1.00	60.000
Volume aspect ratio	1.00	5.000
Minimum size	2.00	0.200
Maximum size	1.00	30.000

Triangles:

Fix all

Edge swap

Remesh

Constraints:

Fixed tetras

Feature lines

Anchor nodes

Refinement box

Fix shell component boundaries

Maintain geometry edges

Save to current component

Update input shells

Optimize tetras by force

Maximum iteration: 0

Feature angle: 35.0

On geometry: 0.1

Away from geometry: 0.01



3D页面

- solid map
- linear solid
- solid mesh
- drag
- spin
- line drag
- elem offset
- connectors
- tetramesh
- smooth
- CFD tetramesh
- edit element
- split
- replace
- detach
- order change
- config edit
- elem types

CFD tetramesh 经典界面（为CFD创建带有边界层的网格） 1/2

经典界面

Boundary selection

Boundary selection

With BL (fixed):

With BL (float):

All are fluid volu

BL parameters

comps

comps

remesh

Tetramesh parameters

W/o BL (float):

W/o BL (fixed):

Anchor nodes:

2D parameters

comps

comps

nodes

Refinement box

Advanced select

fix comp borders

comp per volum

Smooth/Truncate BL

update input shells

BL parameters

Boundary selection

User controlled

BL only

BL parameters

First group

Second group

Tetramesh parameters

First layer thickness:

0 . 0 1 0

Max Num of laye

2

2D parameters

BL growth rate:

1 . 2 0 0

BL growth rate:

1 . 5 0 0

Refinement box

Number of layers:

3

Final layer h/bas

1 . 0 0 0

Smooth/Truncate BL

1st cell height calc

Advanced settings

Tetramesh parameters

Boundary selection

Max tetra size:

0 . 0 0 0

Min tetra size:

0 . 0 0 0

BL parameters

Optimize Mesh Quality

Number of layers

2

Tetramesh parameters

Standard

fill voids

smoothing

2D parameters

Pyramid transition ratio:

0 . 8 0 0

Elem quality target:

none

Refinement box

Export set

Refinement bo

comps

Smooth/Truncate BL

新界面

Model

MeshControls

Search

Name

Config

ID

Enabled

Mesh Control (2)

BatchMesher (0)

Surface Mesh (0)

Edge Layers

Adaptive Wrap (0)

Volume Mesh (2)

Model (1)

meshcontrol1

BL + Tetra

1

Local (1)

meshcontrol2

Local Tetra

2

Refinement Zone (0)

Name

Value

Name:

meshcontrol1

ID:

1

Config:

Volume - BL + Tetra

Enabled:

Entity Selection

Entities:

0 Components

Boundary Layer

Line node seeding:

Fixed

BL Definition:

Method:

Simple

First Layer Thickness:

0.01

Growth Rate:

1.2

Final Layer Height / ...

0.8

Number of Layers:

3

Hexa Transition Mode:

Simple Pyramid

Boundary Layer Only:

Core Mesher

Tetra Mesh

Element Size Limits:

None

Quality:

Normal

Tetra Mesh Method:

Delaunay

Topology

Mesh Controls

3D页面

solid map

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drag

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smooth

CFD tetramesh

edit element

split

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order change

config edit

elem types

CFD tetramesh 经典界面（为CFD创建带有边界层的网格） 2/2

经典界面

2D parameters

Boundary selection

BL parameters

Tetramesh parameters

2D parameters

Refinement box

Select 2D element type:

▼

trias

Use curvature

Use proximity

Cleanup elements

Element size: 0.000

Export set

Refinement box

Boundary selection

BL parameters

Tetramesh parameters

2D parameters

Refinement box

Define r

▼

By Center & Sizes

center

sx: 0.000

sy: 0.000

sz: 0.000

Refinement size: 0.000

freehand edit

新界面

2D

CFD 2D Mesh

Midmesh

BatchMesher

CFD 2D Mesh

General 2D Mesh

Panel Mesh

Rigid Body Mesh

+

Surfaces (1)

Mesh

Options

Element size: 2

Element type: Trias

Element order: First

Treatment to connected mesh: Keep

Element organization: Surface component

Adaptive mesh

Topology

Mesh Controls

+

Model

MeshControls

Search

Name	Config	ID	Enabled
Mesh Control (1)			
BatchMesher (0)			
Surface Mesh (0)			
Edge Layers			
Adaptive Wrap (0)			
Volume Mesh (0)			
Refinement Zone (1)			
meshcontrol1	Refinement Zone 1	1	✓
Region (0)			

Name	Value
Name:	meshcontrol1
ID:	1
Color:	
Config:	Refinement Zone
Enabled for Volume Mesh:	✓
Enabled for Surface Mesh:	✓
Enabled for Wrapping Mesh:	✓
Refinement	
Element Size:	10.0
Shape:	Box
Define Refinement Box:	By Center and Size
Center:	0, 0, 0
X Size:	0.0
Y Size:	0.0
Z Size:	0.0

Metadata

edit element经典界面（单元的生成、結合、分割）

经典界面

create

☒ create node list 

☐ combin

☐ split

☐ plot ☐ tetra

☐ tria ☐ pyramid

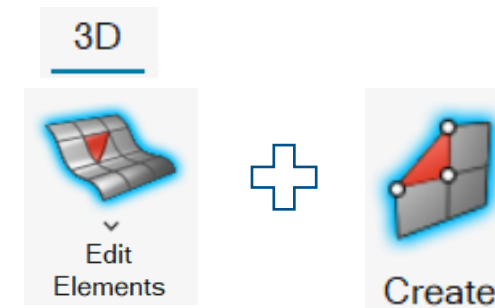
☒ quad ☐ penta

☐ hex

☒ auto order

elem types =

新界面



combine

☐ create
☒ combin
☐ split

elems 

combine to quad

tolerance = 1.000
 auto comb = 4

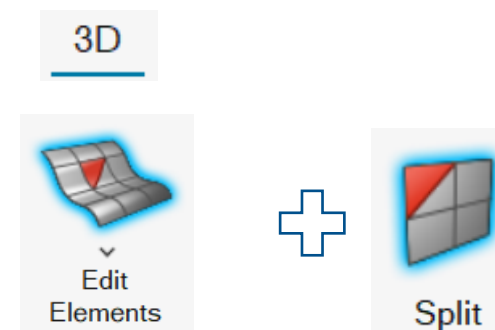


split

☐ create ▼ displayed elems
☐ combin
☒ split

Splitting line: points

☒ Consider 1Ds also



3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

split经典界面（单元的分割） 1/2

经典界面	新界面
plate elements plate elements elems split all sides Split all connected 1D Use inferred surface if no geometry exists	3D Edit Elements + Split + Plate Elements (1) ... Midpoint Split To Quads Split
solid elements plate elements elems split into hexas	3D Edit Elements + Split + Solid Elements (1) ... Hexas Split
Hexa/quad elements plate elements solid elements hex/quad elements refine elements propagate to: all elem edges by node pairs: node list split edges layers = 2 exponential growth rate= 1.000 elems to original comp	3D Edit Elements + Split + Layer Node List (2) ... Split Elements ... Split No. of layers 2 0.00 + Add Split Select Elements

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

split经典界面（单元的分割） 2/2

经典界面	新界面
refine elements plate elements solid elements hexa elements refine elements elems Split all connected 1D refine to target element size target element edge length = 1 0 . 0 0 0	2D Refine + Auto Quads Box Manual

3D页面

- solid map
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- smooth
- CFD tetramesh
- edit element
- split
- replace
- detach
- order change
- config edit
- elem types

replace经典界面（节点的替换）

经典界面

replace: node

with: node

equivalence

at mid-point

total =

x dist =

y dist =

z dist =

3D

Edit Elements

Replace

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

detach经典界面（单元的分离）

经典界面	新界面
detach detach detach elements: elems offset new nodes offset = 0 . 0 0 0 detach all detach from detach from wall	

3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

detach

order change

config edit

elem types

order change经典界面（阶次的变更）

经典界面	新界面
change to 1st change to 1st elems change to 2nd	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To first order Elements (16)
change to 2nd change to 1st elems change to 2nd midside nodes at exact midpoint	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison To second order Elements (16)



3D页面

solid map

linear solid

solid mesh

drag

spin

line drag

elem offset

connectors

tetramesh

smooth

CFD tetramesh

edit element

split

replace

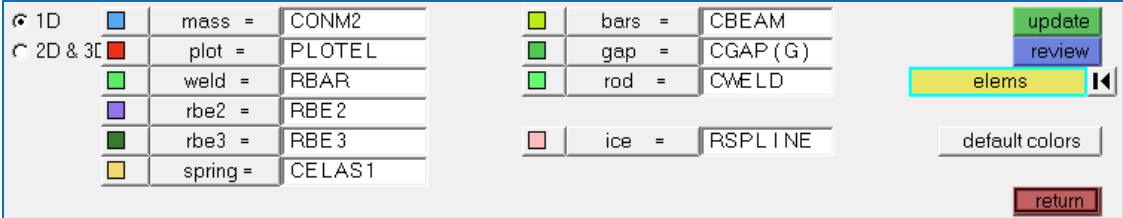
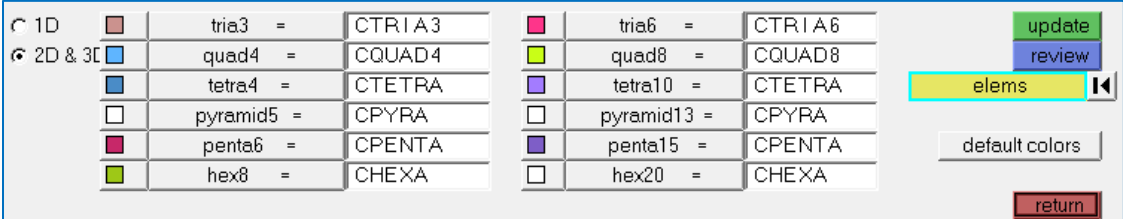
detach

order change

config edit

elem types

elem types经典界面（单元类型的变更）

经典界面	新界面
1D 	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison 1D config Elements (10) ... ⏮ ⏭ ✓ Bars: CBEAM Gap: CGAP Ice: RSPLINE Plot: PLOTTEL Rbe3: RBE3 Spring: CELAS1 Mass: CONM2 Rbe2: RBE2 Rod: CWELD Weld: RBAR
2D & 3D 	Topology Edit CAD Update Geometry Match Topology Geometry Interference Check Find Symmetry Change Element Config Change Element Type Change Element Order CAD/FE Comparison 2D config Elements (25) ... ⏮ ⏭ ✓ Quad4: CQUAD4 Quad8: CQUAD8 Tria3: CTRIA3 Tria6: CTRIA6 3D config Elements (279) ... ⏮ ⏭ ✓ Hex8: CHEXA Hex20: CHEXA Penta6: CPENTA Penta15: CPENTA Pyramid5: CPYRA Pyramid13: CPYRA Tetra4: CTETRA Tetra10: CTETRA

Analysis页面

创建边界条件

vectors	load types		interfaces	control cards	Geom 1D 2D 3D Analysis Tool Post
---------	------------	--	------------	---------------	--

- vectors
- systems
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- blocks
- contactsurfs
- bodies
- nsm
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- output block
- loadsteps
- optimization
- OptiStruct

vectors经典界面（向量的生成）

经典界面

create

vector creation method:
▼ base & magnitude

base nodes:
▼ nodes

vector size % = 25.000

☒ label vector

☐ autoscale

global system

magnitude = 1.000

N1 N2 N3

update

vectors

vector update method:
▼ base & magnitude

base nodes:
▼ nodes

vector size % = 25.000

☒ label vector

☐ autoscale

global system

magnitude = 1.000

N1 N2 N3

新界面

Model

Vectors

+

Base and Magnitude
Two Nodes
Cross Product
Line Tangent
Surface Normal

双击要更新的Vector

+

Edit Vectors

Name	Value
ID:	1
Include:	[Main Model]
Components:	1, 0, 0
Magnitude:	1.0
Collector:	(1) auto1
Start Node:	(13) Node
End Node:	<Unspecified>
System:	<Unspecified>
Metadata	

Close

或

Model

Vectors

+

Vectors

Name	ID	Include
Vectors	1	0

Name	Value
ID:	1
Include:	[Main Model]
Components:	1, 0, 0
Magnitude:	1.0
Collector:	(1) auto1
Start Node:	(13) Node
End Node:	<Unspecified>
System:	<Unspecified>
Metadata	

Analysis页面

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- nsm
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systems经典界面（局部坐标系的创建）

经典界面	新界面
create by axis direction nodes relative size = 10.000 origin x-axis xy plane rectangular	Model Systems Origin [7] *CORD3R (X-XY) Rectangular Cylindrical Spherical
create by node reference rectangular relative size = 10.000 node origin node x-axis z-axis xz-plane	Model Systems Origin [7] *CORD3R (X-XY) Rectangular Cylindrical Spherical
assign set: nodes relative size = 10.000 to: system	Model Systems System [1] Nodes (1) Set reference Set displacement



preserve node经典界面（节点的保留）

vectors

systems

preserve node

load types

constraints

equations

forces

moments

pressures

accels

temperatures

flux

load on geom

interfaces

rigid walls

entity sets

blocks

contactsurfs

bodies

nsm

control cards

output block

loadsteps

optimization

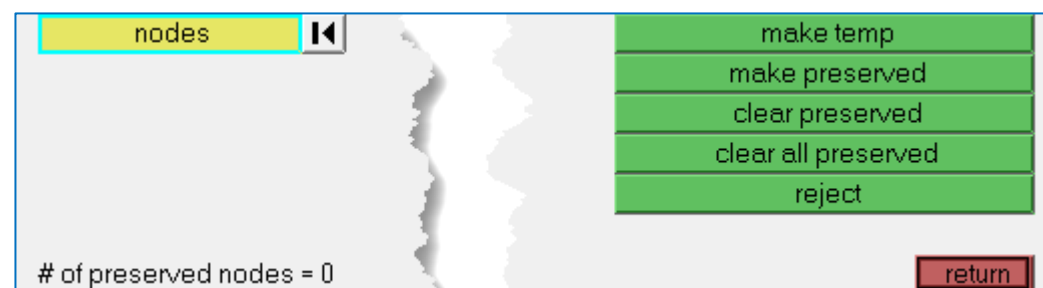
OptiStruct

经典界面

```

preserve node

```

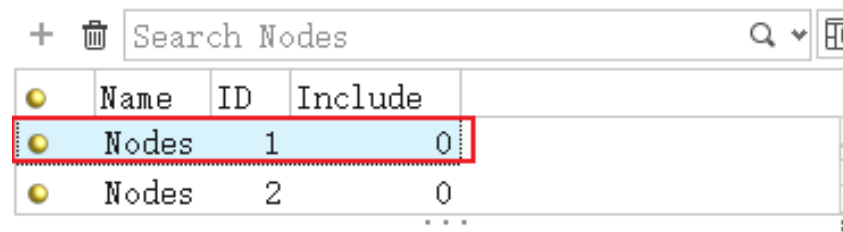


新界面

Browser/Entity Editor

Model	Nodes
Model 1	1
Model 2	2
Model 3	3
Model 4	4
Model 5	5
Model 6	6
Model 7	7
Model 8	8
Model 9	9
Model 10	10
Model 11	11
Model 12	12
Model 13	13
Model 14	14
Model 15	15
Model 16	16
Model 17	17
Model 18	18
Model 19	19
Model 20	20
Model 21	21
Model 22	22
Model 23	23
Model 24	24
Model 25	25
Model 26	26
Model 27	27
Model 28	28
Model 29	29
Model 30	30
Model 31	31
Model 32	32
Model 33	33
Model 34	34
Model 35	35
Model 36	36
Model 37	37
Model 38	38
Model 39	39
Model 40	40
Model 41	41
Model 42	42
Model 43	43
Model 44	44
Model 45	45
Model 46	46
Model 47	47
Model 48	48
Model 49	49
Model 50	50
Model 51	51
Model 52	52
Model 53	53
Model 54	54
Model 55	55
Model 56	56
Model 57	57
Model 58	58
Model 59	59
Model 60	60
Model 61	61
Model 62	62
Model 63	63
Model 64	64
Model 65	65
Model 66	66
Model 67	67
Model 68	68
Model 69	69
Model 70	70
Model 71	71
Model 72	72
Model 73	73
Model 74	74
Model 75	75
Model 76	76
Model 77	77
Model 78	78
Model 79	79
Model 80	80
Model 81	81
Model 82	82
Model 83	83
Model 84	84
Model 85	85
Model 86	86
Model 87	87
Model 88	88
Model 89	89
Model 90	90
Model 91	91
Model 92	92
Model 93	93
Model 94	94
Model 95	95
Model 96	96
Model 97	97
Model 98	98
Model 99	99
Model 100	100

Nodes



Name	Value
Solver Keyword:	GRID
ID:	1
Include:	[Main Model]
Super Element ID:	0
Input System:	 <Unspecified>
Output System:	 <Unspecified>
Surface ID:	 <Unspecified>
Local Coordinates:	0.504023, 0.336106, 0
Preserve:	☐
Free:	☒
User Comments:	Hide In Menu/Export
SPOINT:	
CP:	0
X1:	0.504023
X2:	0.336106
X3:	0.0
CD -1:	☐
PS:	
GRID_COMMENT:	☐

Metadata

Metadata

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- bodies
- nsm
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- OptiStruct

load types经典界面（更改载荷类型）

经典界面

load types

force =	FORCE	temperature =	TEMP
moment =	MOMENT	flux =	QBDY1
constraint =	SPC	velocity =	
pressure =	PLOAD4	acceleration =	ACCEL
		equation =	MPC

新界面

Analyze

Structural ▾

Load TypesLine Loads1D Deformations

Loads

Constraints

Enforced Disps

Body Accelerations

Excitations

Initial Conditions

Bolt Pretension

Load Types

Line Loads

1D Deformations

Acceleration: ACCEL ▾

Equation: MPC ▾

Force: FORCE ▾

Pressure: PLOAD4 ▾

Velocity: INLTVEL ▾

Constraint: SPC ▾

Flux: QVOL ▾

Moment: MOMENT ▾

Temperature: TEMP ▾

◀

▶

[illegible]

新界面

Analyze



Name	Value
Load Type:	SPC
Entities:	● 0 Nodes
Magnitude Type:	Constant Value
Retain Deformed Boundary:	☐
DOF1:	☒ 0
DOF2:	☒ 0
DOF3:	☒ 0
DOF4:	☒ 0
DOF5:	☒ 0
DOF6:	☒ 0

Create Close

update

Browser/Entity Editor



	Name	ID	Include
	Loads	31	0
	Loads	1	0
	Loads	2	0
	Loads	3	0
	Loads	4	0
	Loads	5	0
	Loads	6	0
	Loads	7	0
	Loads	8	0
	Loads	9	0
	Loads	10	0

Name	Value
Solver Keyword:	SPC
Include:	[Main Model]
Type:	SPC
Config:	Constraint
Collector:	 (1) SPCs
DOF1:	0. 0
DOF2:	0. 0
DOF3:	0. 0
DOF4:	0. 0
DOF5:	0. 0
DOF6:	 0. 0
Entity id:	 ###
C:	123456
D:	0. 0
Metadata	

或

Model

Search

Name

ID

Include

Load Steps (1)

Loads (31)

DAREA (1)

SPC (30)

Name

Value

Solver Keyword:

SPC

Include:

[Main Model]

Type:

SPC

Config:

Constraint

Collector:

(1) SPCs

DOF1:

0.0

DOF2:

0.0

DOF3:

0.0

DOF4:

0.0

DOF5:

0.0

DOF6:

0.0

Entity id:

###

C:

123456

D:

0.0

Metadata

Analysis页面

- vectors
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equations经典界面（创建和编辑MPC）

经典界面

create

dependent:

node

dof1

w

1.000

independent:

nodes

dof1

w

1.000

dof2

w

1.000

dof3

w

1.000

constant

0.000

load types =

MPC

update

equations

mesh connectivity

connectivity

dofs & weights

constant

load types

equivalence tolerance

1.000

新界面

Analyze

Constraints

Inertia Relief

MPCs

MPC

Independent (3)

Dependent [12]

1

2.000000

2

1.000000

3

2.00

Browser/Entity Editor

Model

Nodes

Equations

Search Equations

Equations

1

0

Name

Value

Solver Keyword:

MPC

ID:

1

Include:

[Main Model]

Collector:

(1) auto1

Type:

MPC

Dependent Node Data

Dependent Node:

(12) Node

Dependent DoF:

DOF 1

Dependent Coefficient:

-1.0

Independent Nodes Data

Independent Nodes:

3 Nodes

Weight Factor 1:

1.0

Weight Factor 2:

1.0

Weight Factor 3:

1.0

Weight Factor 4:

3.0

Weight Factor 5:

3.0

Weight Factor 6:

3.0

Number of Independent No...

3

Independent Node Weigh...

G:

12

CI_ZERO:

Metadata

Number of Independent Nodes

Node ID

WF 1

WF 2

WF 3

WF 4

WF 5

WF 6

1

8

1

1

1

3

3

3

2

9

1

1

1

3

3

3

3

10

1

1

1

3

3

3

Close



Analysis页面

- vectors
- systems
- preserve node
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- equations
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- temperatures
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- bodies
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- OptiStruct

forces经典界面（创建和编辑集中力）

经典界面

create

nodes

global system

magnitude = 1.000

N1N2N3

relative size = 100.0

label loads

load types = FORCE

update

loads

display

global system

magnitude = 1.000

N1N2N3

relative size = 100.0

label loads

load types = FORCE

新界面

Analyze

Loads

+

Forces

Name	Value
Load Type:	FORCE
Entities:	1 Nodes
System Type:	Global
Magnitude Type:	Constant Vector
Magnitude:	1.0
Direction:	0, 0, 1

CreateClose

Loads

或

鼠标图标

+

双击要model中loads

ModelLoads

Search Loads

Name	ID	Include
Loads	31	0

Name	Value
Solver Keyword:	DAREA
ID:	31
Include:	[Main Model]
Type:	DAREA
Config:	Constraint
Collector:	(2) loadcol_2
DOF1:	
DOF2:	
DOF3:	-1500.0
DOF4:	
DOF5:	
DOF6:	
Entity id:	(395) Node
C1:	3
DELAY3:	
DPHASE3:	

Metadata

◀

▶

Analysis页面

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moments经典界面（创建和编辑力矩）

经典界面

create

nodes

relative size =

100.000

global system

magnitude =

1.000

N1

N2

N3

label loads

load types =

MOMENT

update

loads

display

relative size =

25.000

global system

magnitude =

1.000

N1

N2

N3

label loads

load types =

MOMENT

新界面

Analyze

Loads

Moments

Name	Value
Load Type:	MOMENT
Entities:	1 Nodes
System Type:	Global
Magnitude Type:	Constant Vector
Magnitude:	1.0
Direction:	0, 0, 1

CreateClose

Analyze

Loads

Model

Loads

Search Loads

Name	ID	Include
Loads	32	0

Name	Value
Solver Keyword:	MOMENT
ID:	32
Include:	[Main Model]
Type:	MOMENT
Config:	Moment
Collector:	(4) auto1
Total Magnitude:	1.0
Direction:	0, 0, 1
X-magnitude:	0.0
Y-magnitude:	0.0
Z-magnitude:	1.0
Input system:	<Unspecified>
Entity id:	(29) Node
CID:	0
M:	1.0

Model

Search

Name	ID	Include
Load Collectors (4)		
Load Step Inputs (2)		
Load Steps (1)		
Loads (434)		
DAREA (1)		
MOMENT (1)		
PLOAD4 (402)		
SPC (30)		
Materials (1)		

Name	Value
Solver Keyword:	MOMENT
ID:	32
Include:	[Main Model]
Type:	MOMENT
Config:	Moment
Collector:	(4) auto1
Total Magnitude:	1.0
Direction:	0, 0, 1
X-magnitude:	0.0
Y-magnitude:	0.0
Z-magnitude:	1.0
Input system:	<Unspecified>
Entity id:	(29) Node
CID:	0
M:	1.0

pressures经典界面（创建和编辑分布载荷）

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经典界面

```
create
```

faces  relative size = 100.000
☒ label loads

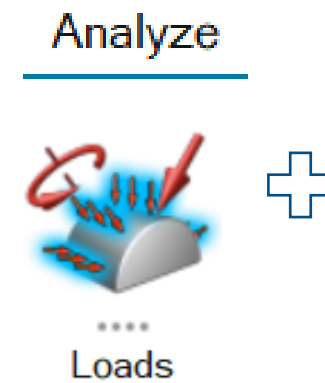
 magnitude = 1.000  face angle = 30.000

 normal  load types = PLOAD4

update

loads  relative size = 100.000
display ☒ label loads
▼ magnitude = 1.000
◆ normal
load types = PLOAD4

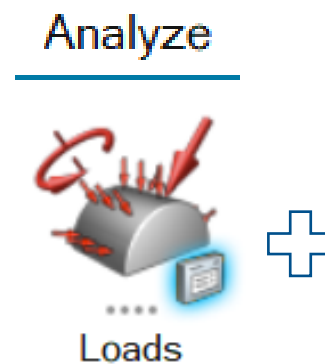
新界面



Pressures [.....] [X]

Name	Value
Load Type:	PLOAD4
Entity Type:	Elements
Entities:	 6 Elements
Magnitude Type:	Constant Vector
Magnitude:	1.0
Normal Defined:	☒

Create
Close



Model	Loads	
+ 🗑 Search Loads 🔍 ▼		
Name	ID	Include
Loads	406	0
Loads	405	0
Loads	404	0
Loads	403	0
Loads	402	0
...		

Name	Value
Solver Keyword:	PLOAD4
Include:	[Main Model]
Type:	PLOAD4
Config:	Pressure
Collector:	(4) auto1
Total Magnitude:	1.0
Direction:	###
X-magnitude:	###
Y-magnitude:	###
Z-magnitude:	###
Input system:	<Unspecified>
Entity id:	###
Pressure type:	Pressure on face
G1:	###

Model

Search

Name

ID

Include

Load Collectors (4)

Load Step Inputs (2)

Load Steps (1)

Loads (434)

DAREA (1)

MOMENT (1)

PLOAD4 (402)

SPC (30)

Materials (1)

Name	Value
Solver Keyword:	PLOAD4
Include:	[Main Model]
Type:	PLOAD4
Config:	Pressure
Collector:	(4) auto1
Total Magnitude:	1.0
Direction:	###
X-magnitude:	###
Y-magnitude:	###
Z-magnitude:	###
Input system:	<Unspecified>
Entity id:	###
Pressure type:	Pressure on face
G1:	###

Metadata

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accels经典界面（创建和编辑加速度）

经典界面

create

global system

magnitude = 1.000

N1 N2 N3

relative size = 100.000

label loads

load types = ACCEL

update

loads display

global system

magnitude = 1.000

N1 N2 N3

relative size = 25.000

label loads

load types = ACCEL

新界面

Analyze

Body Accelerations

Body Rotational Force

Body Gravity

Accelerations

Name	Value
Load Type:	ACCEL
System Type:	Global
Magnitude Type:	Constant Vector
Magnitude:	1.0
Direction:	0, 0, 1

CreateClose

Body Accelerations

或

Body Accelerations

双击要model中load collector

ModelLoad Collectors

Search Load Collectors

Name	ID	Include	Card Image
grav	5	0 GRAV	

NameValue

Solver Keyword:GRAV

Name:grav

ID:5

Color:

Include:[Main Model]

Card Image:GRAV

Load Types:ACCEL(1)

User Comments:Hide In Menu/Export

CID:<Unspecified>

G:9800.0

N1:0.0

N2:0.0

N3:-1.0

Metadata

temperatures经典界面（创建和编辑温度载荷）

经典界面

create

faces

value =

relative size =

☒ label loads

load types =

face angle =

update

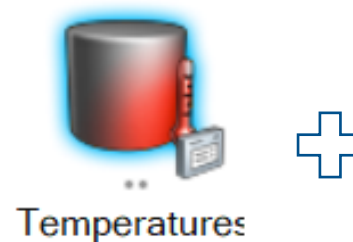
loads   display   relative size = 100.000

☒ label loads

 value = 1.000 load types = TEMP

新界面

Analyze



Temperatures

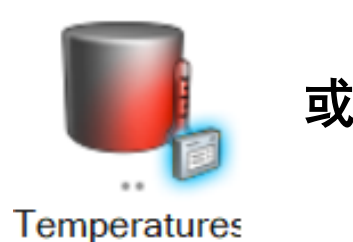
Name	Value
Load Type:	TEMP
Entities:	
Magnitude Type:	Constant Value
Value:	1.0

Select Nodes...

☒ By Face
 ☐ By Collector
 ☐ By Edge
 ☐ By Face
 ☐ By ID
 ☐ By Line
 ☒ By Path
 ☐ By Plane
 ☐ By Points
 ☐ By Solid
 ☐ By Surface

Angle:
☐ Ignore Intersections
 ☐ Ignore Plot Elements
 ☐ Ignore Surface Edges
 ☐ Ignore Part Boundaries

Analyze



或



双击要model中loads

Model

Loads

+

🗑️

Search Loads

🔍

📄

	Name	ID	Include
	Loads	1	0
	Loads	2	0

...

Name	Value
Solver Keyword:	TEMP
ID:	2
Include:	[Main Model]
Type:	TEMP
Config:	Temperature
Collector:	 (1) auto1
Temperature:	1.0
Entity id:	 (5) Node
G:	5

Metadata

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flux经典界面（创建和编辑Flux）

经典界面

create

elems

relative size = 100.000

label loads

load types = QBDY1

value = 1.000

update

loads

display

relative size = 100.000

label loads

load types = QBDY1

value = 1.000

新界面

Analyze

Heat Flux

+

Create Load

Name	Value
Solver Keyword:	HEATFLUX
ID:	439
Include:	[Main Model]
SID:	(5) grav
Engineering type:	Thermal
Distribution:	Uniform
Type:	HEATFLUX
ELSETID:	(4) set1
QBDY1 Option:	☒
Q0:	0.5
Metadata	

Close

Heat Flux

或

双击要model中loads

+

Model Loads

Search Loads

Name	ID	Include
Loads	1	0
Loads	2	0
Thermal	4	0

Name	Value
Solver Keyword:	HEATFLUX
ID:	4
Include:	[Main Model]
SID:	(1) auto1
Engineering type:	Thermal
Distribution:	Uniform
Type:	HEATFLUX
ELSETID:	(1) set1
QBDY1 Option:	☒
Q0:	0.5
Metadata	

Analysis页面

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load on geom经典界面（几何载荷映射到有限元中）

经典界面	新界面
load on geom loadcols map loads reject return	直接选择单元进行加载

- vectors
- systems
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- load types
- constraints
- equations
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interfaces经典界面（接触的定义）

经典界面

create

create

name

=

update

type

=

creation method:

card image

=

interface color

update

create

name

=

update

type

=

add

interface color

add

create

name

=

master:

entity

elems

reverse

slave:

entity

elems

reverse

新界面

Model

Groups

+

Create groups

Name	Value
Solver Keyword:	CONTACT
Name:	group1
ID:	1
Color:	
Include:	[Main Model]
Card Image:	CONTACT
User Comments:	Hide In Menu/Export
Property Option:	Property Type
TYPE:	SLIDE
Secondary Entities:	<Unspecified>
Main Entities:	<Unspecified>
MORIENT:	
SRCHDIS:	
Adjust Option:	String Value
ADJUST:	
Clearance Option:	BLANK
DISCRET:	
TRACK:	
PSURF:	
COHE:	
Metadata	

Close

使用Group Browser/Entity Editor进行updata

- vectors
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interfaces经典界面（接触的定义）

经典界面

card image

create

update

add

card image

name

=

新界面

Model

..

Groups

+

ModelGroups

Search Groups

Q

NameIDColorIncludeCard Image

group110 CONTACT

...

NameValue

Solver Keyword:CONTACT

Name:group1

ID:1

Color:

Include:[Main Model]

Card Image:CONTACT

User Comments:Hide In Menu/Export

Property Option:Property Type

TYPE:SLIDE

Secondary Entities:<Unspecified>

Main Entities:<Unspecified>

MORIENT:

SRCHDIS:0.0

Adjust Option:String Value

ADJUST:

Clearance Option:BLANK

DISCRET:

TRACK:

PSURF:

COHE:

使用Group Browser/Entity Editor进行

- vectors
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rigid walls

经典界面（创建和编辑刚性体）

经典界面

create

create

name =

update

type =

RWALL

geom

add

motion

card

size =

10.000

rgdwall color

update

create

name =

update

type =

RWALL

geom

add

motion

card

rgdwall color

geom

create

name =

update

geom

base node

edit

add

motion

card

shape:

infinite plane

normal vector:

N1

N2

N3

新界面

Model

Rigid Walls

+

Create Rigid Wall

Name	Value
Solver Keyword:	RWALL
Name:	rigidwall2 creat
ID:	2
Color:	
Include:	[Main Model]
Rigidwall config:	RWALL
Geometry Type:	Infinite plane
Engineering data	geom
X0,Y0,Z0:	0, 0, 0
Normal:	0, 0, 0
X1:	0.0
Y1:	0.0
Z1:	0.0
Support	
Slide:	
GSID1:	
GSID2:	
DIST:	
Motion Card:	
Metadata	

Close

请使用 Rigid Wall 浏览器进行更新、编辑。

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- bodies
- nsm
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- output block
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rigid walls经典界面（创建和编辑刚性体）

经典界面

add

create

name =

update

slaves:

sets

sets

edit

geom

add

motion

dist =

0 . 0 0 0

card

motion

create

name =

update

geom

magnitude =

0 . 0 0 0

type of motion:

none

add

motion

N1

N2

N3

card

card

create

name =

update

geom

load

load/edit

edit

add

motion

reset

reset all

return

card

新界面

Model

Rigid Walls

Create Rigid Wall

Name	Value
Solver Keyword:	RWALL
Name:	rigidwall12
ID:	2
Color:	
Include:	[Main Model]
Rigidwall config:	RWALL
Geometry Type:	Infinite plane
Engineering data	
X0, Y0, Z0:	0, 0, 0
Normal:	0, 0, 0
X1:	0.0
Y1:	0.0
Z1:	0.0
Support	
Slide:	card
GSID1:	set
GSID2:	
DIST:	
Motion Card:	motion
Metadata	

Close

请使用 Rigid Wall 浏览器j进行更新、编辑。

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entity sets经典界面（创建组）

经典界面

entity sets

name =

card image

set type: non-ordered

entity: elems

☐ formula

create

update

card edit

review

return

新界面

Model

Sets

+

Create Sets

Name	Value
Solver Keyword:	SET
Name:	set2
ID:	2
Include:	[Main Model]
Defined:	☒
Card Image:	SET_ELEM
Set Type:	non-ordered
Entities:	0 Elements
User Comments:	Hide In Menu/Export
TYPE:	ELEM
SUBTYPE:	LIST
Metadata	

Close

- vectors
- systems
- preserve node
- load types
- constraints
- equations
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- OptiStruct

blocks经典界面（创建区块）

经典界面

create

create

update

review

name =

card image

global system

lower bound: corner node

upper bound: corner node

color

update

create

update

review

blocks

card image

global system

lower bound: corner node

upper bound: corner node

color

review

create

update

review

blocks

nodes

color

新界面

Model

Interactions

Blocks

Boolean On Sets

Combine Rigid

Switch Rigid

Features

Fields

Joints

Parameters

Regions

RSpline

Contact Comparison

Search Blocks

Name

ID

Include

block1

1

0

Name

Value

Name:

block1

ID:

1

Color:

Include:

[Main Model]

System:

<Unspecified>

Upper bound:

0, 0, 0

Lower bound:

0, 0, 0

Metadata

Model

Interactions

Blocks

Boolean On Sets

Combine Rigid

Switch Rigid

Features

Fields

Joints

Parameters

Regions

RSpline

Contact Comparison

Search Blocks

Name

ID

Include

block1

1

0

Name

Value

Name:

block1

ID:

1

Color:

Include:

[Main Model]

System:

<Unspecified>

Upper bound:

0, 0, 0

Lower bound:

0, 0, 0

Metadata

Model

Interactions

Blocks

Boolean On Sets

Combine Rigid

Switch Rigid

Features

Fields

Joints

Parameters

Regions

RSpline

Contact Comparison

Search Blocks

Name

ID

Include

block1

1

0

Select

Duplicate

Rename

Rename by ID

Review

Reverse

Hide

Isolate

请使用Blocks浏览器。

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contactsurfs经典界面（接触面的定义） 1/2

经典界面

elems

elems

solid faces

remove elems

adjust normals

name =

card image =

2d faces

face angle = 30.000

reverse normals

color

新界面

Model

Contact Surfaces

Create Set

Name	Value
Solver Keyword:	SURF
Name:	set3
ID:	3
Color:	
Include:	[Main Model]
Defined:	☒
Card Image:	SURF
Elements:	Elements
User Comments:	Hide in M
FACE_FORMAT:	☐
No of rows:	0
Metadata	

Close

solid faces

elems

solid faces

remove elems

adjust normals

name =

card image =

3d faces

face angle = 30.000

reverse normals

color

Model

Contact Surfaces

Create Set

Name	Value
Solver Keyword:	SURF
Name:	set3
ID:	3
Color:	
Include:	[Main Model]
Defined:	☒
Card Image:	SURF
Elements:	Faces
User Comments:	Hide in M
FACE_FORMAT:	☐
No of rows:	0
Metadata	

Close

remove elems

elems

solid faces

remove elems

adjust normals

contactsurf

faces

face angle = 30.000

Model

Contact Surfaces

Search Sets

Name	ID	Include	Card Image
set1	1	☐	0 SURF
set2	4	☐	0 SURF
set3	5	☒	0 SURF

Create Set

Name	Value
Solver Keyword:	SURF
Name:	set3
ID:	5
Color:	
Include:	[Main Model]
Defined:	☒
Card Image:	SURF
Elements:	Elements (84)
User Comments:	Hide in M
FACE_FORMAT:	☐
No of rows:	84
Data: EID:	
Metadata	

Close

Shift+

鼠标

快捷键

请使用 Contact 浏览器

Analysis页面

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contactsurfs经典界面（接触面的定义） 2/2

经典界面	新界面																
adjust normals elems solid faces remove elems adjust normals contactsurf reverse normals reject all elems return	Model ... Contact Surfaces + Search Sets <table><tr><th>Name</th><th>ID</th><th>Include</th><th>Card Image</th></tr><tr><td>set1</td><td>1</td><td>0 SURF</td><td></td></tr><tr><td>set2</td><td>4</td><td>0 SURF</td><td></td></tr><tr><td>set3</td><td>5</td><td>0 SURF</td><td></td></tr></table> Name Value Solver Keyword: SURF Name: set3 ID: 5 Color: Include: [Main Model] Defined: ☒ Card Image: SURF Elements: Elements (84) User Comments: Hi % ... FACE_FORMAT: ☐ No of rows: 84 Data: EID: Metadata + ... ◀ ▶ ✓ ✗ Adjust directions Select Elements to reverse direction. Reverse Align ☒ All Elements ... ◀ ▶ Reverse OK i 请使用 Contact 浏览器	Name	ID	Include	Card Image	set1	1	0 SURF		set2	4	0 SURF		set3	5	0 SURF	
Name	ID	Include	Card Image														
set1	1	0 SURF															
set2	4	0 SURF															
set3	5	0 SURF															

Analysis页面

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bodies经典界面（Bodies的创建）

经典界面

create

create

body =

update

type =

parameters

properties:

props

rigids:

elems

free nodes:

nodes

body color

update

create

body =

update

type =

parameters

properties:

props

rigids:

elems

free nodes:

nodes

body color

parameters

create

body =

update

mass =

0 . 0 0 0

parameters

lxx =

0 . 0 0 0

lyy =

0 . 0 0 0

lzz =

0 . 0 0 0

global system

COG

lxy =

0 . 0 0 0

lxz =

0 . 0 0 0

lyz =

0 . 0 0 0

新界面

只用于OptiStruct多体动力学分析，建议使用MotionView 和 MOtionSolver进行多体动力学分析

Analysis页面

- vectors
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- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

nsm经典界面（非结构质量）

经典界面

create

create

update

name =

type =

color

mass =

0 . 0 0 0

elems

update

create

update

name =

type =

color

mass =

0 . 0 0 0

elems

新界面

model浏览器空白处右键

Create

Show All

Reverse

Displayed Count

Export

Expand All

Collapse All

Close Entity Views

Configure Browser

Load

Load Step

Load Step Inputs

Material

Modal Results Output

Multibody

Non-structural Mass

Output Block

Parameter

Part

Plot

Ply

Property

Create Solver Mass

Name

Value

Solver Keyword:

NSM

Name:

nonstructuralmass1

ID:

1

Color:

Include:

[Main Model]

Config:

Mass

Type:

NSM

NSM Definition

NSM Num:

1

Mass:

0.0

Entities:

<Unspecified>

Metadata

Close

Model

Search

Name

Beam Section Collectors (1)

Beam Sections (4)

Components (204)

Elements (90)

Geometry (1090)

Groups (3)

CONTACT (3)

Mesh Controls (1)

Nodes (109)

Non-structural Masses (1)

NSM (1)

Parts (204)

Rigid Bodies (4)

Rigid Walls (2)

Titles (1)

Model

Non-structural Masses

Search Solver Masses

Name

ID

Include

Config

nonstructuralmass1

1

0 Mass

Name

Value

Solver Keyword:

NSM

Name:

nonstructuralmass1

ID:

1

Color:

Include:

[Main Model]

Config:

Mass

Type:

NSM

NSM Definition

NSM Num:

1

Mass:

0.0

Entities:

<Unspecified>

Metadata

Analysis页面

- vectors
- systems
- preserve node
- load types
- constraints
- equations
- forces
- moments
- pressures
- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

control cards经典界面（控制卡片）

经典界面

control cards

ACMODL	CONTPRM	DMIGMOD
ANALYSIS	DEBUG	DMIGROT
ASSIGN	DENSITY	DMIGNAME
B2GG	DENSRES	DTI_UNITS
BULK_UNSUPPORTED_CARDS	DESHIS	ECHO
CASE_UNSUPPORTED_CARDS	DESVARG	EIGVNAME
CHECK	DGLOBAL	ELEMQUAL

FORMAT	INCLUDE_BULK	LABEL
GAPPRM	INCLUDE_CTRL	LOADLIB
GLOBAL_CASE_CONTROL	INFILE	M2GG
GLOBAL_OUTPUT_REQUEST	A2GG	MECHCHECK
GRDSET	K2GG	MODEL
GROUNDCHECK	K2PP	Model Documentation
HISOUT	K42GG	MODESELECT

MSGLMT	PRETPRM	RESTART
OMIT	PFGRID	RESTARTR
OSDIAG	PFMODE	RESTARTW
OUTFILE	PFPANEL	RESULTS
OUTPUT	PROPERTY	SCREEN
P2G	RADPRM	SENSITIVITY
PARAM	RESPRINT	SENSOUT

SHAPE	TMPDIR	
SHRES	UNITS	
SUBTITLE	XSHLPRM	
SWLDPRM	XSOLPRM	
SYSSETTING		
THICKNESS		
TITLE		

新界面

Analyze

Parameters

Global Case Control

Global Output Requests

Run Parameters

◀

▶

Analysis页面

- vectors
- systems
- preserve node
- load types
- constraints
- equations
- forces
- moments
- pressures
- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

output block经典界面（输出请求）

经典界面	新界面
output block name = ▼ nodes ⏮ create edit update review return	Analyze Parameters Global Case Control Global Output Requests Run Parameters





Analysis页面

- vectors
- systems
- preserve node
- load types
- constraints
- equations
- forces
- moments
- pressures
- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

loadsteps经典界面（载荷步）

经典界面

loadsteps

name =

type: linear static

☐ SPC

☐ LOAD

☐ MPC

☐ SUPORT1

☐ DEFORM

☐ STATSUB(PRELOAD)

☐ PRETENSION

☐ STATSUB(PRETENS)

新界面

Analyze



Analyze

Loadstep

Global Options

Headers

Load References

Output Formats

Output Requests

Parameters

Loadsteps

右键

New loadstep

Edit options

Edit card

Delete

Rename

Renumber

Summary Table

Contour Loads

Loads Summary

Collapse all

Collapse selection

Expand all

Expand selection

Auto-manage load references

OptiStruct

Analysis页面

- vectors
- systems
- preserve node
- load types
- constraints
- equations
- forces
- moments
- pressures
- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

optimization经典界面（优化设置）

经典界面

optimization

topology	size(parameter)	responses	table entries	opti control
topography	gauge	dconstraints	dequations	constr screen
free size	desvar link	obj reference	discrete dvs	lattice params
free shape		objective		
	shape			
composite shuffle	perturbations			
composite size	HyperMorph			

return

新界面

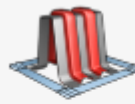
Files

Measure

Move

Home

Topology

Topography

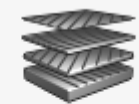
Size

Shape

Gauge

Free Size

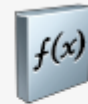
Free Shape

Composite Size

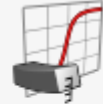
Shuffle

Design Variables

Table Entries

Equations

Links

Responses

Constraints

Objectives

Optimize

Targets



Analysis页面

- vectors
- systems
- preserve node
- load types
- constraints
- equations
- forces
- moments
- pressures
- accels
- temperatures
- flux
- load on geom
- interfaces
- rigid walls
- entity sets
- blocks
- contactsurfs
- bodies
- nsm
- control cards
- output block
- loadsteps
- optimization
- OptiStruct

OptiStruct经典界面（OptiStruct执行）

经典界面

OptiStruct

input file: save as...

export options:
▼ custom

run options:
▼ optimization

memory options:
⬆ memory default

☐ include connectors options

新界面

Analyze



Analyze

+

Solver Export Options

OptiStruct

General

Export: All

Template: Standard

Include files

Include export: Preserve

☒ Export include file path relative to include statement

☐ Use drive mapping

☐ Write include file statements only for exported includes

Write comments for

☒ Connectors

☒ HyperMesh

☒ ID rules

☒ Materials

☒ Parts

☒ Subsystems

Warning messages

☒ Invalid elements

☒ Overwrite existing file

☒ ID Overflow

OptiStruct

☒ Remove 'E' from real values

☐ Round numbers close to zero

Restore Defaults

☐ Do not show this dialog again

Export

Cancel

Tool页面

一般功能

assemblies	find	translate	check elems	numbers	Geom 1D 2D 3D Analysis Tool Post
------------	------	-----------	-------------	---------	---

Tool页面

assemblies

- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

assemblies经典界面（创建装配关系）

经典界面	新界面
create create assem name = color card image creation method: card image = comps asems multibodies	只用于OptiStruct多体动力学分析，建议使用MotionView 和 MOtionSolver进行多体动力学分析
card image create assem name = load card image creation method: card image = load/edit edit reset reset all return	

Tool页面

assemblies

organize

color

rename

reorder

build menu

find

mask

delete

translate

rotate

scale

reflect

project

position

permute

check elems

edges

faces

features

normals

dependency

penetration

numbers

renumber

count

mass calc

tags

HyperMorph

organize经典界面（改变组织关系）

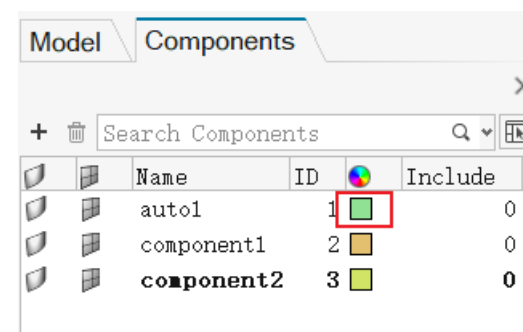
经典界面	新界面
collectors collectors includes parts elems dest component = move copy reject return	Assembly Organize Elements Destination Copy
includes collectors includes parts elems dest = move reject locate return	Assembly Organize Elements Destination Copy
parts collectors includes parts comps dest part = move return	Assembly Organize Components Destination Copy Part Assembly Include File Subsystem

经典界面

color



新界面



请使用Components浏览器



Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

rename经典界面（改变名称）

经典界面

individually

individually

all by id

comps

original name =

new name =

rename

return

all by id

individually

all by id

comps

prefix =

rename

return

新界面

ModelComponents

+

Search Components

Q

	Name	ID		Include		No. Elements	Direct
	let	1		0		0	

NameValue

Name:let

ID:1

Color:

Include:[Main Model]

Property:

<Unspecified>

Material:

<Unspecified>

FE Style:

Geometry Style:

Metadata

i

Browser/Entity Editor

ModelComponents

+

Search Components

Q

	Name	ID		Include		No. Elements	
	let	选中-右键	1	0			
	component1	Select					
	component2	Rename by ID					
	component3						
	component4	Review	Q				
	component5	Reverse	R				
	component6	Hide	H				
	component7	Isolate	I				
	component8	Show	A				
	component9	More					
	component10						
	component11	References					
		Copy	Ctrl + C				
		Assign					
		Organize	O				
		Create Sets					
		Add Metadata					
		Create Parts					
		Export					

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

reorder经典界面（改变顺序）

经典界面

reorder

▼comps

sort by:

☐ name

☐ id

☒ front

☐ back

move to:

reorder

return

新界面

reorder

Tools

Reorder

+

Reorder

Name	Value
Entities:	0 Components
Sort By:	ID
Move To:	Back

Reorder

Close

◀

▶

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

build menu (菜单的编辑)

经典界面

build menu

accels	axis labels	collectors	connector sea	CreatePlane	domains
add links	bars	color	connector spo	curve attribs	drag
admas	basicfea main	composite shu	connectors	data curves	dummy
ALE setup	beamsectcols	composite siz	constraints	data mgr...	edge edit
Apply Mass	blocks	composites	contactsurfs	defeature	edges
apply result	bodies	comps	contour	Deform main_p	edit curves
Area Connecto	border	cones	control cards	deformed	edit element
assemblies	build menu	config edit	control vol	delete	elem cleanup
autocleanup	CFD main_page	connector are	convert	dependency	elem offset
automesh	CFD tetramesh	connector bol	count	detach	elem types
autoshape	check elems	connector bol	crash main_pa	discrete dvs	ellipsoids
axes	circles	connector imp	create	distance	empty panel
delete	insert	erase	next	restore	
nodes	lines	surfaces	solids	quick edit	Geom exit
node edit	line edit	surface edit	solid edit	edge edit	1D
temp nodes	length	defeature	ribs	point edit	2D
distance	blank	midsurface	blank	autocleanup	3D
points	blank	dimensioning	blank	blank	Analysis
blank	blank	blank	blank	blank	Tool
blank	blank	blank	blank	blank	Post

新界面

Post

Report

Custom

+

Altair HyperMesh 2023.1 - OptiStruct

File Edit View Topology 1D 2D 3D Assembly Connectors Morph Model Validate Analyze Optimize Post Report Custom +

Files

Measure

Move

General 2D Mesh

Hex

Materials

Properties

Loads

Constraints

Analyze

拖动

自定义菜单可以通过右键单击=> export 为一个文件。

Custom +

Float

Export

Rename

Delete

Tool页面

assemblies

organize

color

rename

reorder

build menu

find

mask

delete

translate

rotate

scale

reflect

project

position

permute

check elems

edges

faces

features

normals

dependency

penetration

numbers

renumber

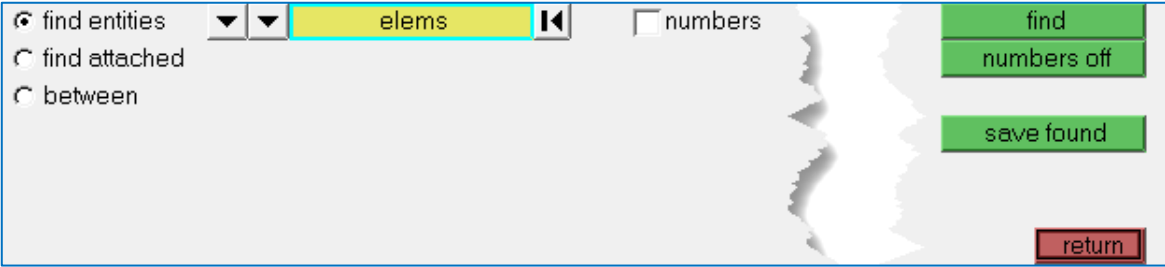
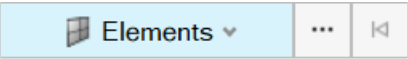
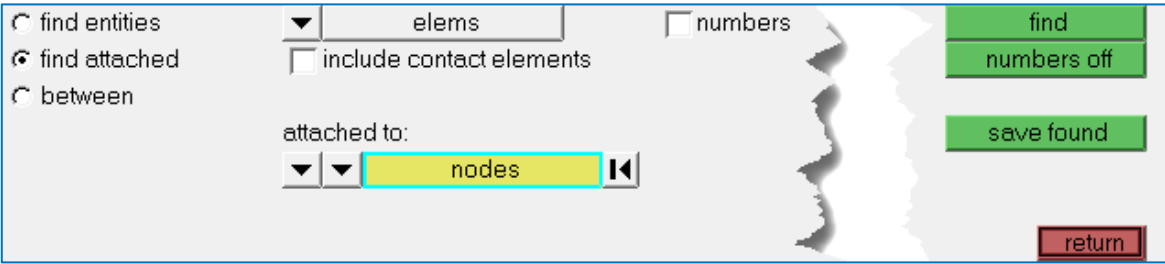
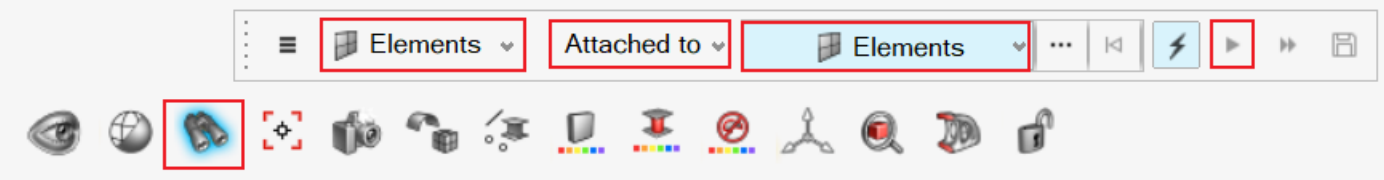
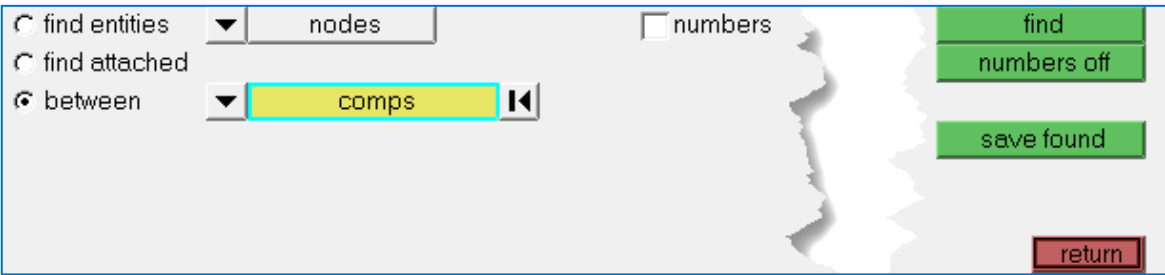
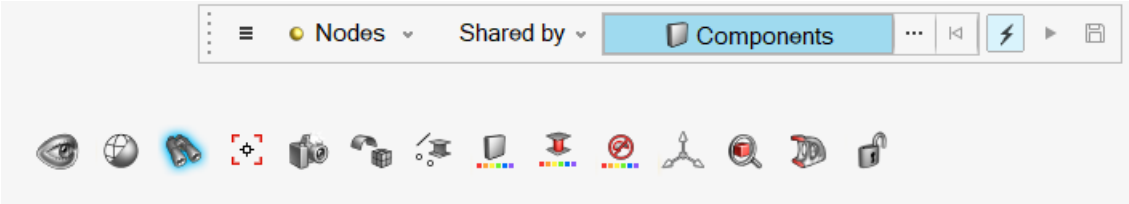
count

mass calc

tags

HyperMorph

find经典界面（寻找和显示相关对象）

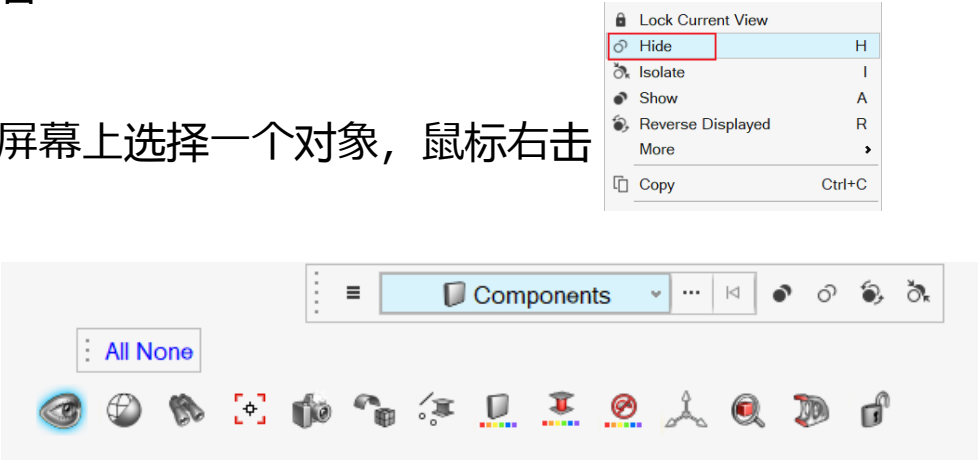
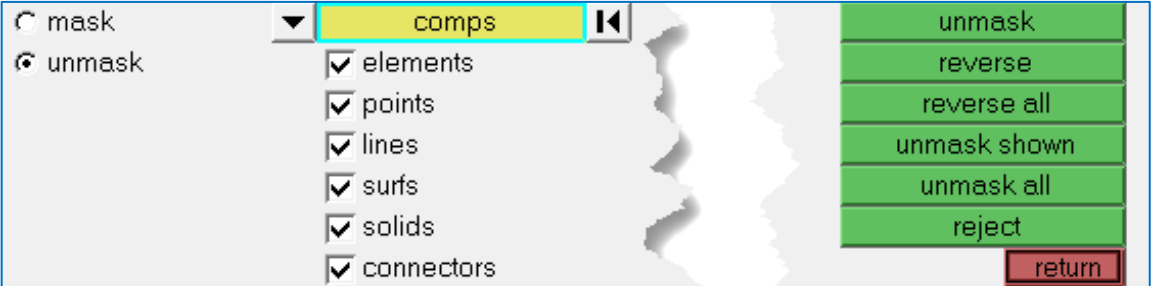
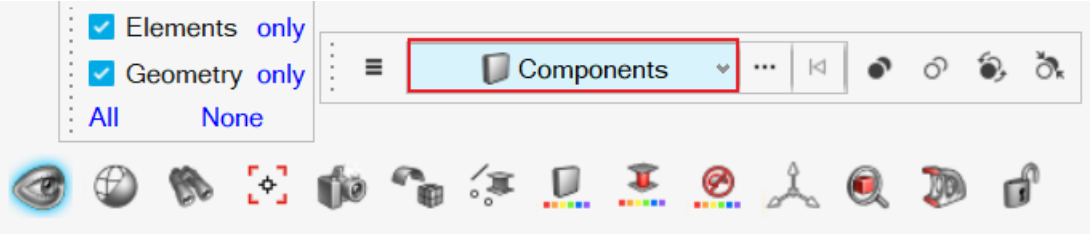
经典界面	新界面
find entities 	-使用案例- 例如，按 E 键，将切换到单元选择器  然后按 ...。用高级选项‘By ID’等选择单元指定单元后,按 I 键，在屏幕上只显示所选单元然后可以在屏幕上显示选定的单元。 
find attached 	
between 	



Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

mask经典界面（隐藏对象）

经典界面	新界面
mask 	从屏幕上选择一个对象，然后按h键（隐藏） 或者 从屏幕上选择一个对象，鼠标右击  i 选择一个对象后，可以通过按H键将其隐藏。 要反转显示，按R（reverse 的首字母）。
unmask 	

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

delete经典界面（删除对象）

经典界面

delete

▼▼elems▶▶

delete entity

preview empty

preview unused

reject

delete model

return

新界面

在不同类型之间进行切换

对象选择

Assemblies ▼

⚡ All

Assemblies

Components

Elements

Groups

Lines

Load Collectors

Loads

Materials

Nodes

Points

Properties

Sets

Solids

Surfaces

+



+

Delete

◀

▶

Tool页面

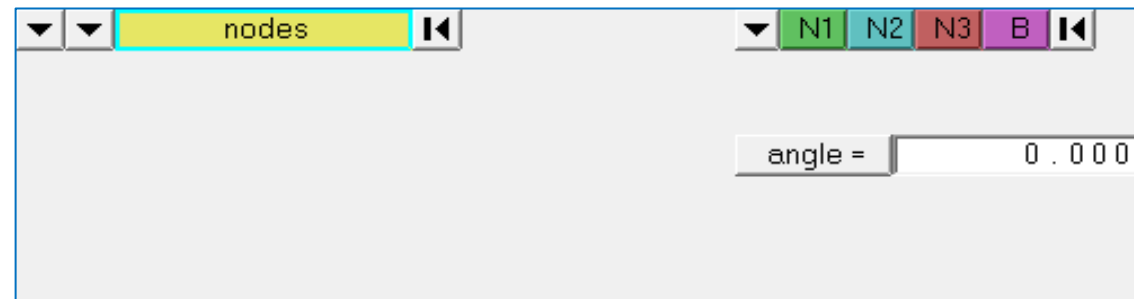
- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

translate经典界面（移动）

经典界面	新界面
translate nodes N1 N2 N3 magnitude = 0 . 0 0 0 global system	Home Move + Interactive Components (1) ... + Y: 0.00 拖动

新界面

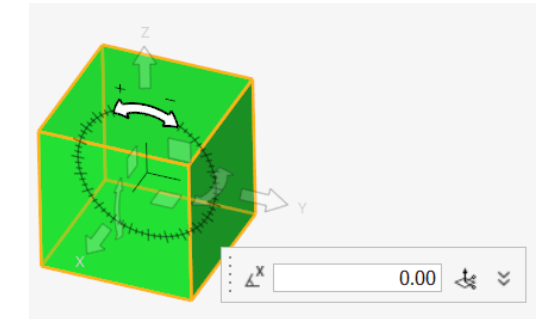
rotate

[Home](#)

Interactive ▾



Components (1) ▾



拖动

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

scale经典界面（缩放）

经典界面

scale

▼▼nodes

origin:

node

global system

x scale =1.000

y scale =1.000

z scale =1.000

uniform

新界面

Home

Scale

FE Geome

Move

Transformation Tool

Mirror

Scale

Components (1)

Systems

Local system

1.00

Scale

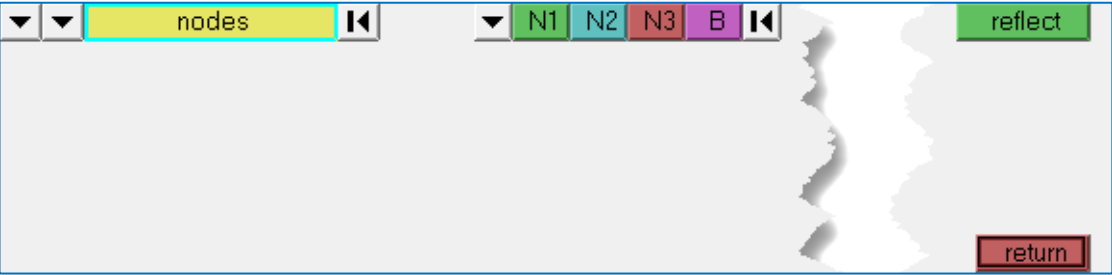
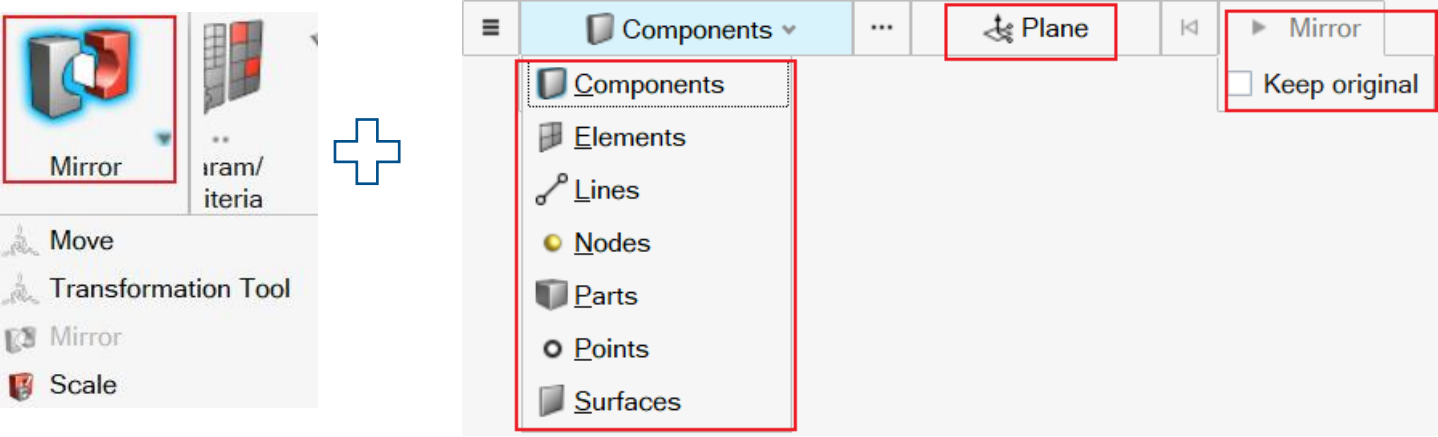
◀

▶

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

reflect经典界面（对称）

经典界面	新界面
reflect 	Home 

project经典界面（对象的投影） 1/2

assemblies

organize

color

rename

reorder

build menu

find

mask

delete

translate

rotate

scale

reflect

project

position

permutation

check elems

edges

faces

features

normals

dependency

penetration

numbers

renumber

count

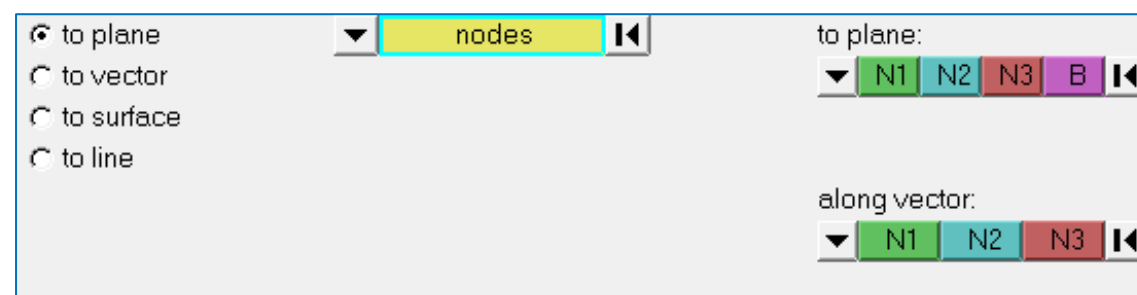
mass calc

tags

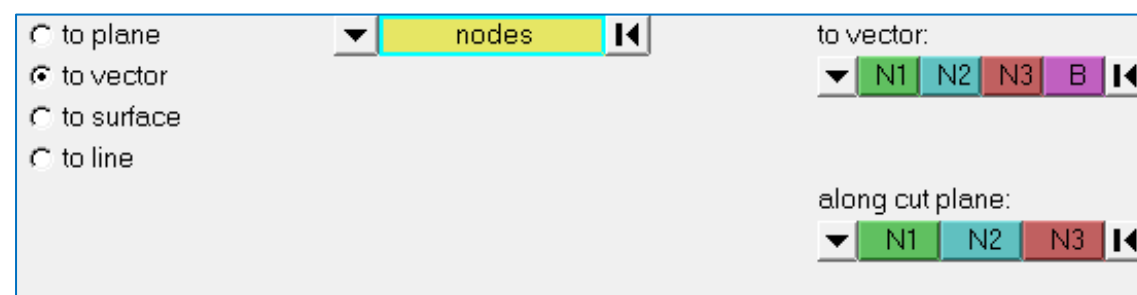
HyperMorph

经典界面

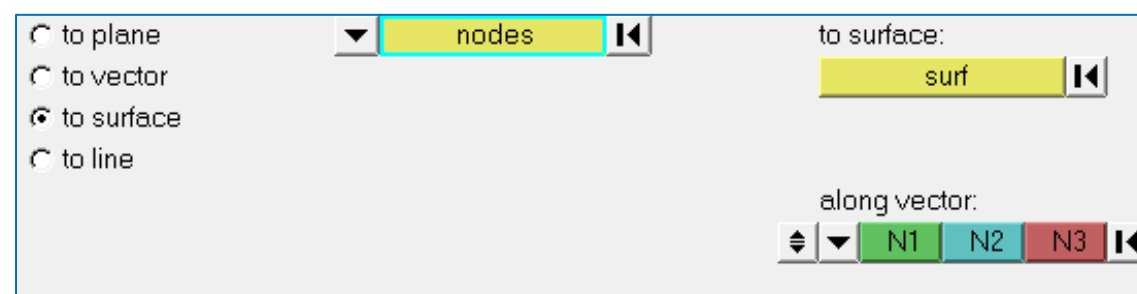
to plane



to vector

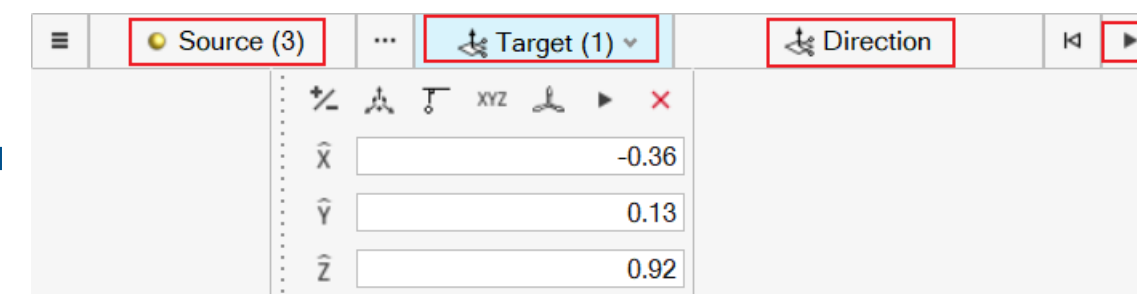


to surface

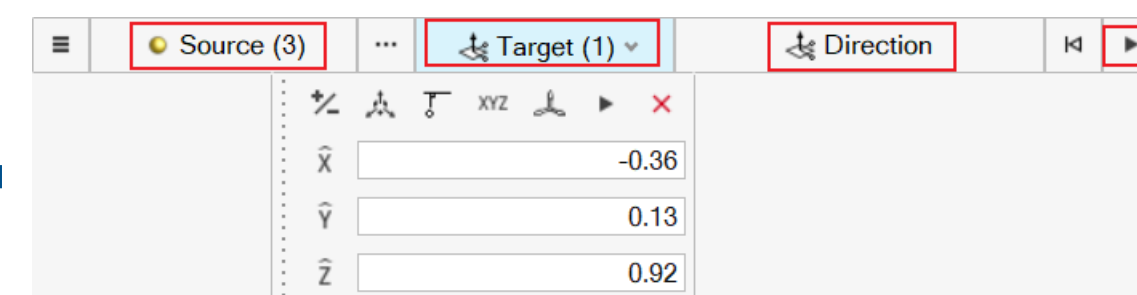


新界面

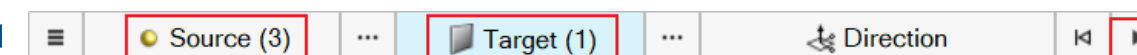
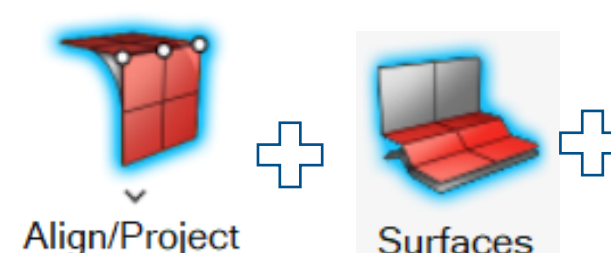
Topology



Topology



Topology



Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
- check elems
- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags
- HyperMorph

project经典界面（对象的投影） 2/2

经典界面	新界面
to line to plane to vector to surface to line nodes to line: line list along vector: N1 N2 N3	Topology Align/Project Lines Source (3) Target (1) Along vector

Tool页面

- assemblies
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- scale
- reflect
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- position
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- faces
- features
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- penetration
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- renumber
- count
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- HyperMorph

position经典界面（定位）

经典界面

position

▼

nodes

⏮

from:

N1

N2

N3

⏮

to:

N1

N2

N3

⏮

新界面

Home

⌵

Position ▼

Components ▼

Elements

Nodes

Parts

Source

Target

⏮

▶

✓

```
permute
```

▼

nodes

⏮

☒ $x \leftrightarrow y$
☐ $x \leftrightarrow z$
☐ $y \leftrightarrow z$

 停用

Tool页面

- assemblies
- organize
- color
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- renumber
- count
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check elems经典界面（单元质量检查）

经典界面	新界面
1-d 1-d free 1-d's length < 20.000 connectivity 2-d free 1-d nodes length > 0.000 duplicates 3-d rigid loops time dependency ☐ include independent nodes save failed user standard group return	Automatic 1D/2D/3D Component Configuration Element Quality Normals Part Subsystem Thickness Topology Custom + Validate Model
2-d / 3-d 1-d 2-d warp > 5.000 length < 7.500 min angl < 20.000 connectivity 3-d aspect > 5.000 length > 20.000 max ang > 120.000 duplicates time skew > 60.000 jacobian < 0.700 settings... user chord dev > 0.100 equia sk > 0.600 save failed group cell squish > 0.500 area ske > 0.600 standard trias: min angl < 20.000 quads: min angl < 45.000 max ang > 135.000 return	Automatic 1D/2D/3D Component Configuration Element Quality Normals Part Subsystem Thickness Topology Custom + Validate Model
time 1-d failure criteria minimum values check elems 2-d all types: < 0.005 0.000 shells and solids 3-d springs: < 0.005 0.000 ☐ display added mass time beams: < 0.005 0.000 user shells: < 0.005 0.000 all group solids: < 0.005 0.000 thick shells < 0.005 0.000 save failed standard return	Automatic 1D/2D/3D Component Configuration Element Quality Normals Part Subsystem Thickness Topology Custom + Validate Model

Tool页面

- assemblies
- organize
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edges经典界面（自由边检测/节点的连接）

经典界面

edges

comps

tolerance = 0.010

create:

plot elements

equiv at:

lowest id

retain:

lowest id

find:

free edges

find edges

delete edges

preview equiv

save preview equiv

equivalence

reject

return

新界面

Validate

Edges

Components

Review

+

-

←

→

↺

🗑

▶

✓

✗

◀

▶

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
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- features
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faces经典界面（在实体单元的表面创建壳单元/连接节点）

经典界面	新界面
faces ▼comps tolerance = 0.010 equiv at: lowest id retain: lowest id find faces delete faces preview equiv save preview equiv equivalence reject return	Validate Faces + Components Review + - ← → ↺ 🗑 ▶ ✓ ✗

Tool页面

- assemblies
- organize
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- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
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- HyperMorph

features经典界面（提取特征线）

经典界面	新界面
features features comps feature angle = 30.000 features edit simple ignore normals reject create: plot elements return	Topology Create Ribs Feature Edges + + + Components (1) Feature
edit features edit nodes to add feature node list review opened element featur continue add remove reject element features to remove elem restart review interactive review displayed size = 100.000 return	Topology Create Ribs Feature Edges + + Node Path Review Continue Add

Tool页面

- assemblies
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normals经典界面（检查和纠正法线方向）

经典界面	新界面
elements elements surfs displayed 2D ele orientation: auto color display display adjust reverse display adjusted only use feature angle return	2D Normals + Reverse Elements ... ⏮ ⏭ ✓ ✗
surfs elements surfs displayed surfs adjust associated FE color display display reverse return	2D Normals + Reverse Surfaces ... ⏮ ⏭ ✓ ✗

Tool页面

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- features
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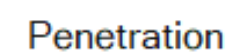
dependency经典界面（确认从属关系）

经典界面	新界面
dependency 	Validate  ** Model



penetration

Validate



Close

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
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- HyperMorph

numbers经典界面（ID号的显示）

经典界面

numbers

nodes

display

on

off

all off

return

新界面

Model

Tags

+

Tags

Name	Value
Label by ID:	☒
Entities:	0 Nodes
Color:	
Body:	
Description:	

CreateClose

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
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- scale
- reflect
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- position
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- features
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- HyperMorph

renumbers经典界面（重编号）

经典界面	新界面
single single ▼ ▼ nodes ⏮ ⏪ start with = 1 increment by = 1 offset = 0 all	Assembly 712 534 .. Renumber +  + ☰ Renumber ▼ ● Nodes ▼ ... ⏮ ⏪ ⏩ ⏭ ✓ ✗
all single ▼ ▼ all ⏮ ⏪ start with = 1 increment by = 1 offset = 0	Assembly 712 534 .. Renumber +  + ☰ Renumber ▼  All ▼ ⏮ ⏪ ⏩ ⏭ ✓ ✗

Tool页面

- assemblies
- organize
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- features
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- mass calc
- tags
- HyperMorph

count经典界面（计算对象的数量）

经典界面

count

geometrynodes=sets=plots=

FE entitieselems=plies=curves=

BC entitiescomps=laminates=titles=

safetyassemns=beamsects=tags=

morphmats=beamsectcol=

optimizationprops=

nodes

新界面

Model

Search

Mane	ID		Include
Assemblies (1)			
Cards (3)			
Components (3)			
Curves (3)			
Elements (404)			
OD (1)			
1D (1)			
2D (402)			
Equations (1)			
Geometry (8)			
Load Collectors (4)			
Load Step Inputs (2)			
Load Steps (1)			
Loads (438)			
Materials (1)			
Nodes (441)			
Parts (3)			
Properties (1)			
Results (1)			
Sets (4)			
System Collectors (3)			
Tags (1)			
Titles (1)			

i

图形区选中需要计数的对象，左下角也会显示数量。

Tool页面

- assemblies
- organize
- color
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- find
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mass calc经典界面（体积·面积·质量的测量）

经典界面	新界面
elements surfaces solids comps area = 0.000 volume = 0.000 total mass = 0.000 calculate return	Home Measure + + Components (1) Compute Area: 28365.12 Volume: 99277.91 Mass: 77.44 Structural: 77.44 Non Structural: 0.00 Center of Gravity: X: 2160.67 Y: -552.04 Z: 625.67
elements surfaces solids surfs area = 0.000 calculate return	Home Measure + + Surfaces (1) Compute Area: 1722.38 Bounding box dimensions: Dim1: 49.85 Dim2: 34.55 Dim3: 0.00
elements surfaces solids solids area = 0.000 volume = 0.000 calculate return	Home Measure + + Solids (1) Compute Area: 5607.62 Volume: 27037.88 Bounding box dimensions: Dim1: 43.65 Dim2: 27.60 Dim3: 22.44

Tool页面

- assemblies
- organize
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- dependency
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- count
- mass calc
- tags
- HyperMorph

tags经典界面（标签）

经典界面

create

create

update

label by ID

node

label =

body =

color

tag text display:

label

tag icon display:

text only

update

tag

node

entity type =

entity id =

label =

body =

color

tag text display:

label

tag icon display:

text only

新界面

Model

Tags

Tags (1)

tag_node: 1

Name	Value
Label by ID:	☐
Entity:	<Unspecified>
Color:	
Label:	
Body:	
Description:	

CreateClose

Model

Tags

tag_node: 1

Name	Value
Name:	tag_node:
ID:	1
Color:	
Include:	[Main Model]
Label:	tag_node
Body:	
Description:	
Entity:	(35) Node

Metadata

Tool页面

- assemblies
- organize
- color
- rename
- reorder
- build menu
- find
- mask
- delete
- translate
- rotate
- scale
- reflect
- project
- position
- permute
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- edges
- faces
- features
- normals
- dependency
- penetration
- numbers
- renumber
- count
- mass calc
- tags

HyperMorph

HyperMorph经典界面（设置和执行网格变形）

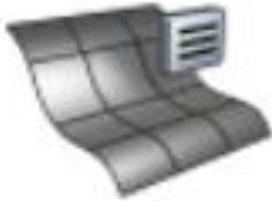
经典界面

morph constraints	morph volumes	morph	morph options
systems	domains	map to geom	
symmetry	handles	freehand	
shapes			

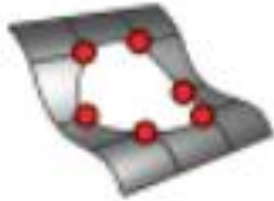
return

新界面

Morph



Options



Constraints

..

Setup



Free



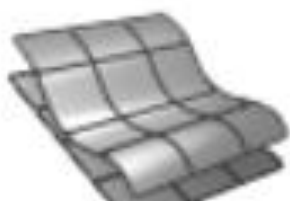
Proximity



Volumes

..

Morph



Shapes

Save

试用新的工作流程!

Post页面

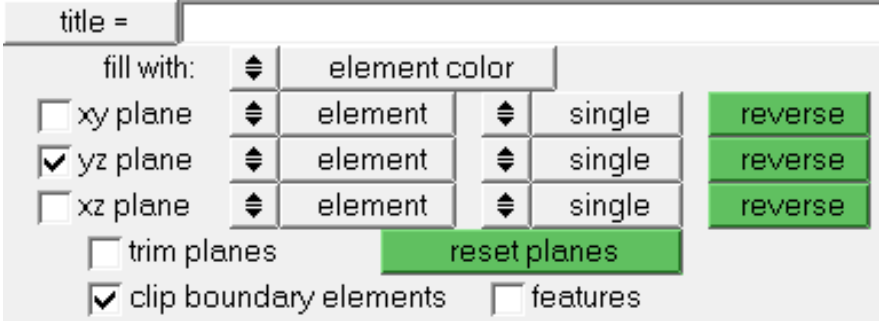
	hidden line	deformed	xy plots	apply result	Geom 1D 2D 3D Analysis Tool Post
--	-------------	----------	----------	--------------	--

Post页面

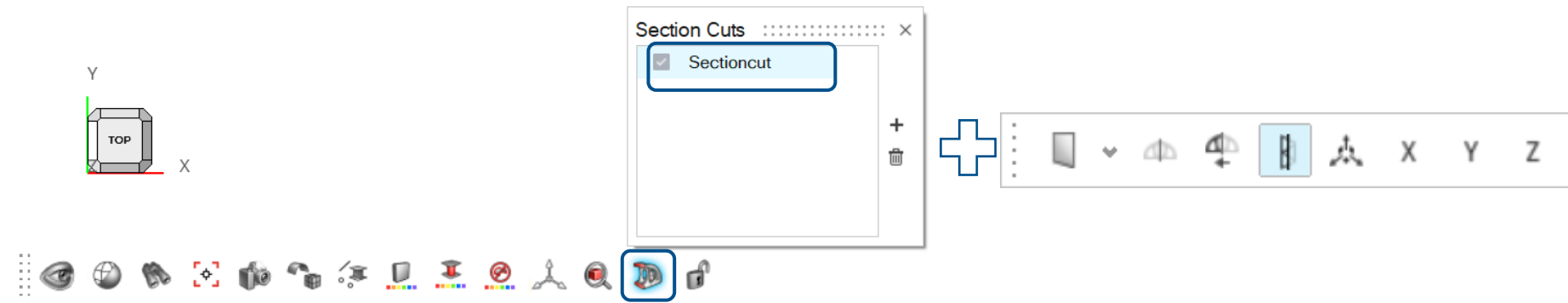
- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

hidden line（剖面图）

经典界面



新界面



 还允许对网格、几何体进行截面切割

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

contour (云图)

经典界面

simulation =

prev

next

data type =

prev

next

title =

params

legend

cutting

isosurface

magnitude

undeformed

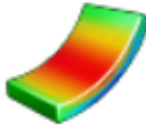
mult = 1 . 0 0 0

min/max titles

info title

新界面

Post



Contour

contour1

Components

Plot

Contour

Name

Value

Name:

contour1

ID:

1

Data Type:

SPC Forces

Data Component:

Mag

Layer:

Resolved In:

global

Averaging:

Corner Data:

Entity IDs:

0 Components

Complex Filter:

real

Omega T (in degrees):

45.0

Enable Iso Plot:

Contour Label:

Custom Legend:

Legend Visibility:

Metadata

Close

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

vector plot (矢量显示)

经典界面

simulation =

data type =

title =

magnitude % =

100.000

prev

next

prev

next

新界面

Post



Vector

vector4

Components (1)

Plot

Vector

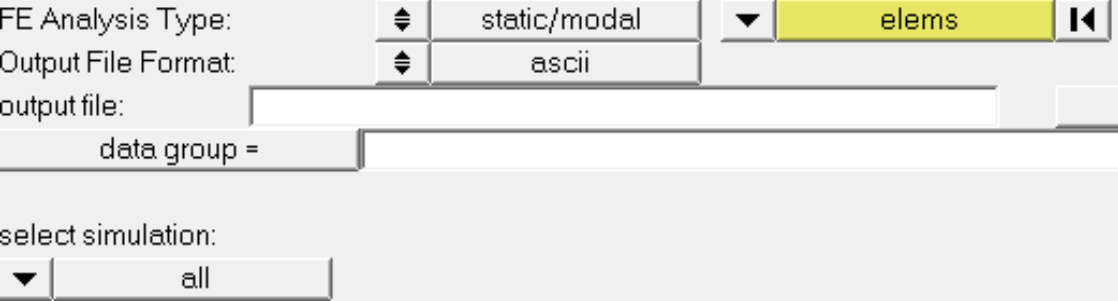
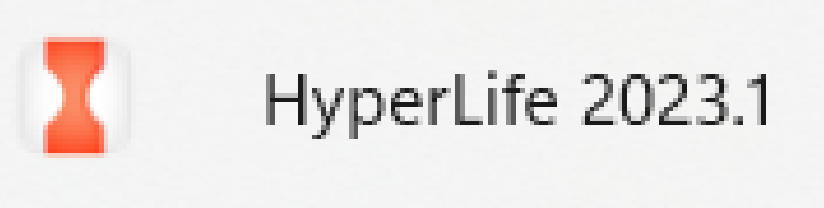
Name	Value
Name:	vector4
ID:	4
Data Type:	Displacement
Layer:	
Resolved In:	global
Corner Data:	☐
Entity IDs:	1 Components
Complex Filter:	mag*cos(wt+phase)
Omega T (in degrees):	45.0
X:	☐
Y:	☐
Z:	☐
Resultant:	☒
Display	
Scale Mode:	By Magnitude
Scale Value:	1.0
Show Values:	☐
Show Prefix:	☐
Value Format:	Fixed
Value Precision:	1
Custom Legend:	☐
Legend Visibility:	☒
Metadata	

Close

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

fatigue (疲劳)

经典界面	新界面
	利用新增加的产品HyperLife的优势。  在HyperLife中计算疲劳，消耗30个HWU。



Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

deformed (变形动画)

经典界面

simulation =

prev

next

data type =

prev

next

title =

model units =

1 0 . 0 0 0

frames =

4

undef color

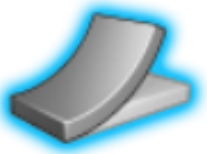
as selected

deform color

use elem color

新界面

Post



**

Deformed

deformed2

Plot

Deformed

Name	Value
Name:	deformed2
ID:	2
Data Type:	Displacement
Complex Filter:	mag*cos(wt+phase)
Omega T (in deg...	45.0
Scale Mode:	Scale Factor
Scale Type:	Uniform
Uniform Scale:	1.0
Undeformed Shape:	None

Metadata

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

transient（时间历程动画）

经典界面

start with =

prev

next

end with =

prev

next

data type =

prev

next

title =

step by =

1

find maximum

scale factor =

1 . 0 0 0

find minimum

新界面

Post

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

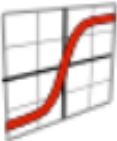
xy plots (XY曲线)

经典界面

files	read curves	axis scaling	plot titles	query curves
plots	results curves	axis labels	legend	integrate
rename	simple math	grid attribs	border	
	edit curves	grid labels		
	curve attribs			

新界面

Model



..

Curves

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

titles (标题)

经典界面

name =

attach to:

entity:

node

text attributes:

☐ color

font 1

border:

☒ on

☐ color

anchor:

lower left

新界面

Model

Tags

+

Tags

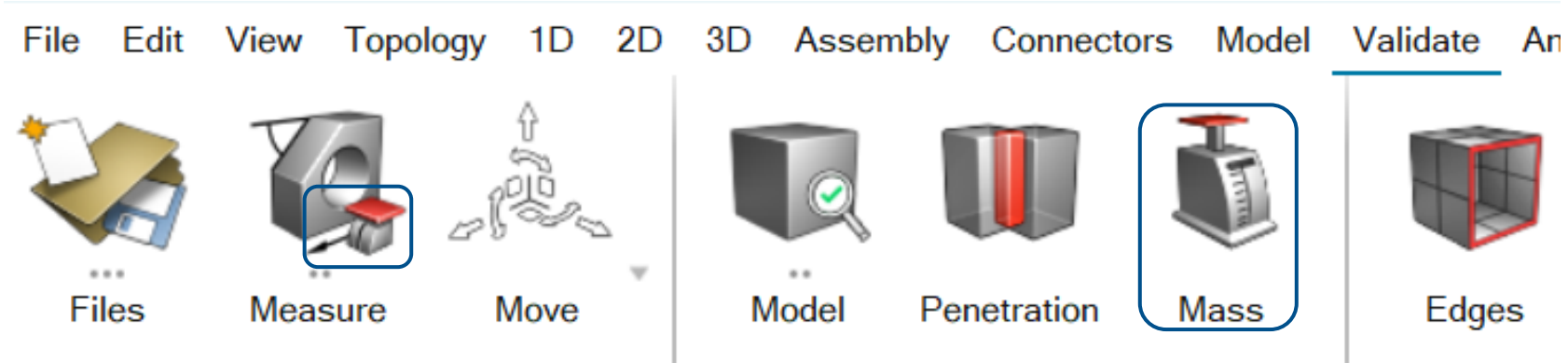
Name	Value
Label by ID:	☐
Entity:	<Unspecified>
Color:	
Label:	
Body:	
Description:	

CreateClose

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

summary (摘要)

经典界面	新界面
	

Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

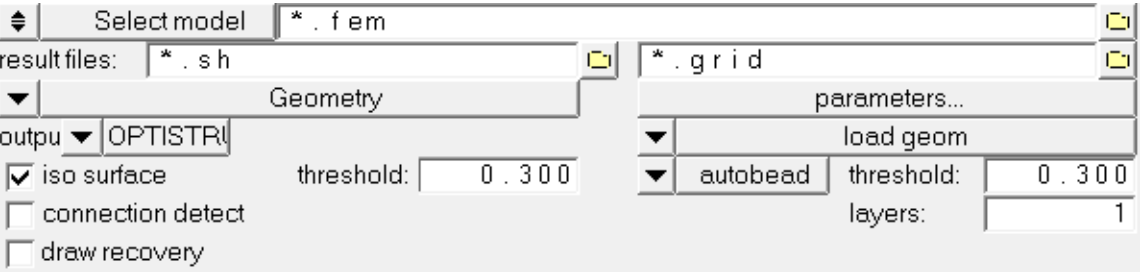
apply result (.res文件结果的变形反映在模型中)

经典界面	新界面
simulation = prev next data type = prev next displacements total disp nodes create loads mult = 1 . 0 0 0	Model Browser > Create > Field

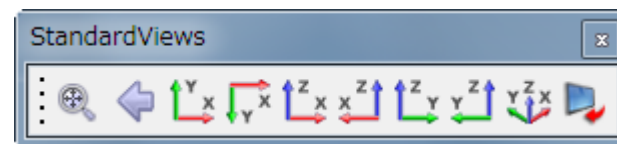
Post页面

- hidden line
- contour
- vector plot
- fatigue
- deformed
- transient
- xy plots
- titles
- summary
- apply result
- OSSmooth

OSSmooth（优化结果的生成）

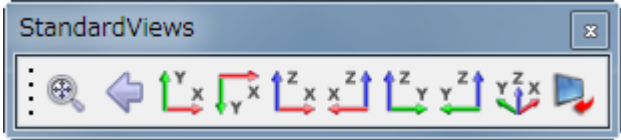
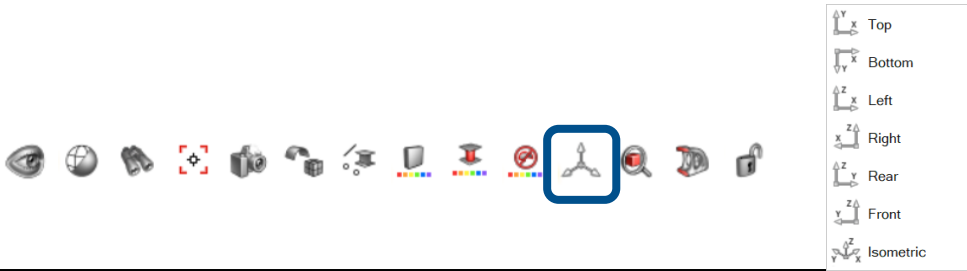
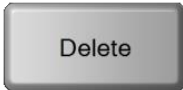
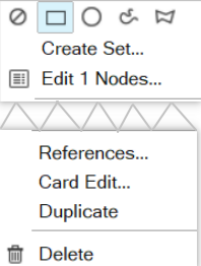
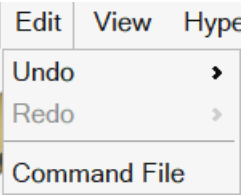
经典界面	新界面
	Optimize  Optimize Tools OSSmooth OSSmooth Volume Voxelmesh Hex-core Matfrac Reg. Volfrac OSSmooth Use current model Model: *.fem Result files(.grid): *.grid Design interpretation: Geometry Parameters Output: OptiStruct Geometry options: Load geometry Optimization: Autobead threshold: 1.0 Layers: 1 Iso Threshold: 0.30 Connection detect Low threshold: Default Draw recovery Run Cancel

图标（工具条）



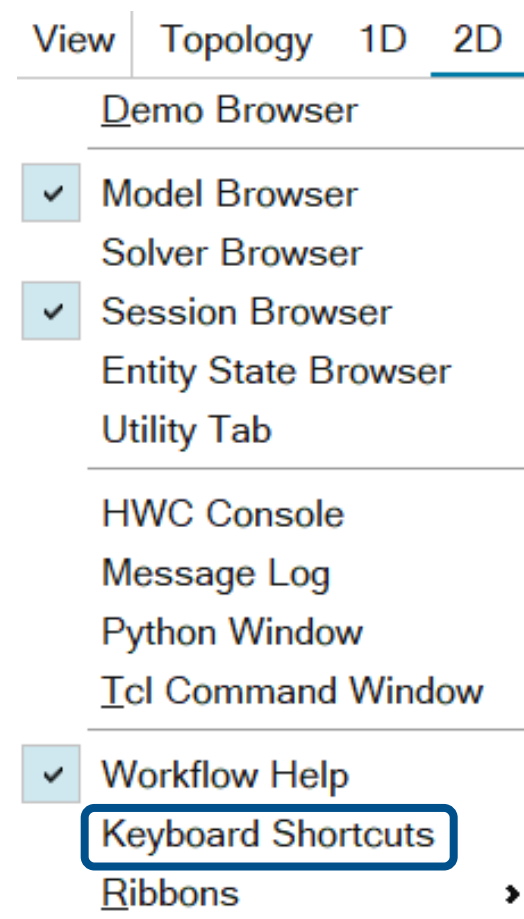
图标

图标（只有容易混淆的图标）

经典界面		新界面
	 切换用户配置文件	下拉菜单 File⇒Solver Interface
	 切换视图方向	
	 Delete（删除）	选择一个对象后，按  键
	 Card Edit（卡片编辑器）	 选择一个对象后右键单击⇒Card Edit 
	 梁/壳 显示 立体	
	 Undo /  Redo	下拉菜单 Edit⇒Undo/Redo Undo:    Redo:    

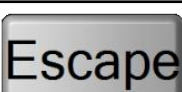
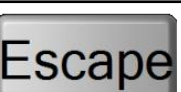


快捷键



- 快捷键
- 选择对象
- 显示
- 选择
- 视图
- 编辑
- 浏览器内
- 面板菜单
- 截图

快捷键 1/4

分类	操作	快捷键
选择对象	组件（Components） / 连接元（Connectors）	
	单元（Elements）	
	层压材料（Laminates） / 线（Lines） / 载荷（Loads）	
	材料（Materials）	
	铺层（Plies） / 点（Points） / 属性（Properties）	
	实体（Solids） / 面（Surfaces） / 坐标系（Systems）	
	所有（All）	  
显示	显示/隐藏全部（Show / Hide All）	
	在对话中显示/隐藏（显示/隐藏dialog）	
	隐藏（Hide）	
	单独显示（Isolate）	
	邻近显示（Adjacent）	
	反向显示（Reverse）	
	解除隐藏（Unhide）	



快捷键

选择对象

显示

选择

视图

编辑

浏览器内

面板菜单

截图

快捷键 2/4

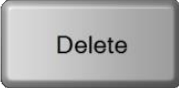
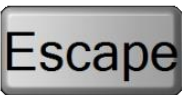
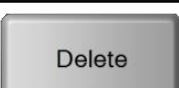
分类	操作	快捷键
选择	框选	 拖动
	增加选择 / 范围增加选择	Ctrl   Ctrl   拖动
	取消选择 / 范围取消选择	Shift   Shift   拖动
	选择所有（显示的内容）	Ctrl  A
	选择所有（不管是否显示）	Ctrl  Shift  A
	邻近选择（将邻近的对象添加到当前选择中）	Ctrl  J
	反选	Ctrl  R
	取消选择	Escape
	选择列表/选择选项	Space
视图	模型放置到合适位置	F
	恢复前一个视图	B
	模型浏览器	F2
	实体编辑	F3
	命令窗口	F4
	工作流程帮助	F12



快捷键

- 选择对象
- 显示
- 选择
- 视图
- 编辑
- 浏览器内
- 面板菜单
- 截图

快捷键 3/4

分类	操作	快捷键
编辑	删除 (Delete)	
	Undo (Undo)	  
	Redo (Redo)	  
	接受 (Accept)	
	从活动工具中退出	 或者 
	改变组织关系 (Organize)	
	剪切 (Cut)	  
	复制 (Copy)	  
	粘贴 (创建新组件)	  
	粘贴 (到当前组件)	    
浏览器内	显示 (Show)	
	隐藏 (Hide)	
	单独显示 (Isolate)	
	删除 (Delete)	
	复制 (Duplicate)	  



快捷键

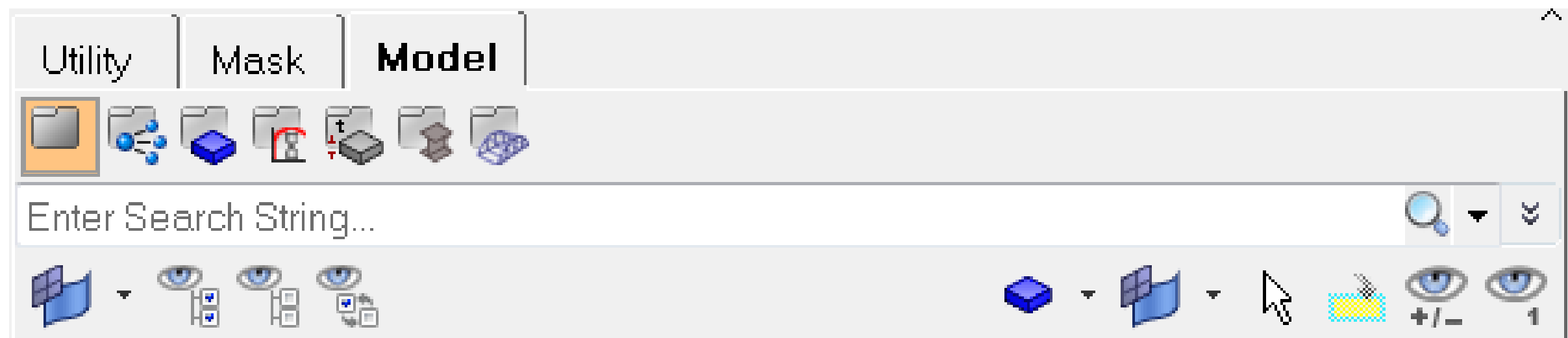
- 选择对象
- 显示
- 选择
- 视图
- 编辑
- 浏览器内
- 面板菜单
- 截图

快捷键 4/4

分类	操作	快捷键
面板菜单	显示帮助	F1 或者 H
	删除（DELETE面板）	F2
	移动节点(REPLACE面板)	F3
	测量距离（DISTANCE面板）	F4
	部分隐藏（MASK面板）	F5
	手动创建单元（编辑单元面板）	F6
	在虚拟向量上对齐节点（节点编辑面板中的对齐功能）	F7
	创建节点（节点面板）	F8
	合并行（行编辑中的合并功能）	F9
	单元质量检查（CHECK ELEMS面板）	F10
	经常使用的几何体修改功能（quick edit面板）	F11
	自动创建壳单元（automesh面板）	F12
打印/截图	截图	Ctrl + F1
	保存BMP文件（自动将背景改为白色，启动Paint）	Ctrl + F2
	保存JPEG文件（自动将背景改为白色）	Ctrl + F6



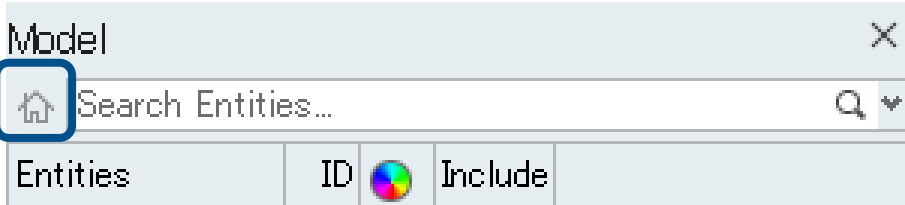
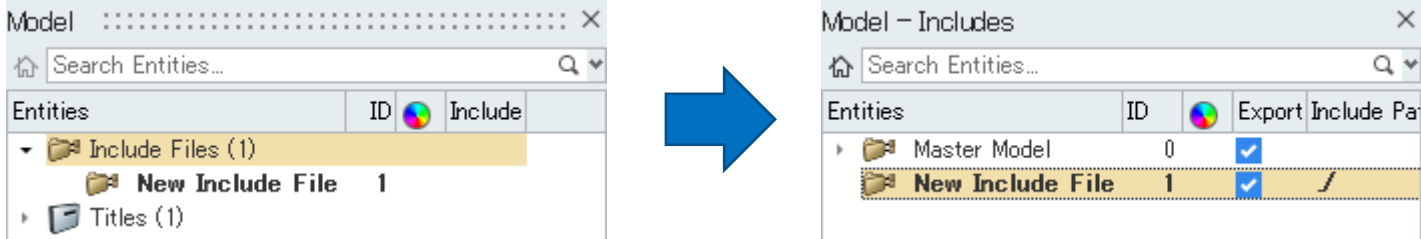
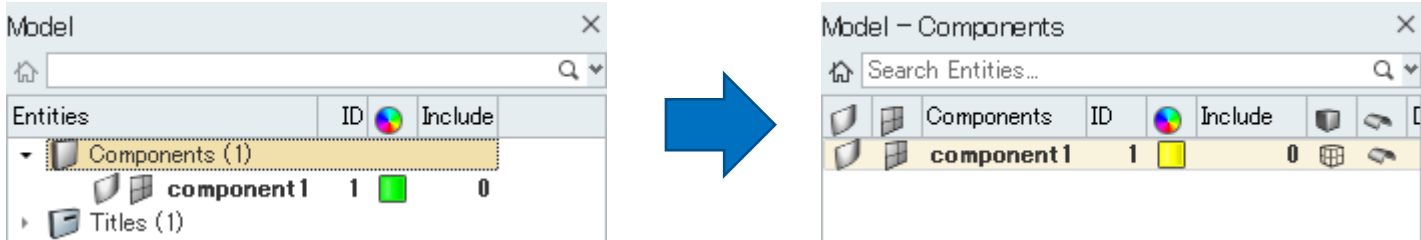
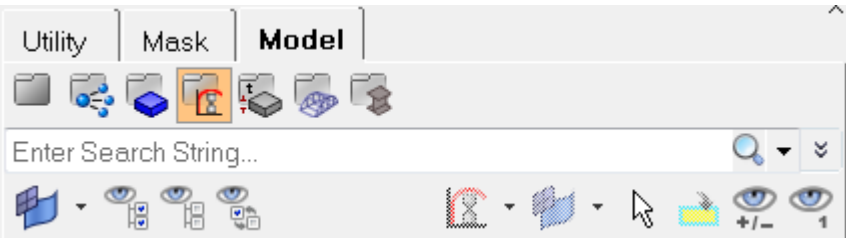
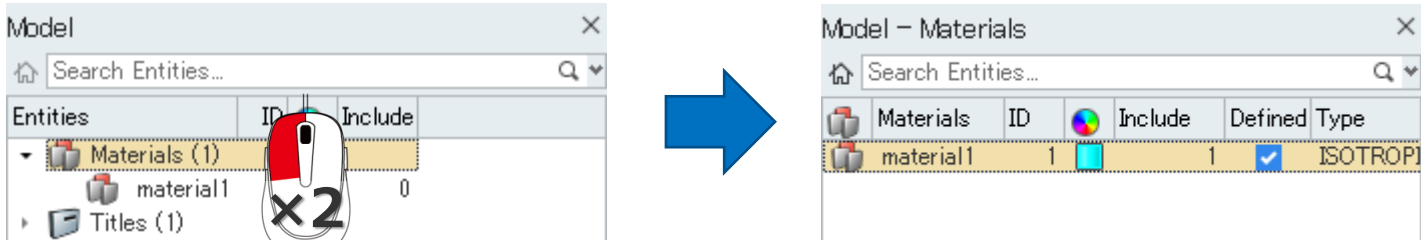
浏览器



图示 1	键盘 1	图示 2	键盘 2	图示 3	键盘 3
	摁几次		参见选择目标		
			不需要		
	× 2		不需要 (始终处于选择模式)		
			—		

浏览器 (Model)

 除了以下内容外，你还可以双击每个项目名称，进入相关的对象视图。

经典	新界面
Model View 	 : 重置浏览器 (Model View)
Include View 	双击Include Files 
Component View 	双击Components 
Material View 	双击Materials 
Property View 	双击Properties 