

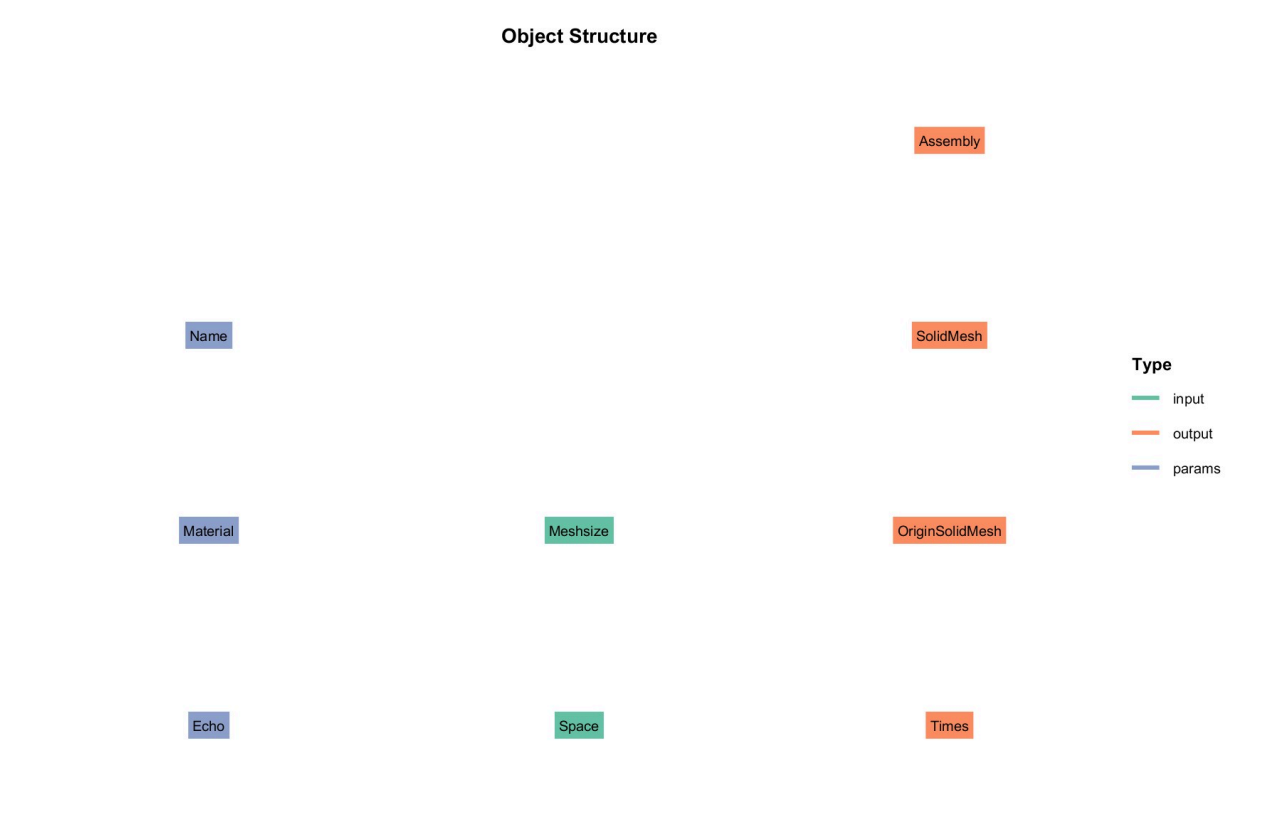
Body

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1 介绍

Body类专门用于雕刻建模，它可以生成复杂形体的网格，虽然无法得到准确的模型细节，但可以再设计初期得到相对准确的刚度和质量信息，以便进行系统级的模型动力学分析。

2 类结构



输入 input:

- Meshsize : 网格大小
- Space : 空间尺寸

参数 params:

- Name : 名称
- Material : 材料

输出 output :

- Assembly : 过盈连接节点装配体
- SolidMesh : 实体网格
- OriginSolidMesh : 平滑前实体网格

- Times : 雕刻次数

3 案例

3.1 Create Body (Flag=1)

以一个风电扭力臂为例，图片来自于德利佳官网3~3.6MW平台<http://www.dljtransmission.com/ctt/1/89.htm>，风电扭力臂用来传递扭矩，观察图片，两端支座用以连接支撑，中间连接轴承，上端增加两吊耳用以吊装，同时增加加强筋增大局部刚度。



```

1  %% WindTurbine Gearbox Torquearm
2  lx=400;
3  ly=3200;
4  lz=2100;
5  inputStruct.Space=[lx,ly,lz];% 设计空间长、宽、高
6  inputStruct.Meshsize=15; %网格大小 [mm];
7  paramsStruct.Name='Torque_arm_build';
8  TorqueArm= body.Body(paramsStruct, inputStruct);
9  TorqueArm = TorqueArm.solve();
10 Plot3D(TorqueArm)
11 %% Basic Circle
12 a=Point2D('Point Ass1');
13 a=AddPoint(a,[0;0;185;185;210;210;270;160;160;0],...
14 [1750/2;1890/2;1890/2;1750/2;1500/2;1200/2;1000/2;1000/2;1500/2;1750/2]);
15 b=Line2D('Line Ass1');
16 b=AddCurve(b,a,1);
17 inputHousing.Outline= b;
18 paramsHousing.Degree = 360;
19 obj1=housing.Housing(paramsHousing, inputHousing);
20 obj1=obj1.solve();
21 obj1=OutputSolidModel(obj1);
22 Plot3D(obj1);
23 %% Support
24 a=Point2D('Point Ass1');
25 a=AddPoint(a,0,0);
26 b=Line2D('Line Ass1');
27 b=AddCircle(b,450/2,a,1);
28

```

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29 inputplate1.Outline= b;
30 inputplate1.Thickness = 280;
31 paramsplate1 = struct();
32 obj2=plate.Commonplate(paramsplate1, inputplate1);
33 obj2 = obj2.solve();
34 obj2=OutputSolidModel(obj2);
35 Plot3D(obj2);
36 %% Connection
37 a=Point2D('Point Ass1');
38 a=AddPoint(a,[-145;145;330;330;145;-145;-145],...
39 [300;300;380;-380;-300;-300;300]);
40 b=Line2D('Line Ass1');
41 b=AddCurve(b,a,1);
42
43 inputplate1.Outline= b;
44 inputplate1.Thickness = 185;
45 paramsplate1 = struct();
46 obj3=plate.Commonplate(paramsplate1, inputplate1);
47 obj3 = obj3.solve();
48 obj3=OutputSolidModel(obj3);
49 Plot3D(obj3);
50 %% Shaft
51 a=Point2D('Point Ass1');
52 a=AddPoint(a,0,0);
53 b=Line2D('Line Ass1');
54 b=AddCircle(b,330/2,a,1);
55
56 inputplate1.Outline= b;
57 inputplate1.Thickness = 280;
58 paramsplate1 = struct();
59 obj4=plate.Commonplate(paramsplate1, inputplate1);
60 obj4 = obj4.solve();
61 obj4=OutputSolidModel(obj4);
62 Plot3D(obj4);
63 %% Stiffness
64 Stiffness_Num=16;
65 a=Point2D('Point Ass1');
66 a=AddPoint(a,[185;273;273;210;210;185;185],...
67 [1890/2;1750/2;1000/2;1000/2;1200/2;1750/2;1890/2]);
68 b=Line2D('Line Ass1');
69 b=AddCurve(b,a,1);
70 inputplate1.Outline= b;
71 inputplate1.Thickness = 80;
72 paramsplate1 = struct();
73 obj5=plate.Commonplate(paramsplate1, inputplate1);
74 obj5 = obj5.solve();
75 obj5=OutputSolidModel(obj5);
76 Plot3D(obj5);
77 %% Lifting hole
78 a=Point2D('Point Ass1');
79 a=AddPoint(a,[-80;200;200;80;-80;-80],...
80 [80;80;-100;-100;-250;80]);
81 a=AddPoint(a,0,0);
82 b=Line2D('Line Ass1');
83 b=AddCurve(b,a,1);

```

```

85 h=AddCircle(h,40,a,2);
86
87 inputplate1.Outline= b;
88 inputplate1.Hole= h;
89 inputplate1.Thickness = 80;
90 paramsplate1 = struct();
91 obj6=plate.Commonplate(paramsplate1, inputplate1);
92 obj6 = obj6.solve();
93 obj6=OutputSolidModel(obj6);
94 Plot3D(obj6);
95
96 %% Sculpture model
97 pos1=[-185/2,0,0,0,0,0];
98 TorqueArm=BodyAdd(TorqueArm,obj1.output.SolidMesh,'position',pos1);
99 Plot3D(TorqueArm);
100
101 mm1 = obj2.output.SolidMesh;
102 pos2=[-280/2,2390/2,0,0,-90,0];
103 TorqueArm=BodyAdd(TorqueArm,mm1,'position',pos2);
104 Plot3D(TorqueArm);
105 pos3=[-281/2,-2390/2,0,0,-90,0];
106 TorqueArm=BodyAdd(TorqueArm,mm1,'position',pos3);
107 Plot3D(TorqueArm);
108
109 mm2 = obj3.output.SolidMesh;
110 pos4=[-185/2,2390/2,0,0,90,90];
111 TorqueArm=BodyAdd(TorqueArm,mm2,'position',pos4);
112 Plot3D(TorqueArm);
113 pos5=[185/2,-2390/2,0,0,90,-90];
114 TorqueArm=BodyAdd(TorqueArm,mm2,'position',pos5);
115 Plot3D(TorqueArm);
116
117 mm3 = obj4.output.SolidMesh;
118 pos6=[-280/2,2390/2,0,0,-90,0];
119 TorqueArm=BodyRemove(TorqueArm,mm3,'position',pos6);
120 Plot3D(TorqueArm);
121 pos7=[-280/2,-2390/2,0,0,-90,0];
122 TorqueArm=BodyRemove(TorqueArm,mm3,'position',pos7);
123 Plot3D(TorqueArm);
124
125 mm4 = obj5.output.SolidMesh;
126 for i=1:Stiffness_Num
127     pos8=[-185/2,0,0,360/Stiffness_Num*(i-1),0,0];
128     TorqueArm=BodyAdd(TorqueArm,mm4,'position',pos8);
129 end
130 Plot3D(TorqueArm);
131
132 mm5 = obj6.output.SolidMesh;
133 pos9=[80/2,1580/2,660,-90,0,90];
134 TorqueArm=BodyAdd(TorqueArm,mm5,'position',pos9);
135 Plot3D(TorqueArm);
136 pos10=[-80/2,-1580/2,660,-90,0,-90];
137 TorqueArm=BodyAdd(TorqueArm,mm5,'position',pos10);
138 Plot3D(TorqueArm);
139

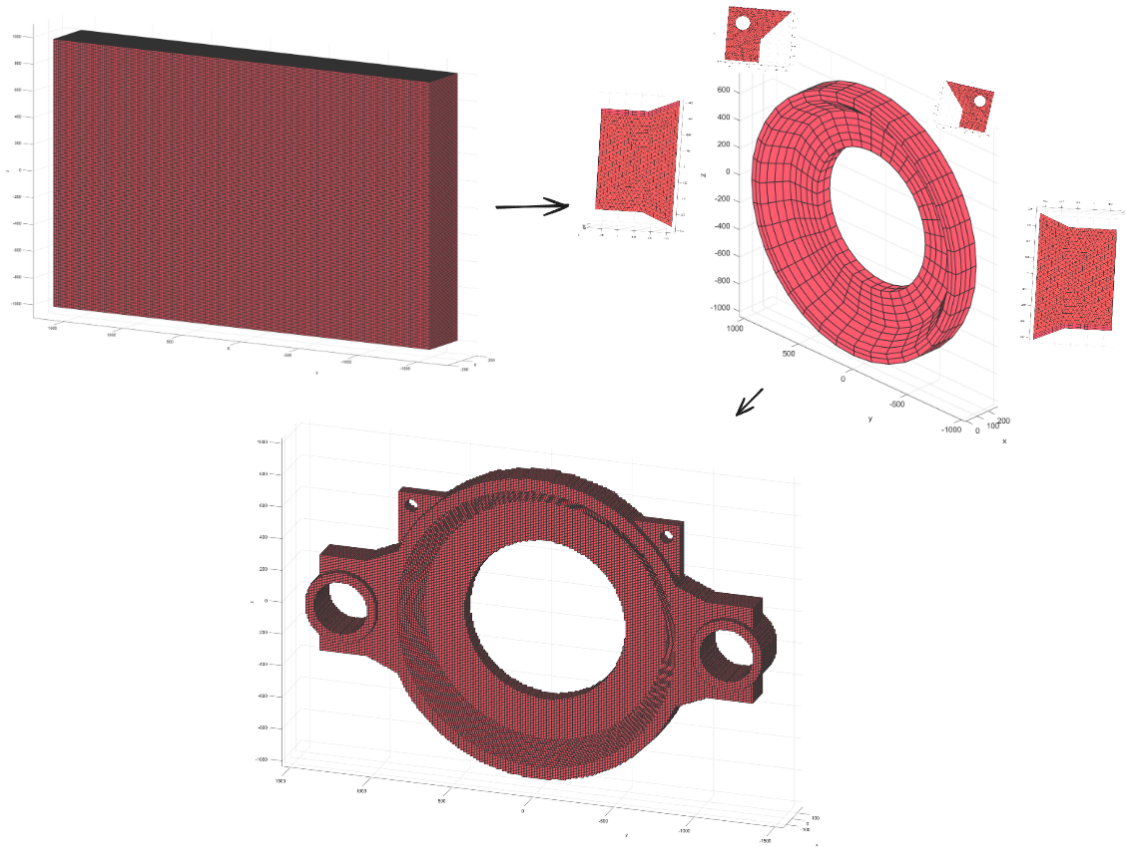
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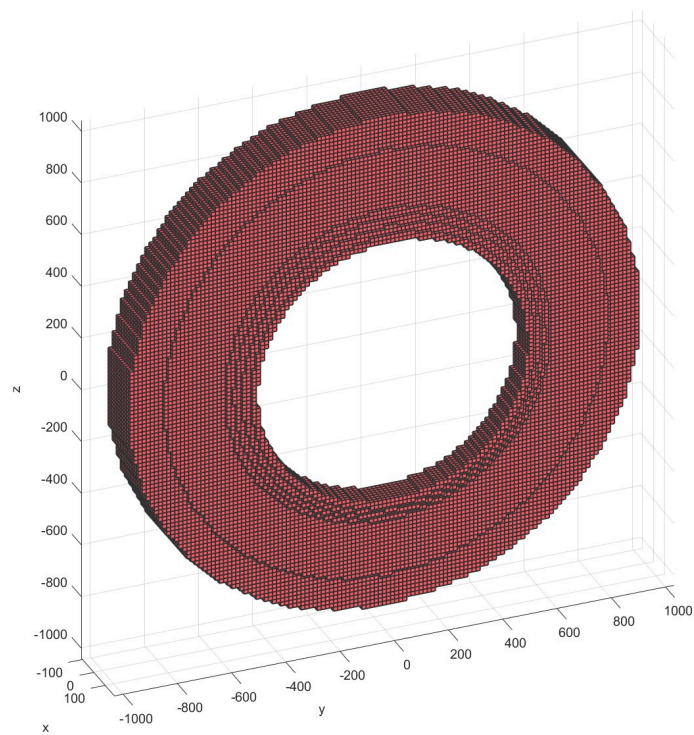
141 Plot3D(TorqueArm);
142 TorqueArm=SmoothFace(TorqueArm,20);
143 Plot3D(TorqueArm);

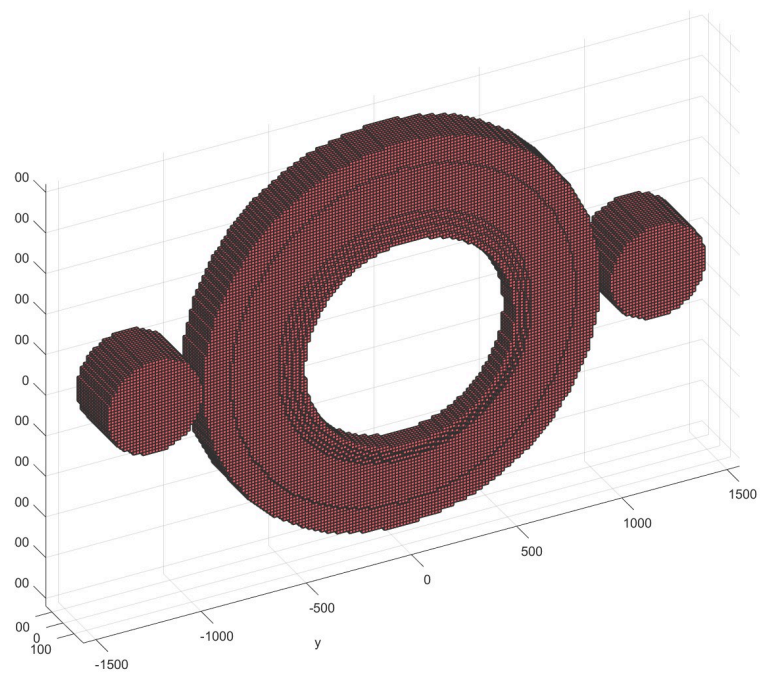
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首先生成一块原料，在通过BodyAdd和BodyRemove增删网格，简要思路如下图所示：

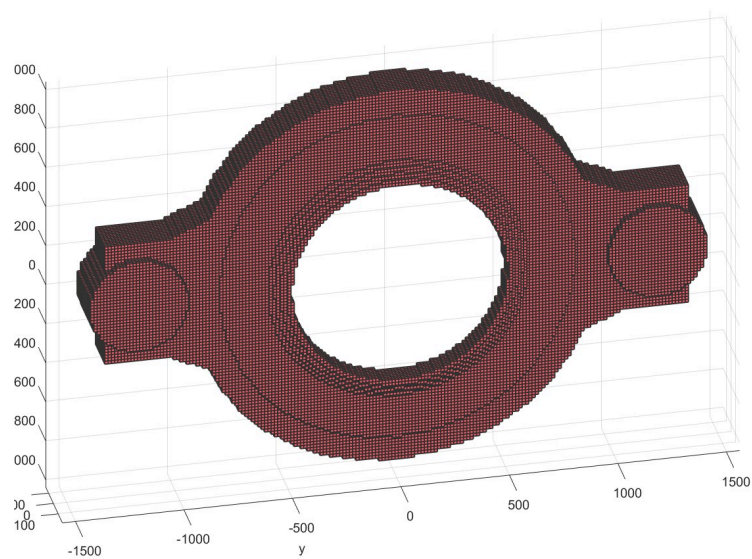


生成中心轴承座主体部分

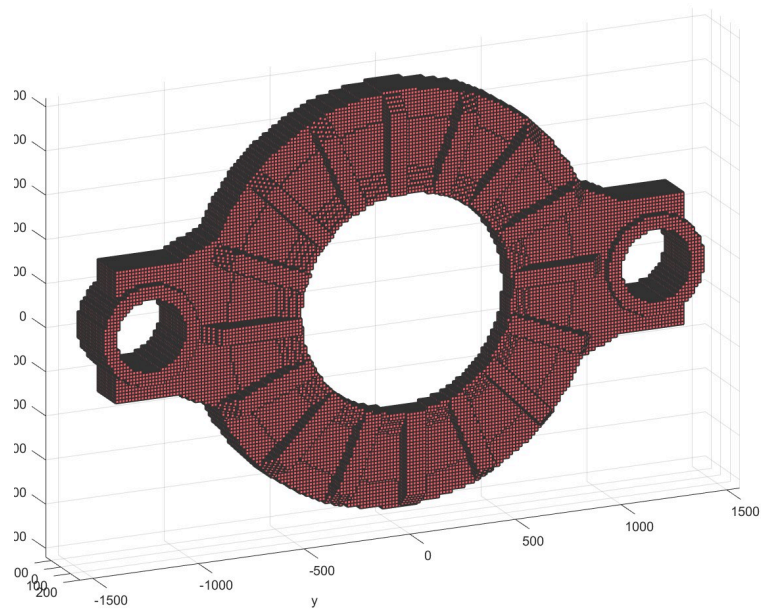




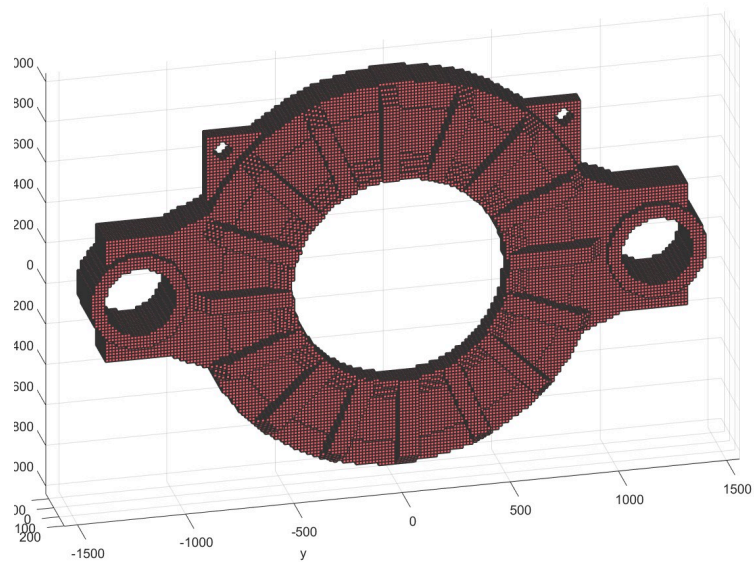
生成支座外壳和主体连接：



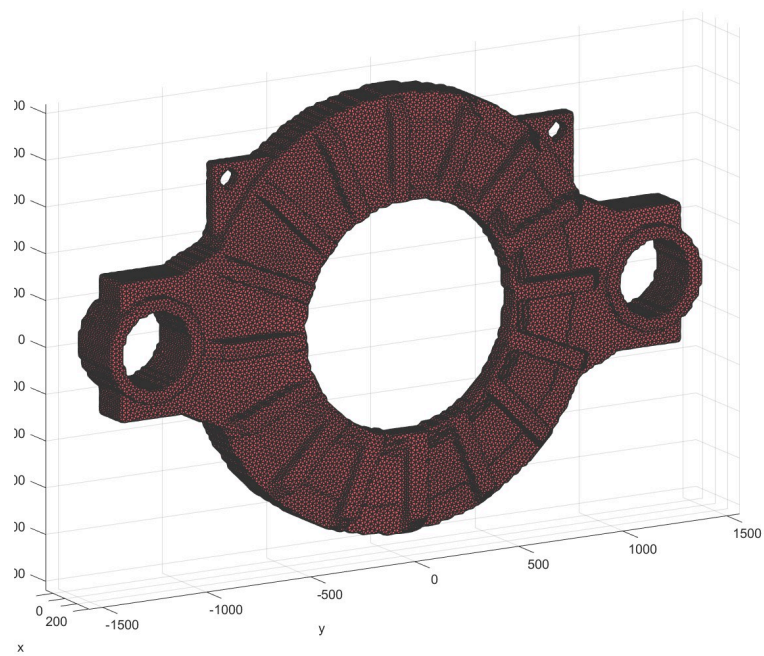
增加一些加强筋：



增加吊耳，可以看到此时的网格已经和图片非常相似了。



以此模型为基础平滑网格，并生成四面体网格，这时的网格已经可以导出进行分析。



4 参考文献