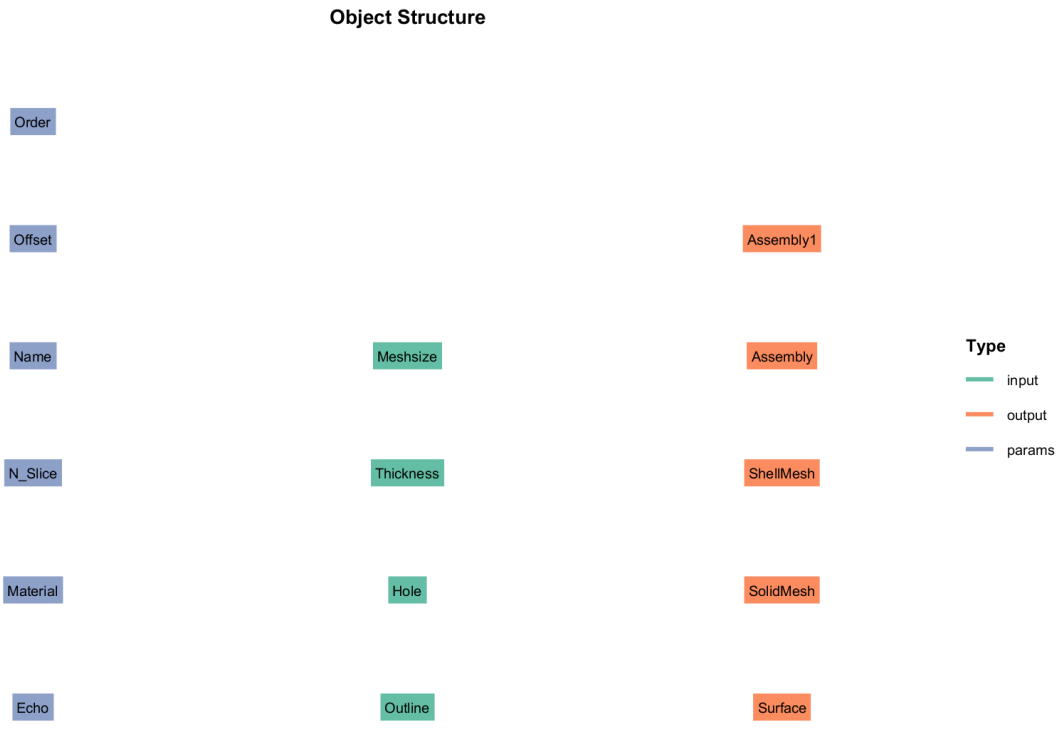
Commonplate

Xie Yu

1 介绍

Commonplate是平板类，它可以通过拉伸一个平面生成网格。

2 类结构



输入 input：

- Meshsize : 单元尺寸
- Thickness : 厚度
- Hole : 孔边界Line2D
- Outline : 外轮廓Line2D

参数 params:

- Order： 单元阶数
- Offset : 壳单元基准面
- Name : 名称
- N_Slice: 厚度方向网格划分数量
- Material : 材料

输出 output :

- Assembly : 实体单元装配
- Assembly1 : 壳单元装配
- Surface : 截面
- SolidMesh : 实体网格
- ShellMesh : 壳网格

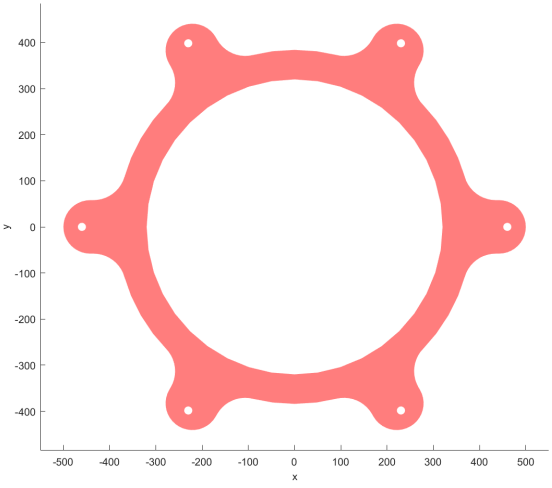
3 案例

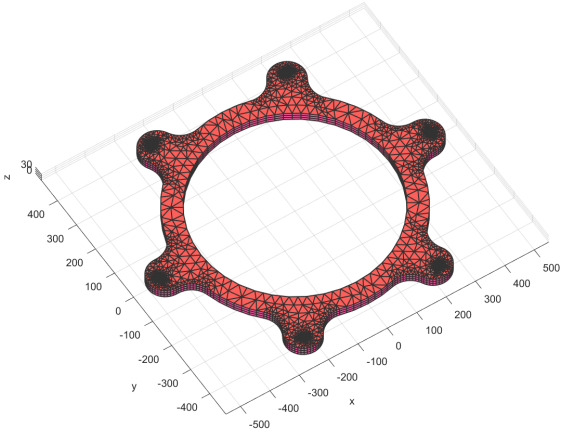
3.1 Create a plate (Flag=1)

```
% Plate 1
IR=640/2;
OR=768/2;
par=442;
radius=70;
R=116/2;
num=6;
Rp=460;
t=30;
hd=17.5;
sang=asin(R/OR)/pi*180;
ang=360/num-2*sang;
a=Point2D('Point Ass1');
b=Line2D('Line Ass1','Dtol',1);
a=AddPoint(a,0,0);
for i=1:num
b=AddCircle(b,OR,a,1,'sang',sang+ang-360/num*(i-1),'ang',-ang);
theta=-360/num/180*pi*(i-1);
mat=[cos(theta),-sin(theta);sin(theta),cos(theta)];
p1=mat*[sqrt(OR^2-R^2),par;R,R];
p1=p1';
a=AddPoint(a,p1(:,1),p1(:,2));
b=AddLine(b,a,2+3*(i-1));
p2=mat*[par;0];
p2=p2';
a=AddPoint(a,p2(1,1),p2(1,2));
b=AddCircle(b,R,a,3+3*(i-1),'sang',90+theta/pi*180,'ang',-180);
p3=mat*[par,sqrt(OR^2-R^2);-R,-R];
p3=p3';
a=AddPoint(a,p3(:,1),p3(:,2));
b=AddLine(b,a,4+3*(i-1));
end
for i=1:num
b=CreateRadius(b,1+6*(i-1),radius);
b=CreateRadius(b,5+6*(i-1),radius);
end
h1=Line2D('Hole Group1');
h1=AddCircle(h1,IR,a,1);
a1=Point2D('Point Ass2');
a1=AddPoint(a1,Rp,0);
```

```
h2=Line2D('Hole Group2');
h2=AddCircle(h2,hd/2,a1,1);
inputplate1.Outline= b;
inputplate1.Hole = [h1;h2];
inputplate1.Thickness = t;
paramsplate1 = struct();
obj1=plate.Commonplate(paramsplate1, inputplate1);
obj1 = obj1.solve();
obj1=MoveFace(obj1,3,[0,0,60],'num',6);
Plot2D(obj1);
Plot3D(obj1);
```

由平面拉伸为平板。



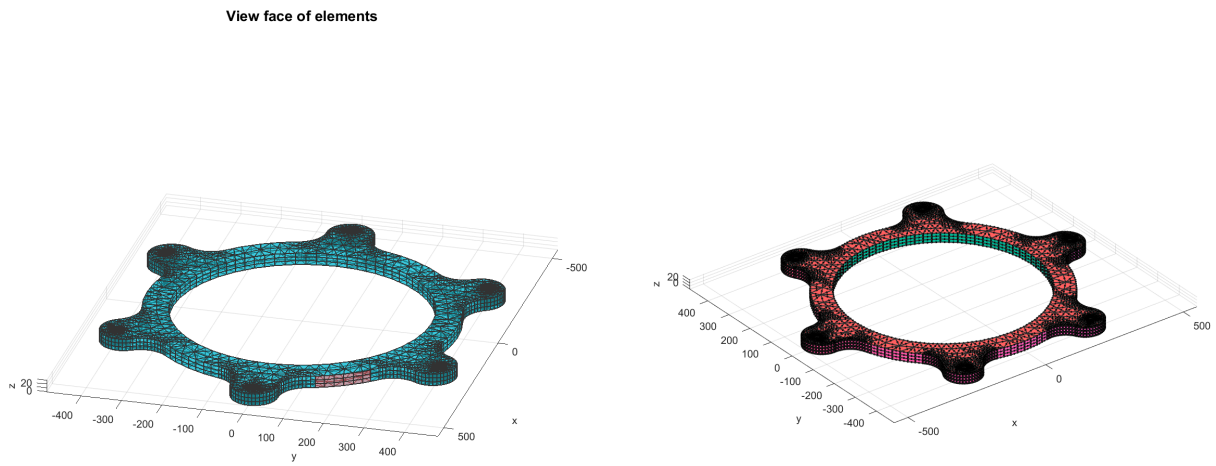


3.2 Plate Outline subdivision， with order 2 elements (Flag=2)

```
% Plate 1
IR=640/2;
OR=768/2;
par=442;
radius=70;
R=116/2;
num=6;
Rp=460;
t=30;
hd=17.5;
sang=asin(R/OR)/pi*180;
ang=360/num-2*sang;
a=Point2D('Point Ass1');
b=Line2D('Line Ass1','Dtol',1);
a=AddPoint(a,0,0);
for i=1:num
b=AddCircle(b,OR,a,1,'sang',sang+ang-360/num*(i-1),'ang',-ang);
theta=-360/num/180*pi*(i-1);
mat=[cos(theta),-sin(theta);sin(theta),cos(theta)];
p1=mat*[sqrt(OR^2-R^2),par;R,R];
p1=p1';
```

```
a=AddPoint(a,p1(:,1),p1(:,2));
b=AddLine(b,a,2+3*(i-1));
p2=mat*[par;0];
p2=p2';
a=AddPoint(a,p2(1,1),p2(1,2));
b=AddCircle(b,R,a,3+3*(i-1),'sang',90+theta/pi*180,'ang',-180);
p3=mat*[par,sqrt(OR^2-R^2);-R,-R];
p3=p3';
a=AddPoint(a,p3(:,1),p3(:,2));
b=AddLine(b,a,4+3*(i-1));
end
for i=1:num
b=CreateRadius(b,1+6*(i-1),radius);
b=CreateRadius(b,5+6*(i-1),radius);
end
h1=Line2D('Hole Group1');
h1=AddCircle(h1,IR,a,1);
a1=Point2D('Point Ass2');
a1=AddPoint(a1,Rp,0);
h2=Line2D('Hole Group2');
h2=AddCircle(h2,hd/2,a1,1);
inputplate1.Outline= b;
inputplate1.Hole = [h1;h2];
inputplate1.Thickness = t;
paramsplate1.Order = 2;
obj1=plate.Commonplate(paramsplate1, inputplate1);
obj1 = obj1.solve();
obj1=MoveFace(obj1,3,[0,0,60],'num',6);
Plot2D(obj1);
obj1=OutputSolidModel(obj1,'SubOutline',1);
obj1=OutputSolidModel(obj1,'SubOutline',1);
Plot3D(obj1,'faceno',201);
Plot3D(obj1)
```

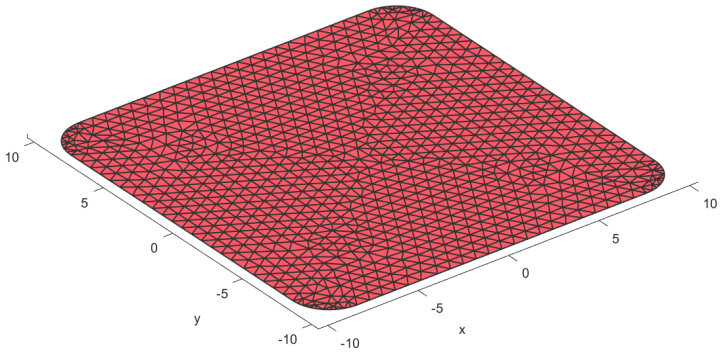
细分平板编号，更改为2阶单元。



3.3 Output shell elements (Flag=3)

```
b=Line2D('Round Polygon');
b=AddRoundPolygon(b,10*sqrt(2),4,2,'sang',45);
inputplate1.Outline= b;
inputplate1.Thickness = 2;
paramsplate1= struct();
obj1=plate.Commonplate(paramsplate1, inputplate1);
obj1 = obj1.solve();
Ass=obj1.output.Assembly1;
Plot(Ass);
```

导出壳单元网格。

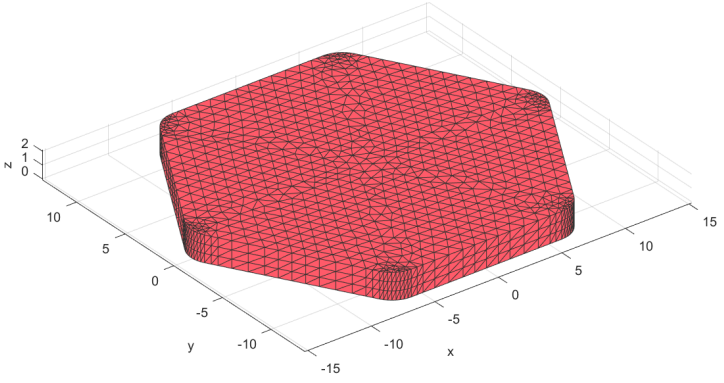


3.4 Oupput STL file (Flag=4)

```
b=Line2D('Round Polygon');
b=AddRoundPolygon(b,10*sqrt(2),6,2);
inputplate1.Outline= b;
inputplate1.Thickness = 2;
paramsplate1= struct();
obj1=plate.Commonplate(paramsplate1, inputplate1);
obj1 = obj1.solve();
OutputSTL(obj1)
% Load stl file
L=Layer('test');
Name=strcat(obj1.params.Name,'.stl');
L=STLRead(L,Name);
Plot(L);

```

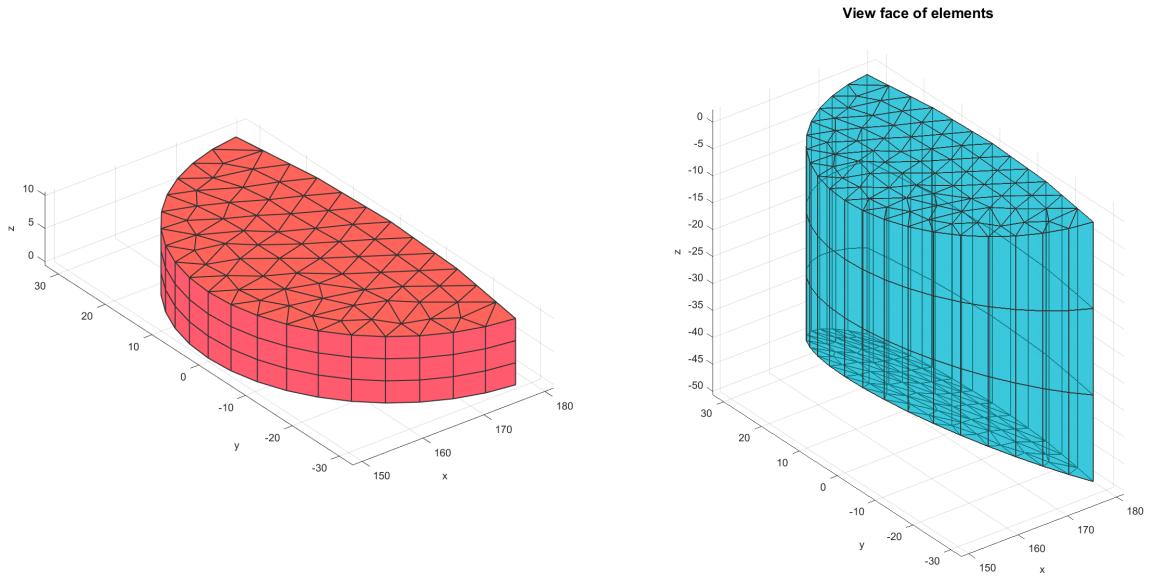
导出STL格式文件。

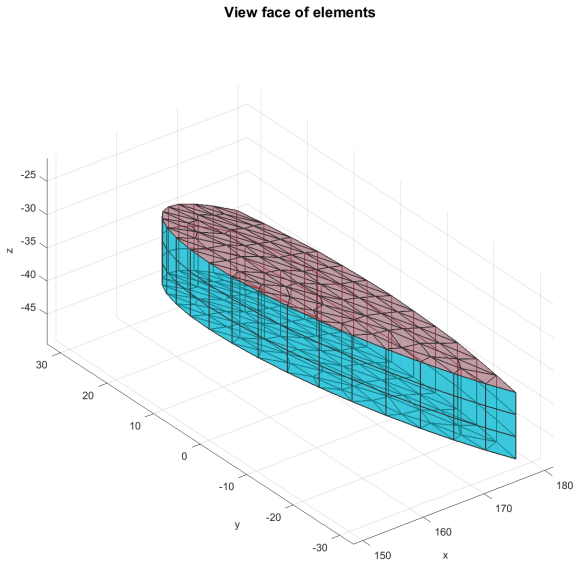


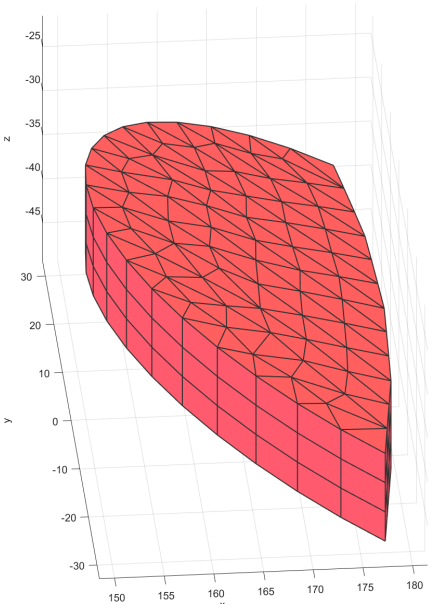
3.5 Deform face (Flag=5)

```
a=Point2D('Points assembly');
a=AddPoint(a,0,0);
R1=180;
r=30;
a=AddPoint(a,R1,0,'polar','deg');
Angle1=acos(r/2/R1)*2/pi*180;
Angle2=(180-Angle1)*2;
b1=Line2D('OutLine');
Sang1=180-Angle1/2;
b1=AddCircle(b1,r,a,2,'sang',Sang1,'ang',Angle1);
Sang2=-180+Angle1;
b1=AddCircle(b1,R1,a,1,'Sang',Sang2,'ang',Angle2);
inputplate1.Outline= b1;
inputplate1.Thickness = 10;
inputplate1.Meshsize=5;
paramsplate1= struct();
obj1=plate.Commonplate(paramsplate1, inputplate1);
obj1 = obj1.solve();
Plot3D(obj1)
f1=@(r)(sqrt(360^2-r.^2)-360);
obj1=DeformFace(obj1,f1,1);
f2=@(r)(sqrt(360^2-r.^2)-360+10);
obj1=DeformFace(obj1,f2,2);
Plot3D(obj1)
```

对目标面按指定方式变换。




View face of elements
-25
-30
-35
-40
-45
z
30
20
10
0
-10
-20
-30
y
150
160
170
180
x


-25
-30
-35
-40
-45
z
30
20
10
0
-10
-20
-30
y
150
155
160
165
170
175
180

4 参考文献