

# Layer

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## 1 介绍

Baffalo\_Layer 作为一个类似于图层的类，他可以存储不同的元素（点、线、网格），且更加关注不同元素间的计算和转换。

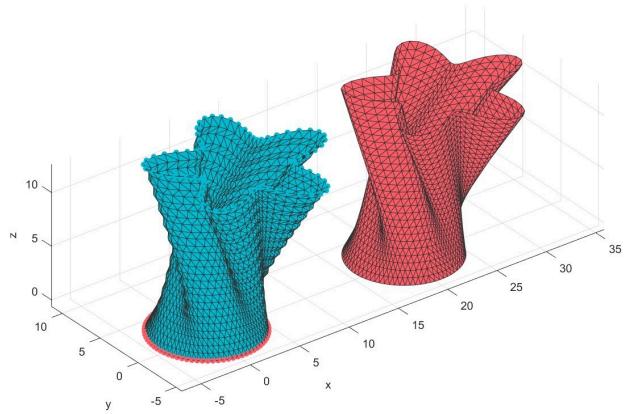
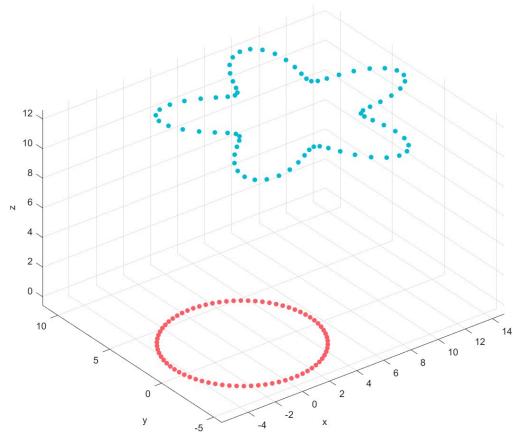
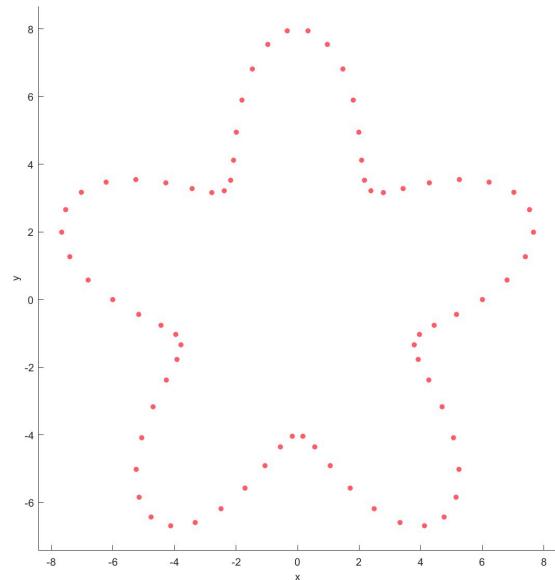
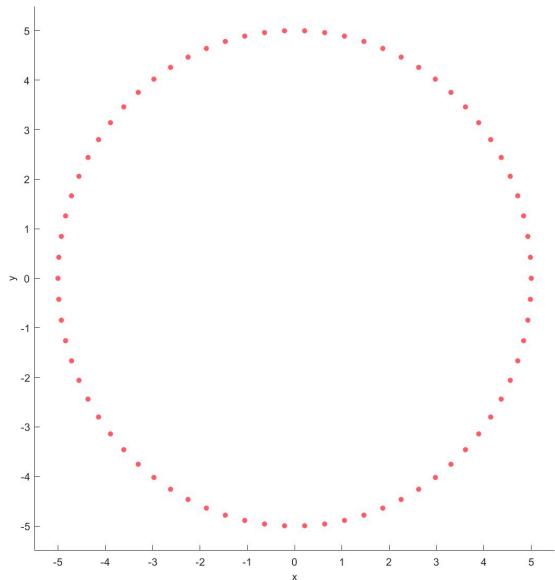
主要参考的工具箱或代码：Gibbon<sup>[1]</sup><sup>[2]</sup>,MRST<sup>[3]</sup>

## 2 案例

### 2.1 LoftLinear (Flag=1)

```
1 %% Bottom verts
2 ns=75;
3 t=linspace(0,2*pi,ns);
4 t=t(1:end-1);
5 r=5;
6 x=r*cos(t);
7 y=r*sin(t);
8 a=Point2D('Bottom Verts');
9 a=AddPoint(a,x',y');
10 Plot(a);
11 %% Top verts
12 t=linspace(0,2*pi,ns);
13 t=t(1:end-1);
14 r=6+2.*sin(5*t);
15 [x,y] = pol2cart(t,r);
16 a1=Point2D('Top Verts');
17 a1=AddPoint(a1,x',y');
18 Plot(a1);
19 %% Layer
20 l1=Layer('Layer');
21 l1=AddElement(l1,a);
22 l1=AddElement(l1,a1,'transform',[6,3,12,0,0,90]);
23 Plot(l1);
24 l1=LoftLinear(l1,1,2,'closeLoopOpt',1,'patchType','tri_slash');
25 l1=LoftLinear(l1,1,2,'closeLoopOpt',1,'patchType','tri');
26 l1=Move(l1,[20,0,0],'Meshes',1);
27 Plot(l1);
```

通过点loft出曲面。



## 2.2 Extrude to face (Flag=2)

```

1  %% Bottom verts
2  ns=75;
3  t=linspace(0,2*pi,ns);
4  t=t(1:end-1);
5  r=5;
6  x=r*cos(t);
7  y=r*sin(t);
8  a=Point2D('Bottom Verts');
9  a=AddPoint(a,x',y');
10 Plot(a);
11 %% Top verts
12 t=linspace(0,2*pi,ns);
13 t=t(1:end-1);
14 r=6+2.*sin(5*t);
15 [x,y] = pol2cart(t,r);
16 a1=Point2D('Top Verts');
17 a1=AddPoint(a1,x',y');
18 Plot(a1);

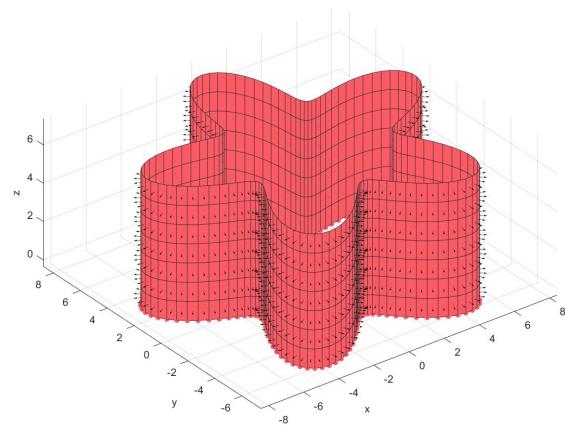
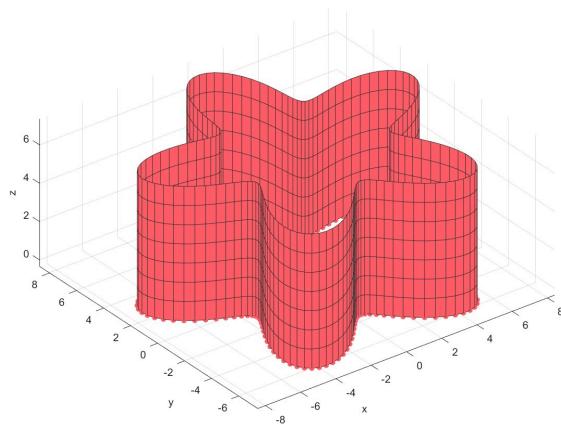
```

```

20 l1=Layer('Layer');
21 l1=AddElement(l1,a);
22 l1=AddElement(l1,a1, 'transform',[6,3,12,0,0,90]);
23 Plot(l1);
24 l1=LoftLinear(l1,1,2, 'closeLoopOpt',1, 'patchType','tri_slash');
25 l1=LoftLinear(l1,1,2, 'closeLoopOpt',1, 'patchType','tri');
26 l1=Move(l1,[20,0,0], 'Meshes',1);
27 Plot(l1);

```

拉伸出曲面。



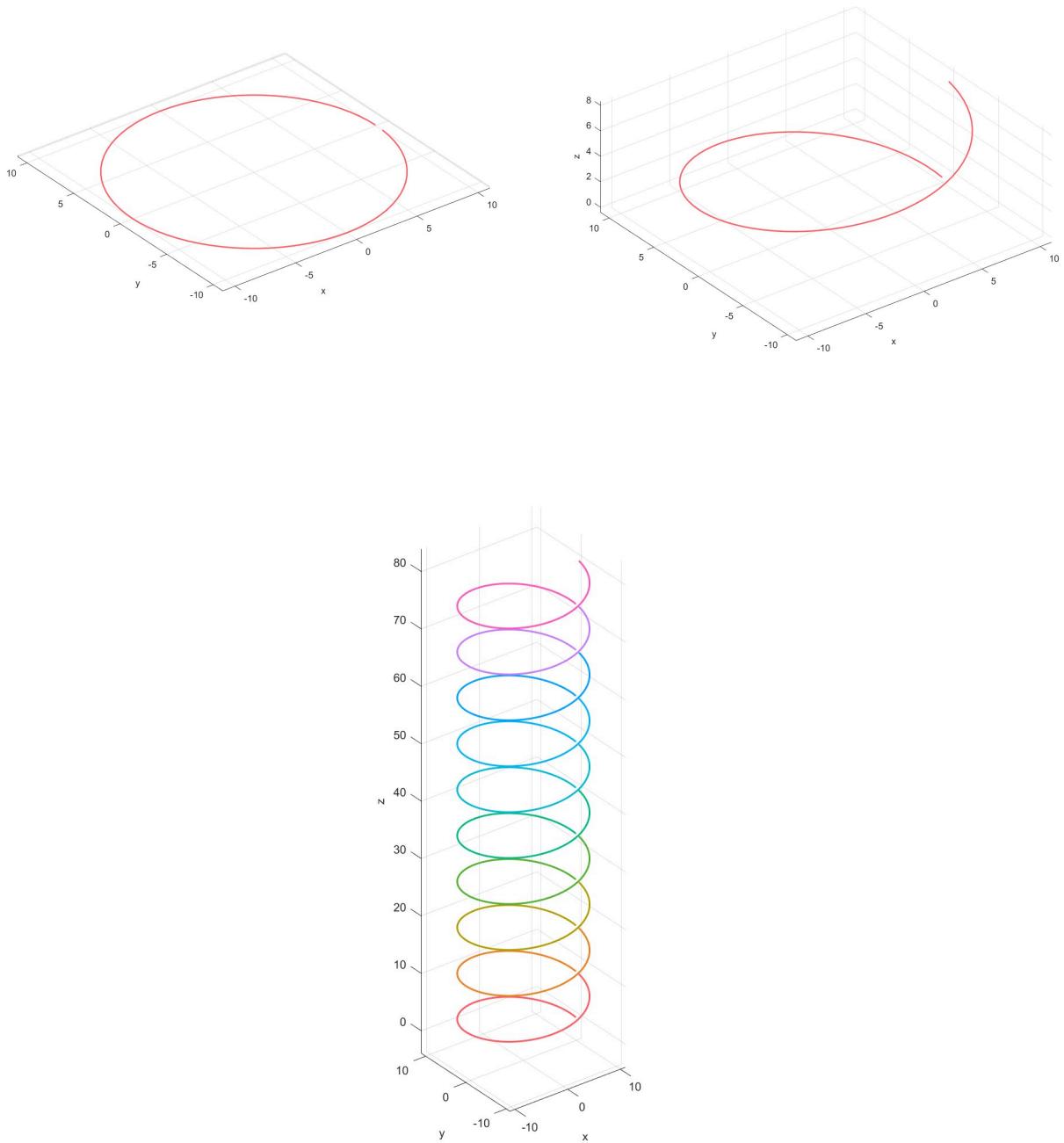
### 2.3 Helical Line (Flag=3)

```

1 %% Create circle
2 a=Point2D('Point');
3 a=AddPoint(a,0,0);
4 b=Line2D('Line');
5 b=AddCircle(b,10,a,1,'seg',80);
6 l1=Layer('Layer1');
7 l1=AddElement(l1,b);
8 Plot(l1);
9 l1=Move(l1,[zeros(80,1),zeros(80,1),0.1*(0:79)' ],'Lines',1);
10 Plot(l1);
11 for i=1:9
12 l1=Move(l1,[0,0,0.1*80*i],'Lines',1,'new',1);
13 end
14 Plot(l1);

```

生成螺旋线。



## 2.4 Add Mesh (Flag=4)

```

1  %% Create circle
2  a=Point2D('Point');
3  a=AddPoint(a,0,0);
4  b=Line2D('Line');
5  b=AddEllipse(b,20,20,a,1,'ang',80);
6  mm=Mesh('Shell Mesh');
7  mm=Rot2Shell(mm,b,'Slice',72,'Type',2);
8  mm=ReverseNormals(mm);
9  l1=Layer('Layer1');
10 l1=AddElement(l1,mm,'Transform',[0,0,0,-90,0,0]);
11 Plot(l1);
12 m1=Mesh2D('Mesh1');

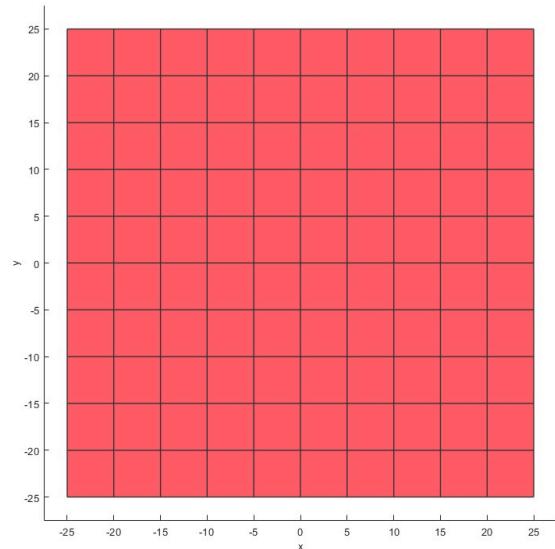
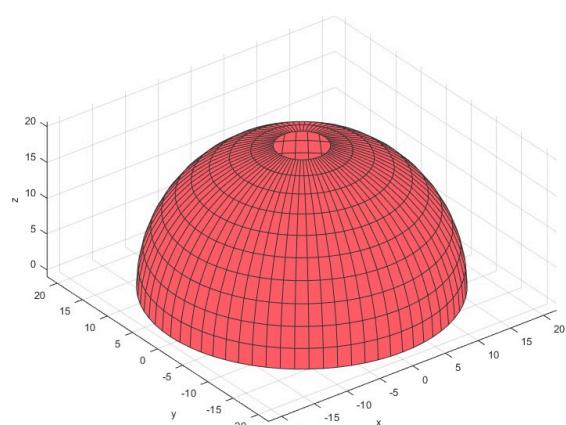
```

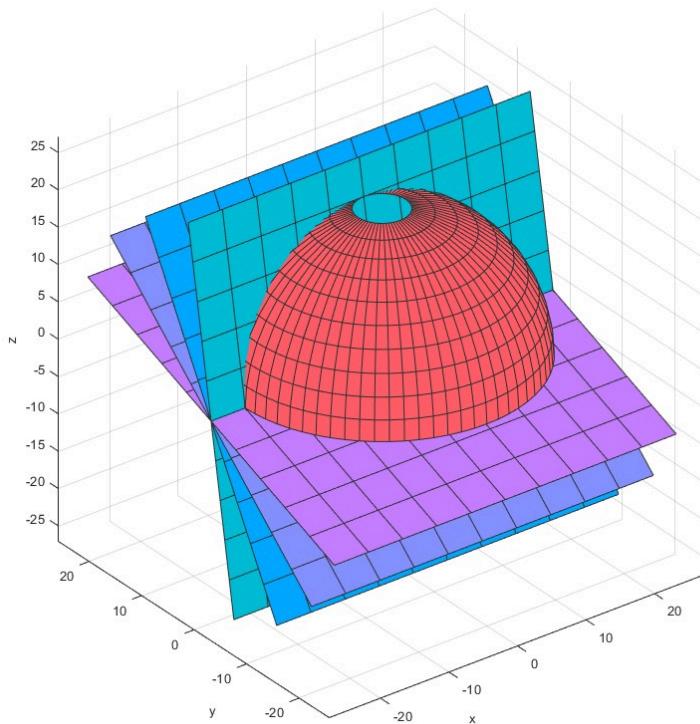
```

13 m1=MeshQuadPlate(m1,[50,50]);
14 Plot(m1);
15 l1=AddElement(l1,m1,'Transform',[0,0,0,-80,0,0]);
16 l1=AddElement(l1,m1,'Transform',[0,0,0,-60,0,0]);
17 l1=AddElement(l1,m1,'Transform',[0,0,0,-40,0,0]);
18 l1=AddElement(l1,m1,'Transform',[0,0,0,-20,0,0]);
19 % l1=AddElement(l1,m1,'Transform',[0,0,0,-80,0,0]);
20 % l1=AddElement(l1,m1,'Transform',[0,5,0,-80,0,0]);
21 % l1=AddElement(l1,m1,'Transform',[0,10,0,-80,0,0]);
22 % l1=AddElement(l1,m1,'Transform',[0,15,0,-80,0,0]);
23 % l1=AddElement(l1,m1,'Transform',[0,0,0,0,0,0]);
24 % l1=AddElement(l1,m1,'Transform',[0,0,5,0,0,0]);
25 % l1=AddElement(l1,m1,'Transform',[0,0,10,0,0,0]);
26 % l1=AddElement(l1,m1,'Transform',[0,0,15,0,0,0]);
27 Plot(l1);

```

加入网格。





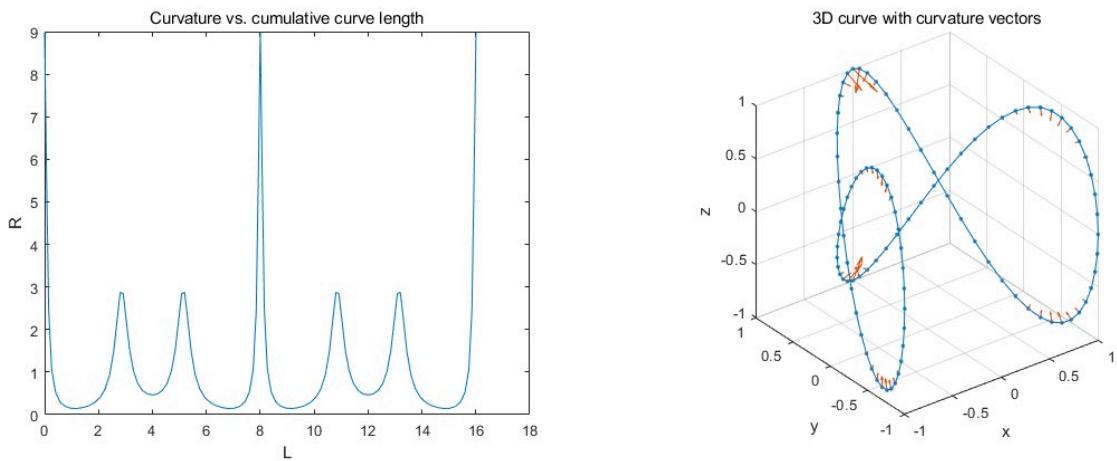
## 2.5 Add Curve and calculate curvature (Flag=5)

```

1 N = 101;
2 theta = linspace(0,pi,N);
3 x = sin(2*theta);
4 y = cos(4*theta);
5 z = cos(6*theta);
6 P = [x',y',z'];
7 l1=Layer('Layer1');
8 l1=AddCurve(l1,P);
9 Plot(l1);
10 [L,R,K,~] = CalculateCurvature(l1,1);
11 figure;
12 plot(L,1./R)
13 xlabel L
14 ylabel R
15 title('Curvature vs. cumulative curve length')
16 figure;
17 h = plot3(P(:,1),P(:,2),P(:,3));
18 grid on;
19 axis equal
20 set(h, 'marker', '.');
21 xlabel x
22 ylabel y
23 zlabel z
24 title('3D curve with curvature vectors')
25 hold on
26 quiver3(P(:,1),P(:,2),P(:,3),K(:,1),K(:,2),K(:,3));
27 hold off

```

曲线曲率计算参考于<sup>[4]</sup>,用于计算空间中曲线的曲率。



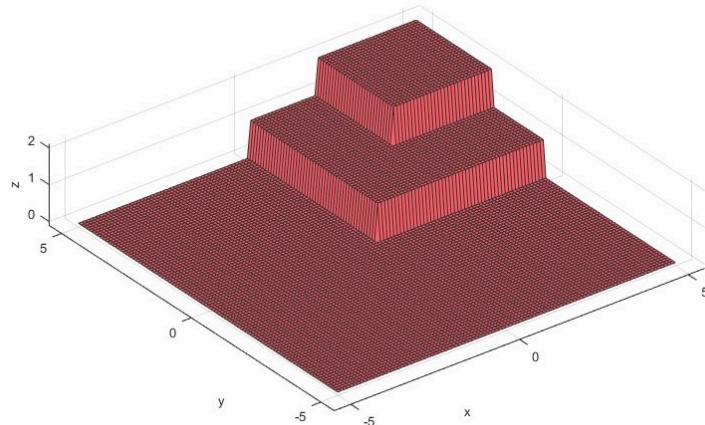
## 2.6 Add thickness of a plate (Flag=6)

```

1 m=Mesh2D('Mesh1');
2 m=MeshQuadPlate(m,[10,10],[100,100]);
3 l1=Layer('Layer1');
4 l1=AddElement(l1,m);
5 f=@(x,y,z)and(x>0,y>0);
6 l1=AddHeight(l1,1,1,'fun',f);
7 f=@(x,y,z)and(x>2,y>2);
8 l1=AddHeight(l1,1,1,'fun',f);
9 Plot(l1)

```

对一个平板增加高度。



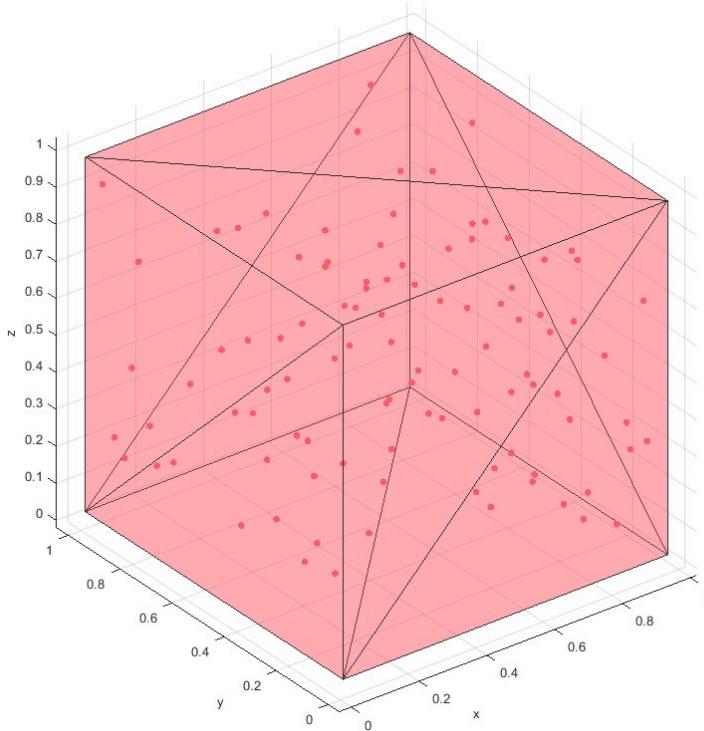
## 2.7 Bounding Box (Flag=7)

```

1 points=rand(100,3);
2 l1=Layer('Layer1');
3 l1=AddPoint(l1,points);
4 l1=BoundingBox(l1,1);
5 Plot(l1,'face_alpha',0.3);

```

计算空间中点包围。



## 2.8 Sweep loft (Flag=8)

```

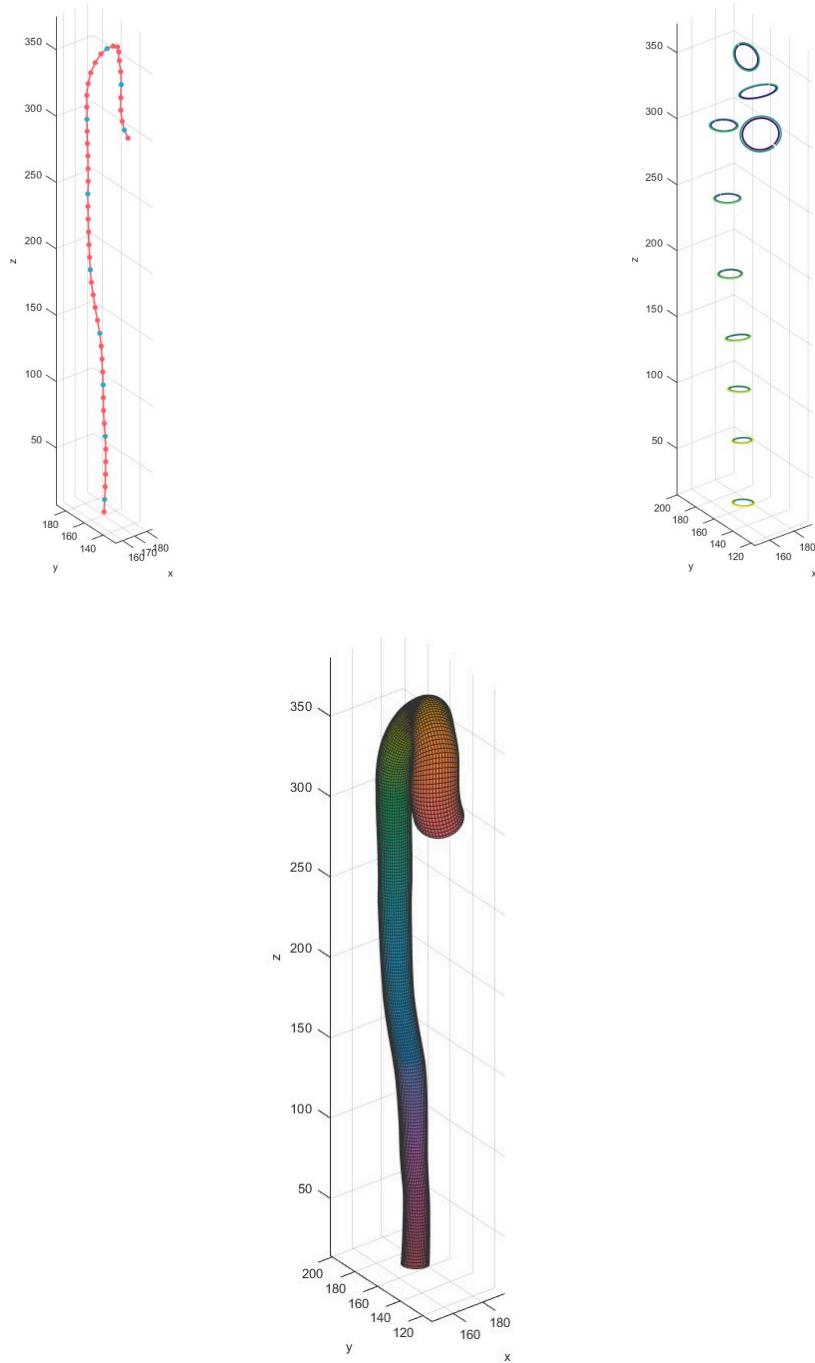
1 %% Load data as structure
2 dataStruct=load('Concannon_aorta_segmentation.mat');
3 %Define smoothing Parameters
4 pointSpacing=1.7;
5 smoothFactorCentreLine=0.01; %Cubic smooth spline parameter [0-1] use empty to turn
off
6 smoothFactorSegments=0.01; %Cubic smooth spline parameter [0-1], 0=straight line,
1=cubic
7 % Access data structure components
8 V_cent=dataStruct.Cent; %Centroid list
9 segmentCell=dataStruct.Points; %Lumen boundary coordinates
10 %Define thickness information
11 dataStruct.WallThickness=[1.425 0.9 1 1.025 0.833333333 0.891666667 0.95 0.975 0.9
0.825];
12 wallThickness=dataStruct.WallThickness; %Raw data for wall thickness as a function of
location
13 % Resampling aorta section contours
14 %Resample boundary points so each plane has same number of points for lofting
15 %Find number of points to use based on biggest circumference
16 d=zeros(size(segmentCell,2),1);
17 SegNum=size(segmentCell,2);
18 l1=Layer('Layer1');% Original Curve
19 for indNow=1:1:SegNum
20 l1=AddCurve(l1,segmentCell{1,indNow});
21 [Length,~,~,~] = CalculateCurvature(l1,indNow);
22 d(indNow)=max(Length);
23 end
24 nSegment=round(max(d)/pointSpacing);
25 %Resample
26 segmentCellSmooth=segmentCell;
27 segmentCellMean=segmentCell;

```

```

28 w=ones(size(V_cent,1),1); %Cubic smoothing spline weights
29 indexPlanePoints_V_cent=zeros(1,size(segmentCell,2)); %Indices of centre line points
30 at sections
31 for indNow=1:1:SegNum
32 %Resample section contour
33 l1=RebuildCurve(l1,indNow,nSegment,'interpPar',smoothFactorSegments,'closeLoopOpt',1);
34 Num=GetNLines(l1);
35 Vs_1_mean=mean(l1.Lines{Num,1}.P,1);
36 segmentCellSmooth{1,indNow}=l1.Lines{Num,1}.P';
37 segmentCellMean{1,indNow}=Vs_1_mean;
38 %Prepare for center line smoothing by setting weight vector
39 [~,indVertex_1]=min(sqrt(sum((V_cent-Vs_1_mean(ones(size(V_cent,1),1),:)).^2,2)));
40 %Index closest to section
41 w(indVertex_1)=1e9; %Heigh weight at contour sections
42 indexPlanePoints_V_cent(indNow)=indVertex_1; %Store index of closets
43 end
44 %% Smooth center line
45 %Fit smoothing spline through centreline points for loft
46 l2=Layer('Layer2');
47 if ~isempty(smoothFactorCentreLine)
48 V_cent_original=V_cent;
49 l2=AddCurve(l2,V_cent_original);
50 [d,~,~,~] = CalculateCurvature(l2,1);
51 V_cent = csaps(d,V_cent_original',smoothFactorCentreLine,d,w)'; %Smoothed
52 l2>AddPoint(l2,V_cent);
53 l2>AddPoint(l2,V_cent(w==max(w),:));
54 Plot(l2)
55 end
56 %% Offsetting section curves outward if thickening is inward
57 for q=1:SegNum
58 l1=CurveOffset(l1,SegNum+q,wallThickness(q));
59 Num=GetNLines(l1);
60 segmentCellSmooth{1,q}=l1.Lines{Num,1}.P';
61 end
62 %% Visualize offset curves
63 Plot(l1,'lineson',1,'group',(SegNum+1:SegNum*3)')
64 %% Perform main trunk loft
65 % Initialize figure with center line
66 l1=AddCurve(l1,V_cent);
67 controlParameter.n=100;
68 controlParameter.Method='HC';
69 l1=SweepLoft(l1,
70 (SegNum*2+1:SegNum*3)',GetNLines(l1),'PointSpacing',pointSpacing,'Smooth',controlParameter);
71 Plot(l1,'Lineson',0)

```



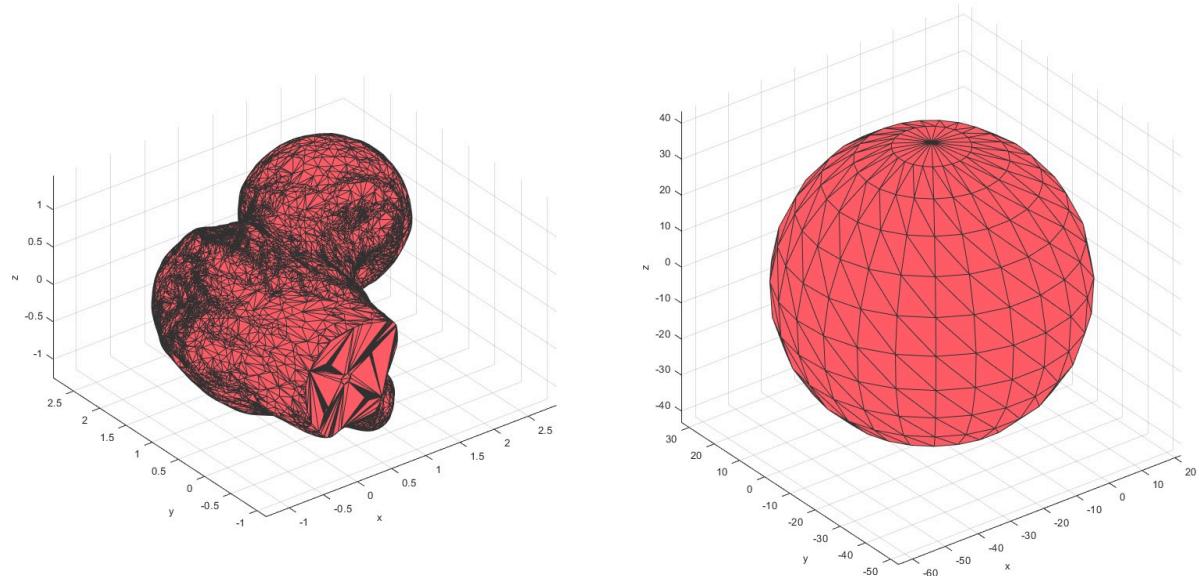
## 2.9 Read STL file (Flag=9)

```

1 | l1=Layer('Layer1');
2 | l1=STLRead(l1, 'femur_binary.stl');
3 | Plot(l1);
4 | l2=Layer('Layer2');
5 | l2=STLRead(l2, 'sphere_ascii.stl');
6 | % STLRead(l2, 'pallet_montado.stl');
7 | Plot(l2);

```

读取stl文件。



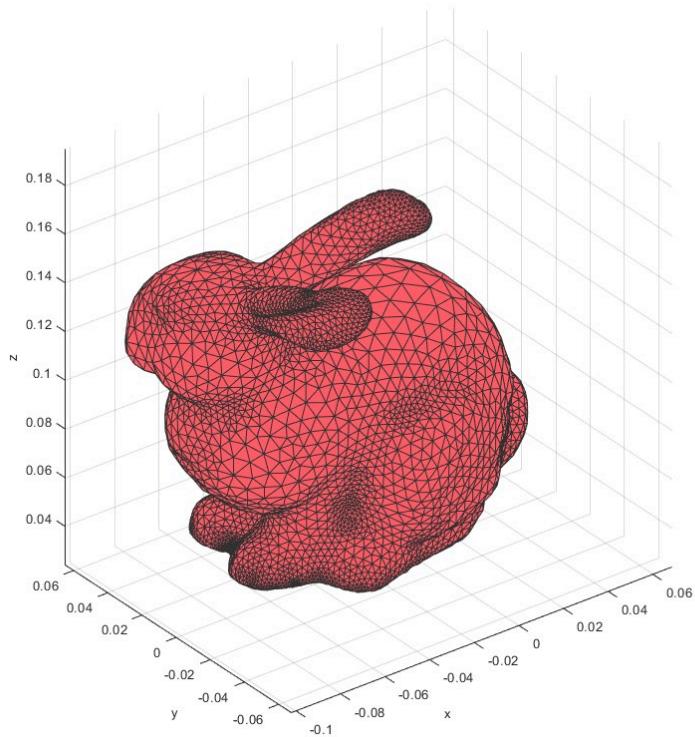
## 2.10 Read msh file (Flag=10)

```

1 | l1=Layer('Layer1');
2 | l1=LoadMsh(l1,'bunny.msh');
3 | Plot(l1)

```

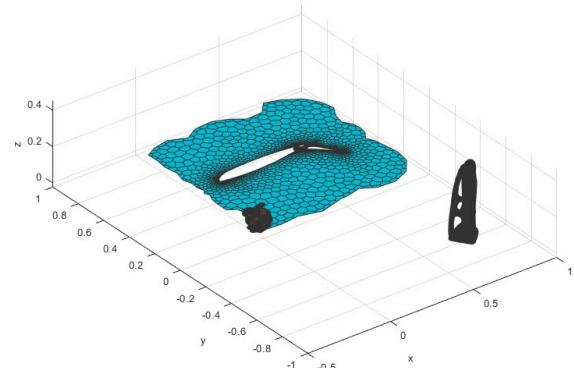
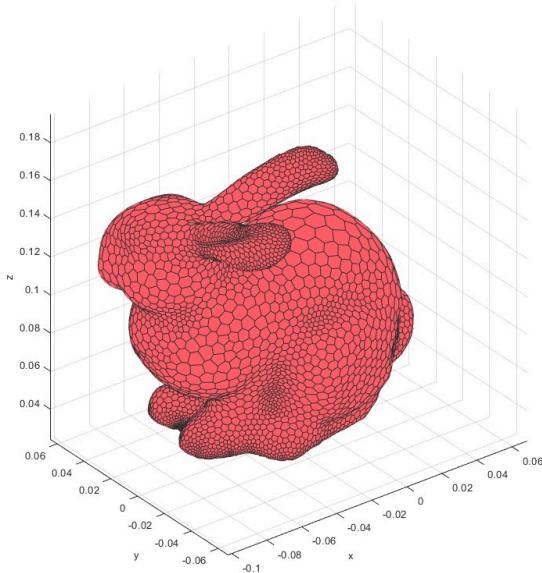
读取msh文件



## 2.11 Tri to Dual (Flag=11)

```
1 l1=Layer('Layer1');
2 l1=LoadMsh(l1,'bunny.msh');
3 l1=Tri2Dual(l1,1);
4 Plot(l1,'mesheson',0);
5 m=Mesh2D('Mesh1');
6 m=LoadMsh(m,'airfoil.msh');
7 m=MeshDual(m);
8 l1=AddElement(l1,m);
9 l1=LoadMsh(l1,'thinker.msh');
10 l1=Tri2Dual(l1,3);
11 Plot(l1,'mesheson',0,'xlim',[-0.5,1],'ylim',[-1,1]);
```

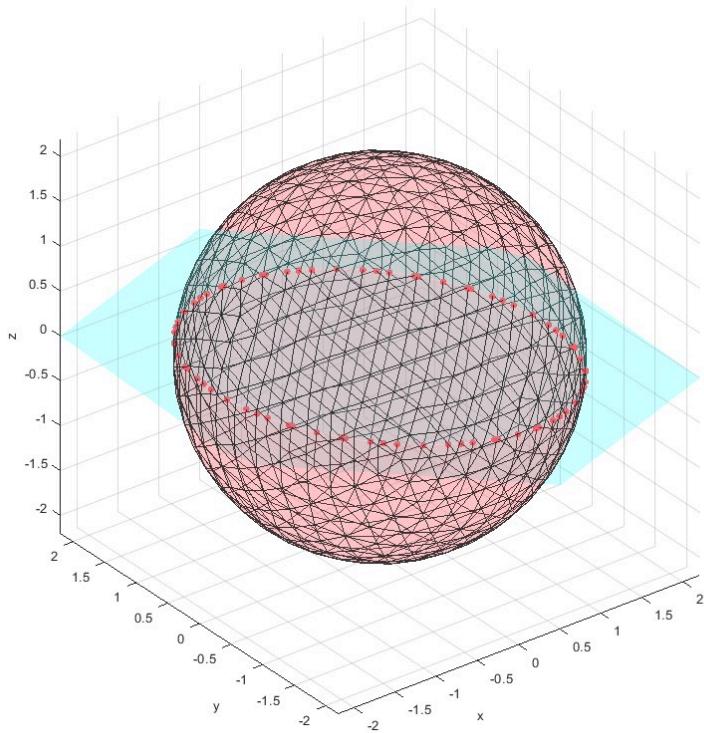
将三角形网格转化为多边形网格



## 2.12 Plane Mesh intersections (Flag=12)

```
1 %Sphere parameters
2 numRefineStepsSphere=3;
3 sphereRadius=2;
4 mm=Mesh('Demo Sphere Mesh');
5 mm=MeshSphere(mm,numRefineStepsSphere,sphereRadius);
6 mm=Mesh3D(mm);
7 l1=Layer('Layer1');
8 l1=AddElement(l1,mm);
9 pos=[0,0,0];
10 vec=[1,1,1];
11 l1=AddPlane(l1,pos,vec);
12 l1=IntersectPlaneMesh(l1,1,1);
13 Plot(l1,'face_alpha',0.2,'planescale',3);
```

计算平面与网格的交点。



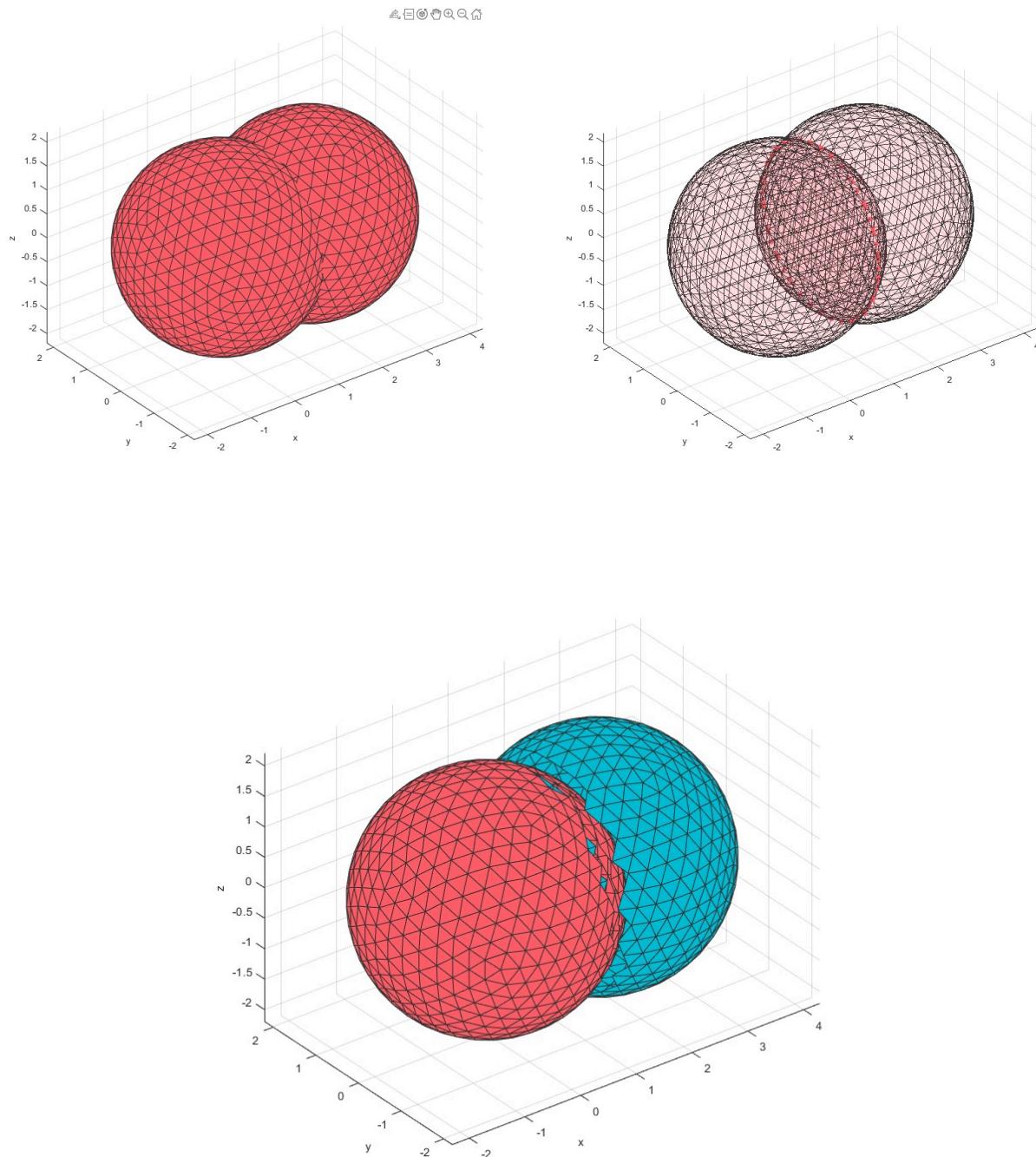
## 2.13 Mesh Mesh intersections (Flag=13)

```

1 %Sphere parameters
2 numRefineStepsSphere=3;
3 sphereRadius=2;
4 mm=Mesh('Demo Sphere Mesh');
5 mm=MeshSphere(mm,numRefineStepsSphere,sphereRadius);
6 mm=Mesh3D(mm);
7 l1=Layer('Layer1');![[Assets/RoTA_Layer.assets/Fig27.jpg]]
8 l1=AddElement(l1,mm);
9 l1=AddElement(l1,mm,'Transform',[2,0,0,0,0,0]);
10 Plot(l1)
11 [Slice,~,~]=IntersectMeshMesh(l1,1,2);
12 Plot(l1,'face_alpha',0.1);
13 Plot(Slice);

```

计算网格与网格间的交点



## 2.14 Combine Mesh pair (Flag=14)

```

1 %Sphere parameters
2 numRefineStepsSphere=3;
3 sphereRadius=2;
4 mm=Mesh('Demo Sphere Mesh');
5 mm=MeshSphere(mm,numRefineStepsSphere,sphereRadius);
6 mm=Mesh3D(mm);
7 l1=Layer('Layer1');
8 l1=AddElement(l1,mm);
9 l1=AddElement(l1,mm,'Transform',[2,0,0,0,0,0]);
10 [~,m1,m2]=IntersectMeshMesh(l1,1,2);
11 m1=KeepGroup(m1,1);
12 m2=KeepGroup(m2,2);

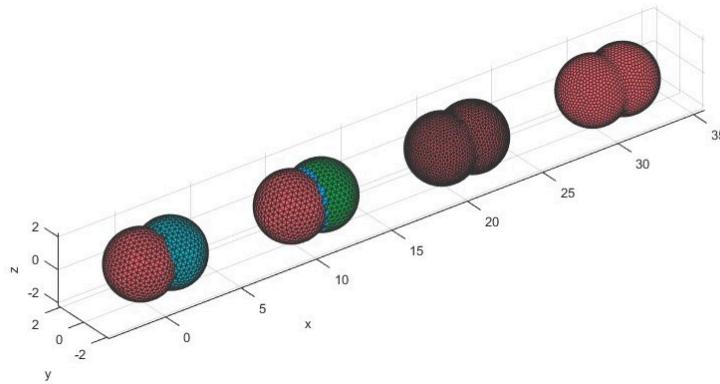
```

```

13 PlotFace(m1);
14 PlotFace(m2);
15 l2=Layer('Layer2');
16 l2=AddElement(l2,m1);AddElement(l2,m2);
17 Plot(l2);
18 l2=CombineMeshPair(l2,1,2,'reverse',1);
19 l2=Move(l2,[10,0,0],'Meshes',3);
20 Plot(l2);
21 l2=CombineMeshPair(l2,1,2,'remesh',0.2,'reverse',1);
22 l2=Move(l2,[20,0,0],'Meshes',4);
23 Plot(l2);
24 l2=Tri2Dual(l2,4);
25 l2=Move(l2,[10,0,0],'Duals',1);
26 Plot(l2);

```

合并网格。



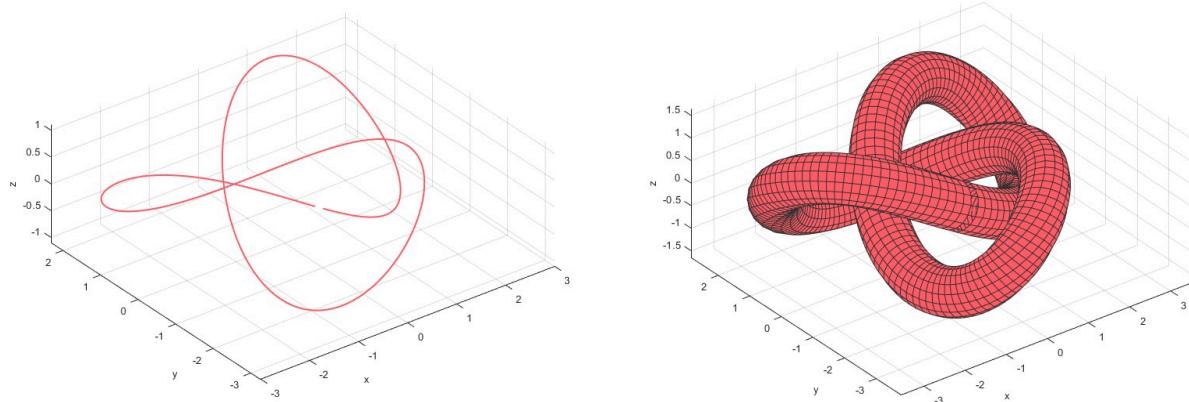
## 2.15 Curve to Mesh (Flag=15)

```

1 %% Constants
2 % number of vertices of trefoil curve
3 nPoints = 200;
4 % thickness of the 3D mesh
5 thickness = .5;
6 % number of corners around each curve vertex
7 nCorners = 16;
8 %% Create trefoil curve
9 % parameterisation variable
10 t = linspace(0, 2*pi, nPoints + 1);
11 t(end) = [];
12 % trefoil curve coordinates
13 curve(:,1) = sin(t) + 2 * sin(2 * t);
14 curve(:,2) = cos(t) - 2 * cos(2 * t);
15 curve(:,3) = -sin(3 * t);
16 l1=Layer('Layer1');
17 l1=AddCurve(l1,curve);
18 Plot(l1);
19 l1=Curve2Mesh(l1,1,thickness,nCorners);
20 Plot(l1);

```

曲线生成网格。



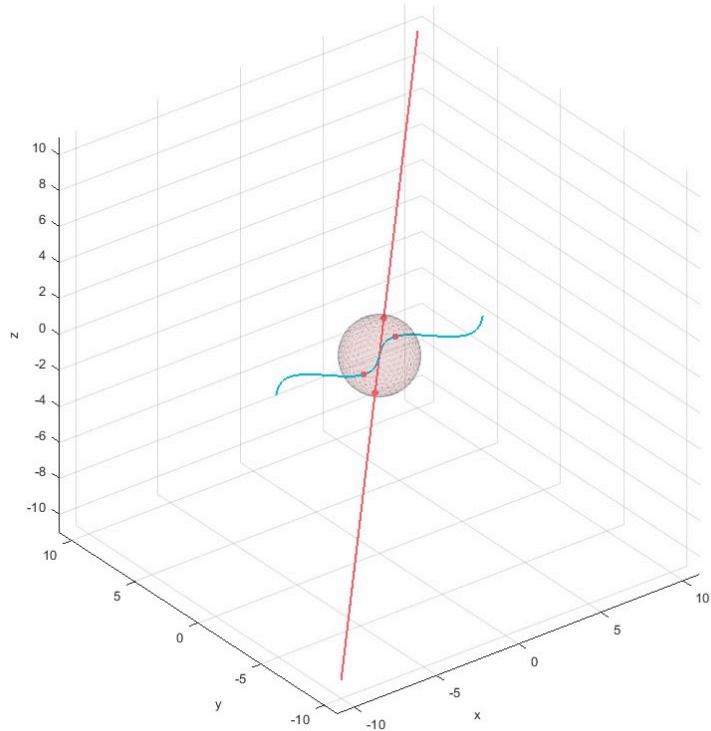
## 2.16 Line Mesh intersections (Flag=16)

```

1 % Sphere Mesh
2 numRefineStepsSphere=3;
3 sphereRadius=2;
4 mm=Mesh('Demo Sphere Mesh');
5 mm=MeshSphere(mm,numRefineStepsSphere,sphereRadius);
6 mm=Mesh3D(mm);
7 l1=Layer('Layer1');
8 l1=AddElement(l1,mm);
9 Plot(l1);
10 % Curve
11 curve(:,1)=[-10;-1;1;10];
12 curve(:,2)=[-10;-1;1;10];
13 curve(:,3)=[-10;-1;1;10];
14 l1=AddCurve(l1,curve);
15 t = linspace(-2*pi, 2*pi, 200);
16 curve1(:,1) = t';
17 curve1(:,2)=sin(t');
18 curve1(:,3)=zeros(200,1);
19 l1=AddCurve(l1,curve1);
20 Plot(l1);
21 l1=IntersectCurveMesh(l1,[1;2],1);
22 Plot(l1,'face_alpha',0.1,'edge_alpha',0.1);

```

线与网格的交点。



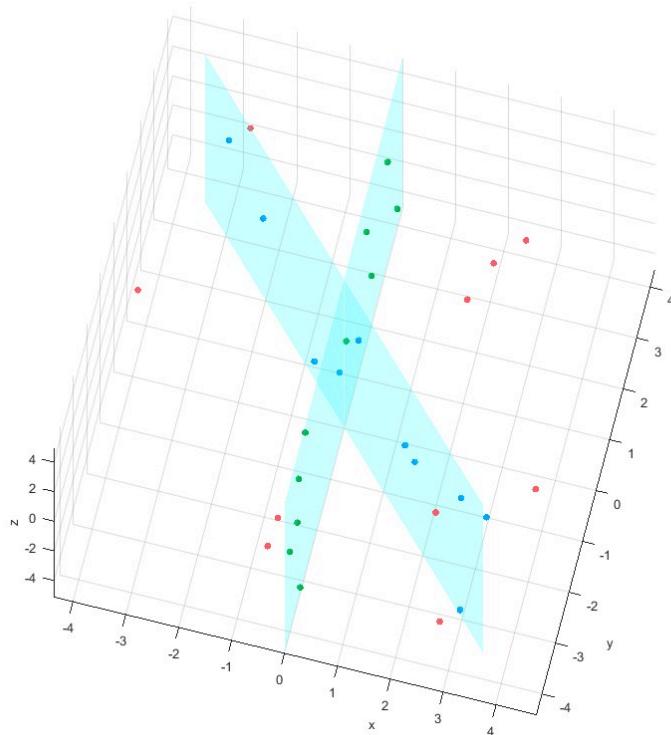
## 2.17 Project points to plane (Flag=17)

```

1 l1=Layer('Layer1');
2 pos=[0,0,0];
3 vec=[1,0,0];
4 l1=AddPlane(l1,pos,vec);
5 pos=[0,0,0];
6 vec=[1,1,0];
7 l1=AddPlane(l1,pos,vec);
8 P=-5+10*rand(10,3);
9 l1=AddPoint(l1,P);
10 Plot(l1,'planescale',5);
11 l1=ProjectPointPlane(l1,1,1);
12 l1=ProjectPointPlane(l1,1,2);
13 Plot(l1,'planescale',5);

```

将点投影到平面。



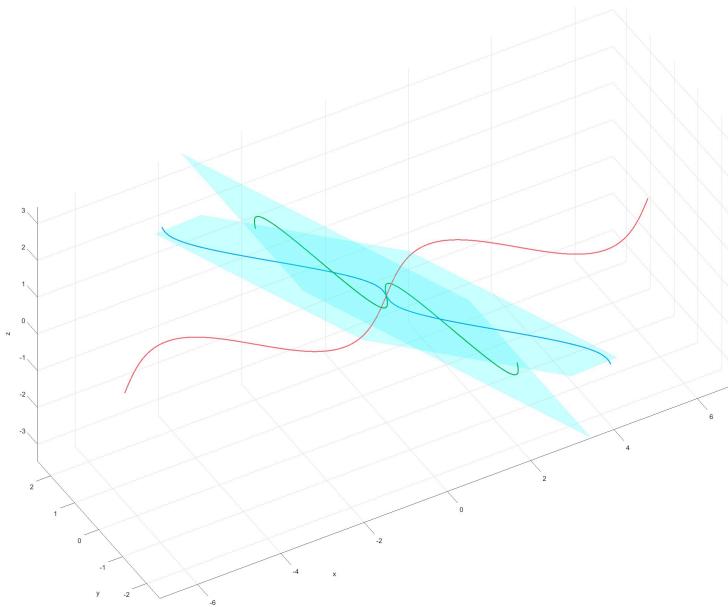
## 2.18 Project curves to plane (Flag=18)

```

1 l1=Layer('Layer1');
2 pos=[0,0,0];
3 vec=[1,0,1];
4 l1=AddPlane(l1,pos,vec);
5 pos=[0,0,0];
6 vec=[1,1,1];
7 l1=AddPlane(l1,pos,vec);
8 t = linspace(-2*pi, 2*pi, 200);
9 curve1(:,1) = t';
10 curve1(:,2)=sin(t');
11 curve1(:,3)=zeros(200,1);
12 l1=AddCurve(l1,curve1);
13 Plot(l1,'planescale',5);
14 l1=ProjectCurvePlane(l1,1,1);
15 l1=ProjectCurvePlane(l1,1,2);
16 Plot(l1,'planescale',5);

```

曲线投影到平面



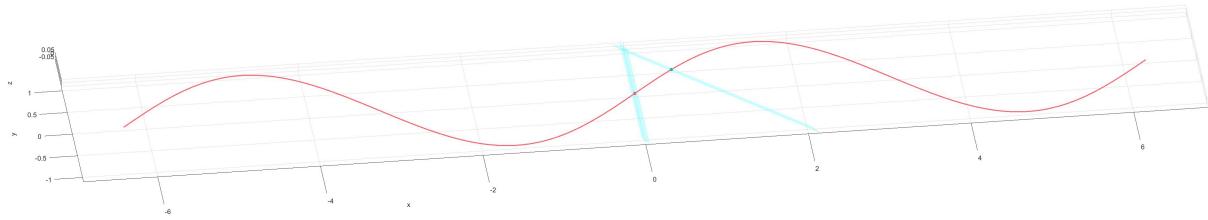
## 2.19 Line Plane intersections (Flag=19)

```

1 l1=Layer('Layer1');
2 pos=[0,0,0];
3 vec=[1,0,1];
4 l1=AddPlane(l1,pos,vec);
5 pos=[1,0,0];
6 vec=[1,1,1];
7 l1=AddPlane(l1,pos,vec);
8 t = linspace(-2*pi, 2*pi, 200);
9 curve1(:,1) = t';
10 curve1(:,2)=sin(t');
11 curve1(:,3)=zeros(200,1);
12 l1=AddCurve(l1,curve1);
13 Plot(l1,'planescale',5);
14 l1=IntersectCurvePlane(l1,1,1);
15 l1=IntersectCurvePlane(l1,1,2);
16 Plot(l1,'planescale',5);

```

曲线与平面交点。



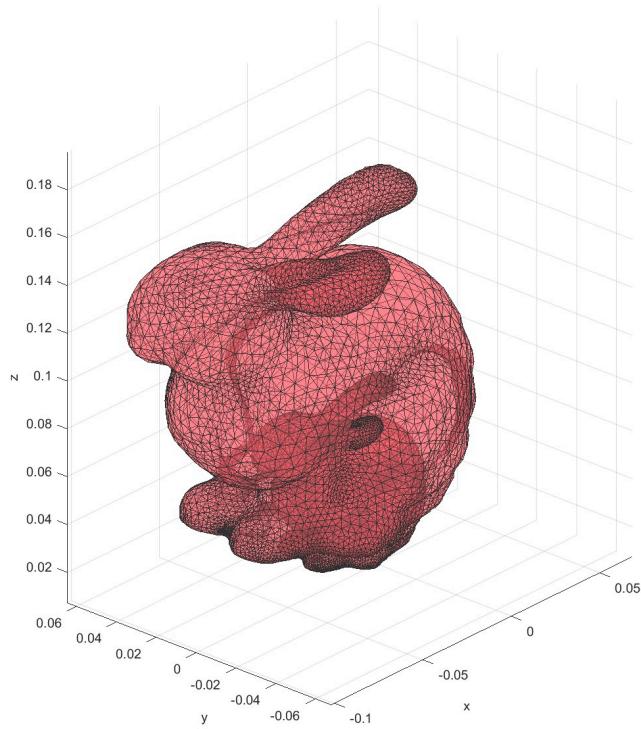
## 2.20 Scale (Flag=20)

```

1 l1=Layer('Layer1');
2 l1=LoadMsh(l1,'bunny.msh');
3 Plot(l1);
4 l1=Scale(l1,0.5,'Meshes',1,'new',1);
5 Plot(l1,'face_alpha',0.5);

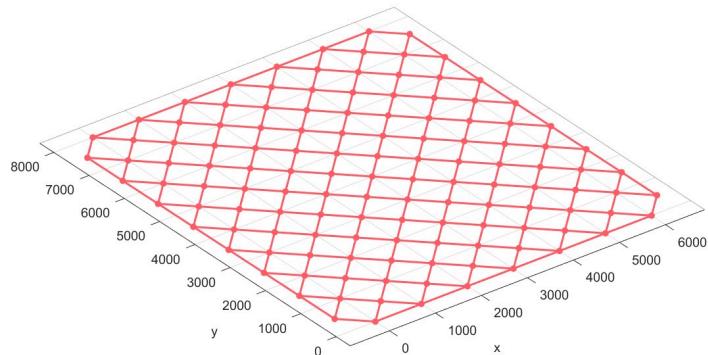
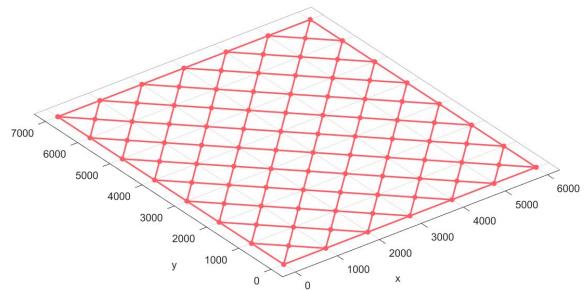
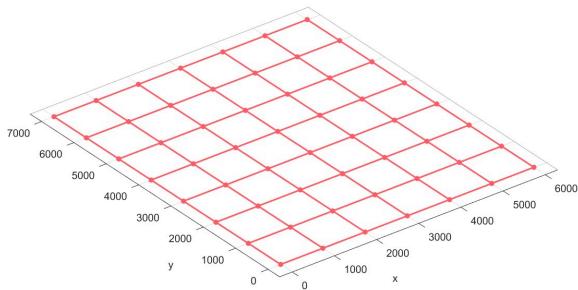
```

缩放网格。



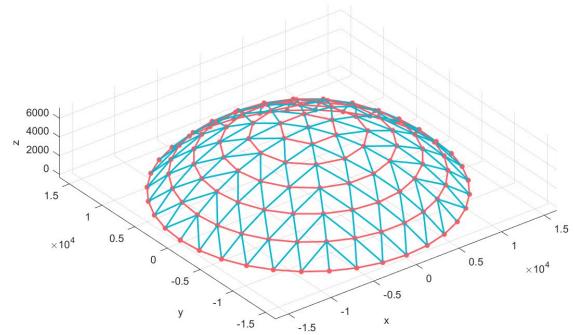
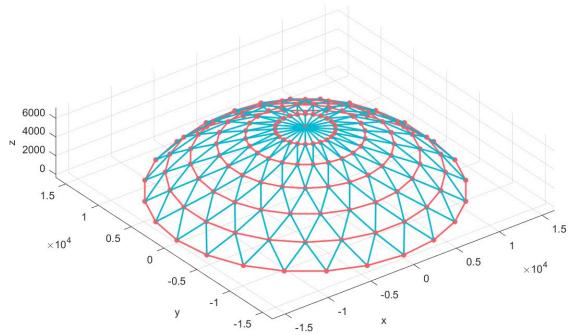
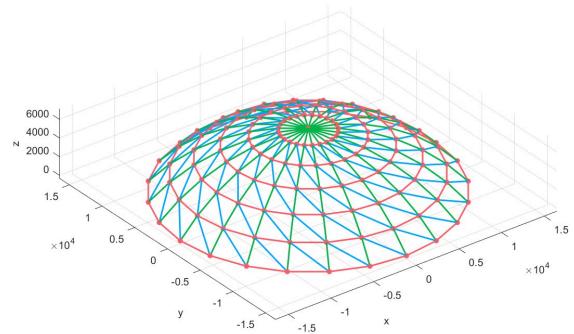
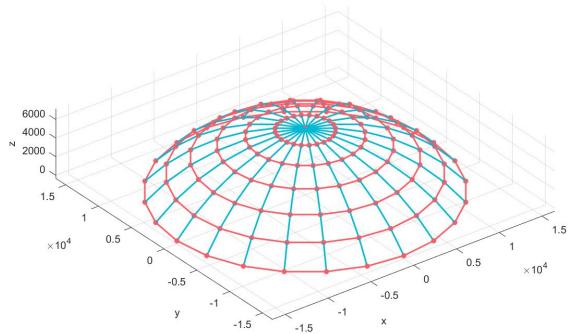
## 2.21 Add Grid (Flag=21)

```
1 l1=Layer('Layer1');
2 l1=AddGrid(l1,1000,1000,7,8);
3 Plot(l1);
4 l2=Layer('Layer2');
5 l2=AddGrid(l2,1000,1000,7,8,'Type',2);
6 Plot(l2);
7 l3=Layer('Layer3');
8 l3=AddGrid(l3,1000,1000,7,8,'Type',4);
9 Plot(l3);
```



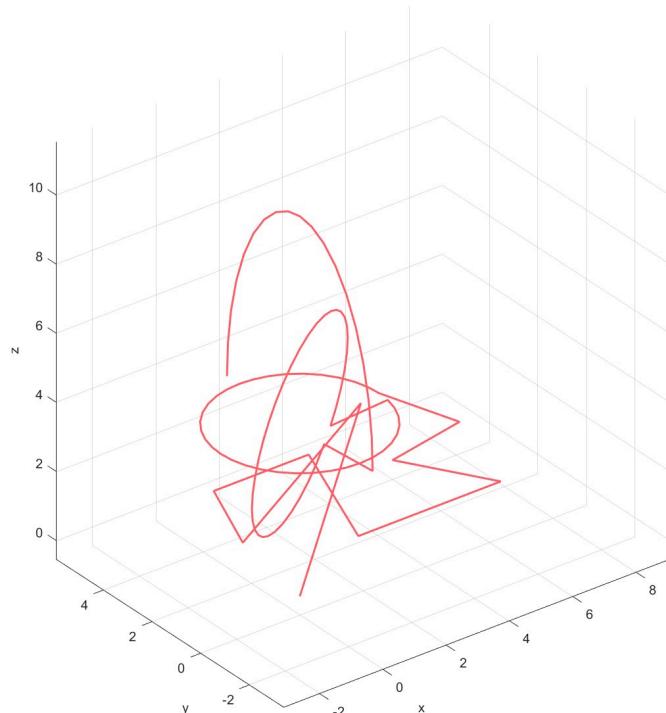
## 2.22 Add ShellGrid (Flag=22)

```
1 l1=Layer('Layer1');
2 l1=AddShellGrid(l1,6800,30000,24,6);
3 Plot(l1);
4 l2=Layer('Layer2');
5 l2=AddShellGrid(l2,6800,30000,24,6,'Type',2);
6 Plot(l2);
7 l3=Layer('Layer3');
8 l3=AddShellGrid(l3,6800,30000,24,6,'Type',3);
9 Plot(l3);
10 l4=Layer('Layer4');
11 l4=AddShellGrid(l4,6800,30000,6,6,'Type',4);
12 Plot(l4);
```



## 2.23 Add Line object (Flag=23)

```
1 %% AddLine
2 a=Point('Point Ass1');
3 a=AddPoint(a,[0;5],[0;4],[0;2]);
4 b=Line('Line Ass1');
5 b=AddLine(b,a,1);
6 %% AddCurve
7 P = [0.5 1.5 4.5 3.0 7.5 6.0 8.5;
8     3.0 5.5 5.5 1.5 1.5 4.0 4.5;
9     0.0 0.0 0.0 0.0 0.0 0.0 0.0];
10 a=AddPoint(a,P(1,:)',P(2,:)',P(3,:)');
11 b=AddCurve(b,a,2);
12 %% AddCircle
13 a=AddPoint(a,0,0,5);
14 b=AddCircle(b,2.5,a,3);
15 b=AddCircle(b,3,a,3,'rot',[45,45,45]);
16 %% AddEllipse
17 b=AddEllipse(b,6,3,a,3,'rot',[0,-90,0],'sang',-90,'ang',180);
18 Plot(b,'clabel',1,'styles',{'-'});
19 l1=Layer('Layer1');
20 l1=AddElement(l1,b);
21 Plot(l1);
```



### 3 CheatTable

Name	Varargin	Description
AddCurve(obj,P)		Add curves
AddElement(obj,inputobj)	'Transform','Compress'	Add objects
AddGrid(obj,lx,ly,nx,ny)	"Type"	Add grids
AddHeight(obj,Num,Height)	'coor','fun','new'	Add Mesh Height
AddMesh(obj,meshinput)		Add Mesh
AddPlane(obj,P0,N)		Add plane
AddPoint(obj,P)		Add points
AddShellGrid(obj,f,L,kn(nx))	"Type"	Add shell grid
BoundingBox(obj,pointsNum)		Bound box of points
CalculateCurvature(obj,LineNo)		Calculate curvature of curves
CombineMeshPair(obj, meshno1,meshno2)	'remesh','reverse'	Combine mesh pair
ComputeGeometryDual(obj,Num)		Compute geometry dual
ConnectPoints(obj,source,tar, point1,point2)		Connect points
Curve2Mesh(obj,lineno, thickness,nCorners)	'close'	Use curve to generate mesh
CurveClockwise(obj,LineNum)		Check curve clockwise
CurveOffset(obj,LinesNum,dis)		Curve offset
Extrude2Face(obj,nn,depth)	'numSteps','pointSpacing', 'patchType','dir','closeLoopOpt'	Extrude curve to face
FindBoundaryCurve(obj,MeshNum)	'color'	Find mesh boundary curve
FindMeshBoundary(obj,MeshNum)	'color'	Find mesh boundary edge
GetNDuals(obj)		Get total number of duals
GetNLines(obj)		Get total number of lines
GetNMeshes(obj)		Get total number of meshes
GetNMeshoutput(obj)		Get total number of meshoutput
GetNPlanes(obj)		Get total number of planes
GetNPoints(obj)		Get total number of point groups
IntersectCurveMesh(obj,lineno,meshno)	'eps'	Intersect curves and meshes
IntersectCurvePlane(obj,lineno,planeno)		Intersect curves and planes
IntersectMeshMesh(obj,meshno1,meshno2)		Intersect meshes and meshes
IntersectPlaneMesh(obj,planeno,meshno)		Intersect meshes and planes
LoadMsh(obj,name)		Load msh file
LoftLinear(obj,start,last)	'numSteps','closeLoopOpt', 'patchType','untwistOpt',	Create a loft between the two input curves
Meshoutput(obj)	'Lines','Compress','Dtol'	Output Layer lines to mesh
Move(obj,dis)	'Meshes','Points','Lines', 'Surfaces','Duals','new'	Move object
ObjRead(obj,filename)		Read object file

Name	Varargin	Description
Plot(obj)	'group','pointson','lineson', 'mesheson','dualson','planeson', 'linesmerge','surfaceson', 'face_normal','face_alpha' , 'edge_alpha','xlim','ylim', , 'zlim','edgecolor','planescala', 'View','equal','grid','axe'	Plot Layer object
Plot2(obj)		Plot Layer object in Paraview
ProjectCurvePlane(obj,lineno,planeno)		Project curves to planes
ProjectPointPlane(obj,pointno,planeno)		Project points to planes
RebuildCurve(obj,LinesNum,n)	'interpPar','closeLoopOpt', 'spacingFlag',	Rebuild curve
Remesh(obj,MeshNo,opt)		Remesh the mesh
Rotate(obj,angle)	'Meshes','Points','Lines', 'Surfaces','Duals','new', 'origin'	Rotate the object
Scale(obj,factor)	'Meshes','Points','Lines', 'Surfaces','Duals','new', 'origin'	Scale the object
STLRead(obj,filename)		Read stl file
Subtract(obj,basemeshno,meshno)		Subtract meshes
SweepLoft(obj,LineNum,guideline)	'PointSpacing','Nseg', 'Smooth'	Sweep loft of lines
Tri2Dual(obj,meshno)		Convert Tri mesh to Dual mesh
Union(obj,meshno)		Union the meshes
VTKWriteLines(obj)		Write VTK file of lines
VTKWriteMeshes(obj)		Write VTK file of meshes
VTKWritePoints(obj)		Write VTK file of

## 4 参考文献

- [1] [https://www.mathworks.com/matlabcentral/fileexchange/48208-gibboncode-gibbon?s\\_tid=srchtitle](https://www.mathworks.com/matlabcentral/fileexchange/48208-gibboncode-gibbon?s_tid=srchtitle)
- [2] <https://www.gibboncode.org>
- [3] <https://www.sintef.no/projectweb/mrst/>
- [4] [https://ww2.mathworks.cn/matlabcentral/fileexchange/69452-curvature-of-a-1d-curve-in-a-2d-or-3d-space?s\\_tid=srchtitle](https://ww2.mathworks.cn/matlabcentral/fileexchange/69452-curvature-of-a-1d-curve-in-a-2d-or-3d-space?s_tid=srchtitle)