MagnetCoupling

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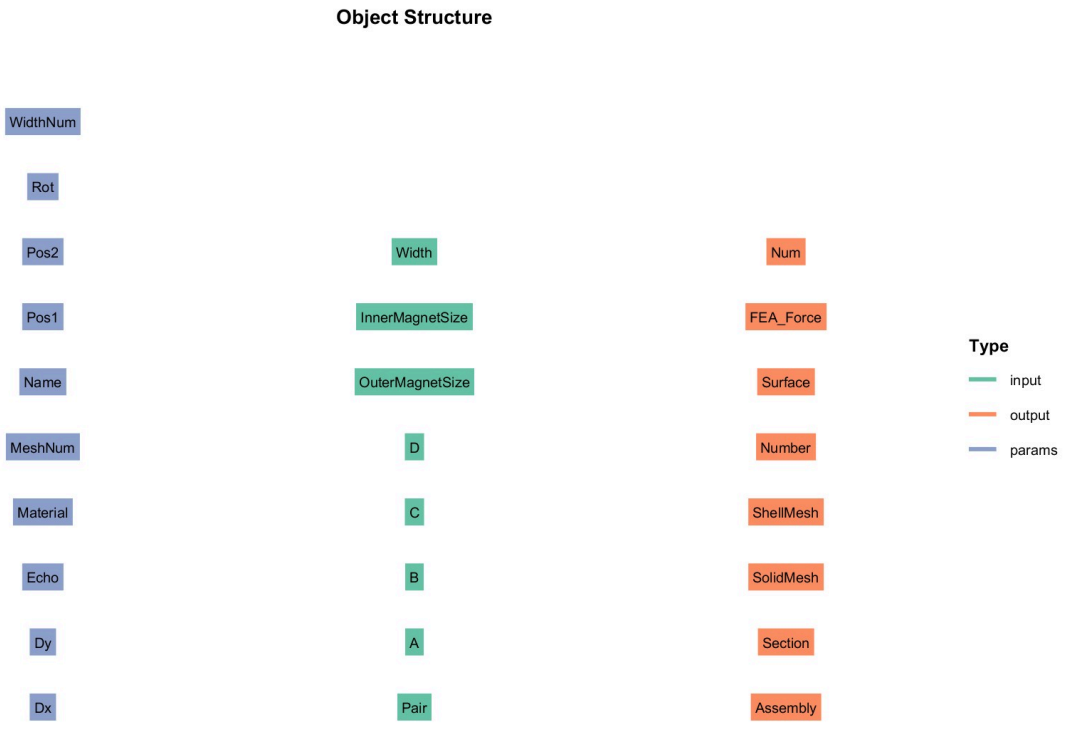
1 介绍

MagnetCoupling用于磁力联轴器的仿真和计算。

2 类结构



输入 input：

- Width : 联轴器宽度
- OuterMagnetSize: 外转子尺寸
- InnerMagnetSize: 内转子尺寸
- A : 内转子内径
- B : 内转子外径
- C : 外转子内径
- D : 外转子外径
- Pair : 磁铁对数

参数 params:

- WidthNum： 宽度方向网格数量
- Rot : 旋转角
- Pos1 : 位置参数
- Pos2 : 位置参数

- Material : 材料
- MeshNum : 磁铁截面长宽方向网格数量
- Dx : x方向位移
- Dy : y方向位移

输出 output :

- Number : 编号
- FEA_Force : 有限元计算反力
- SolidMesh : 实体网格
- ShellMesh : 截面网格
- Surface : 表面
- Section : 截面
- Assembly : 实体装配

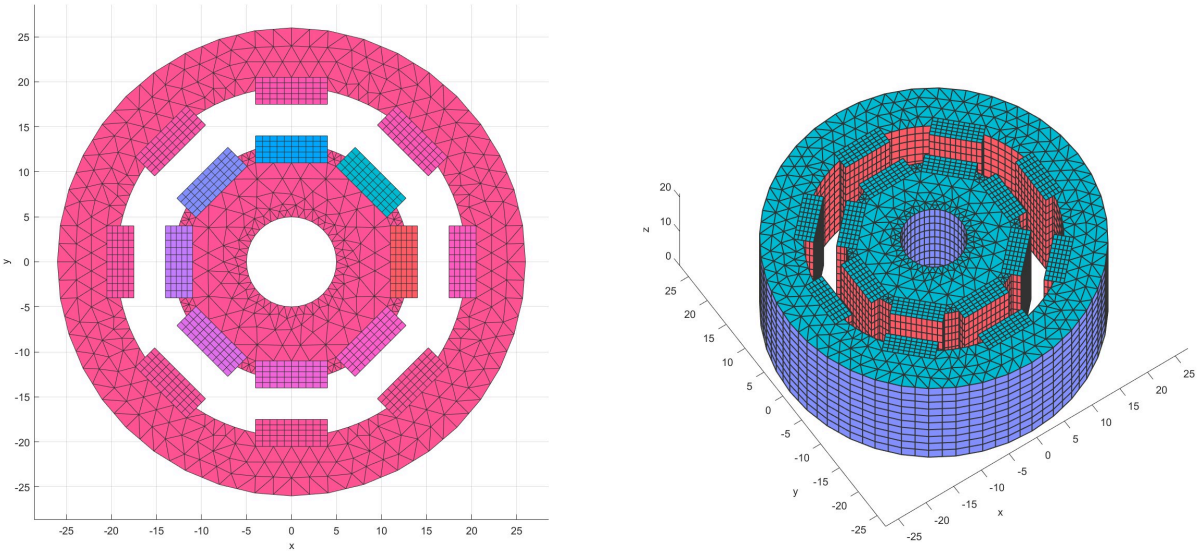
3 案例

3.1 Demo magnet coupling (Flag=1)

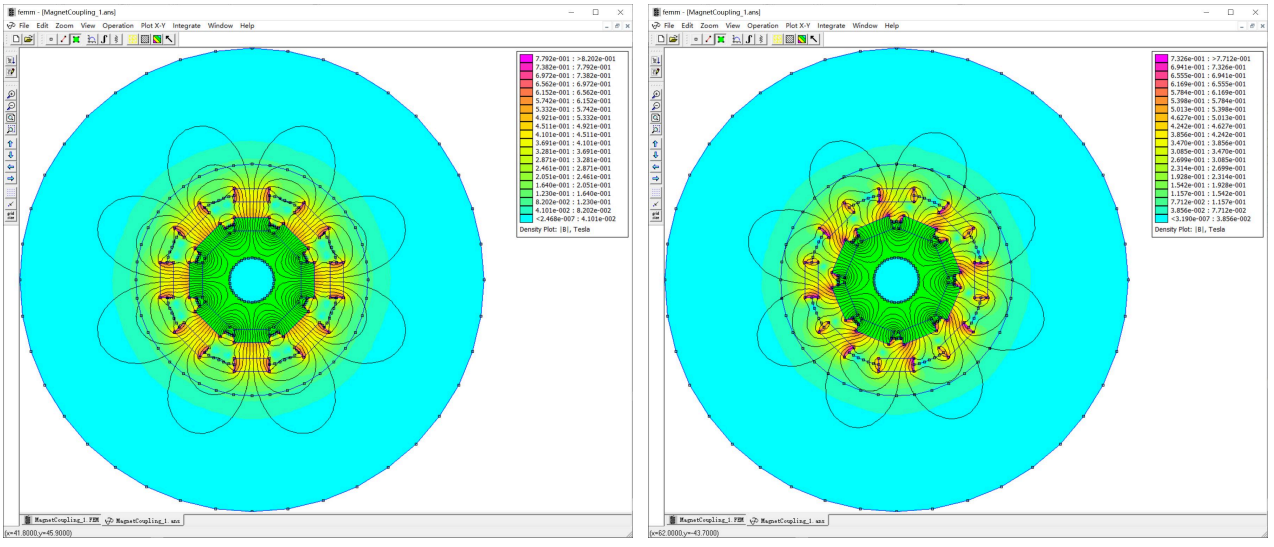
```
S=RMaterial('Magnetic');
Mat=GetMat(S,[36,72,92]'); % Set Material
PairNum=8;

Mat{1,1}.Mux=1.124;
Mat{1,1}.Muy=1.124;
Mat{1,1}.Hc=800000;
Mat{1,1}.BHPoints=[];

inputStruct1.Pair=PairNum;
inputStruct1.A=10;
inputStruct1.B=28;
inputStruct1.C=35;
inputStruct1.D=52;
inputStruct1.OuterMagnetSize=[8,3];
inputStruct1.InnerMagnetSize=[8,3];
inputStruct1.Width=20;

paramsStruct1.Material=Mat;
paramsStruct1.Dx=0;
paramsStruct1.Dy=0;

Conn= connection.MagnetCoupling(paramsStruct1, inputStruct1);
Conn= Conn.solve();
Plot2D(Conn);
Plot3D(Conn);

Step=360/PairNum/20;
Angle=NaN(1,21);
Torque=NaN(1,21);
for i=1:21
  Angle(i)=Step*(i-1);
  paramsStruct1.Rot=Step*(i-1);
  Conn= connection.MagnetCoupling(paramsStruct1, inputStruct1);
```

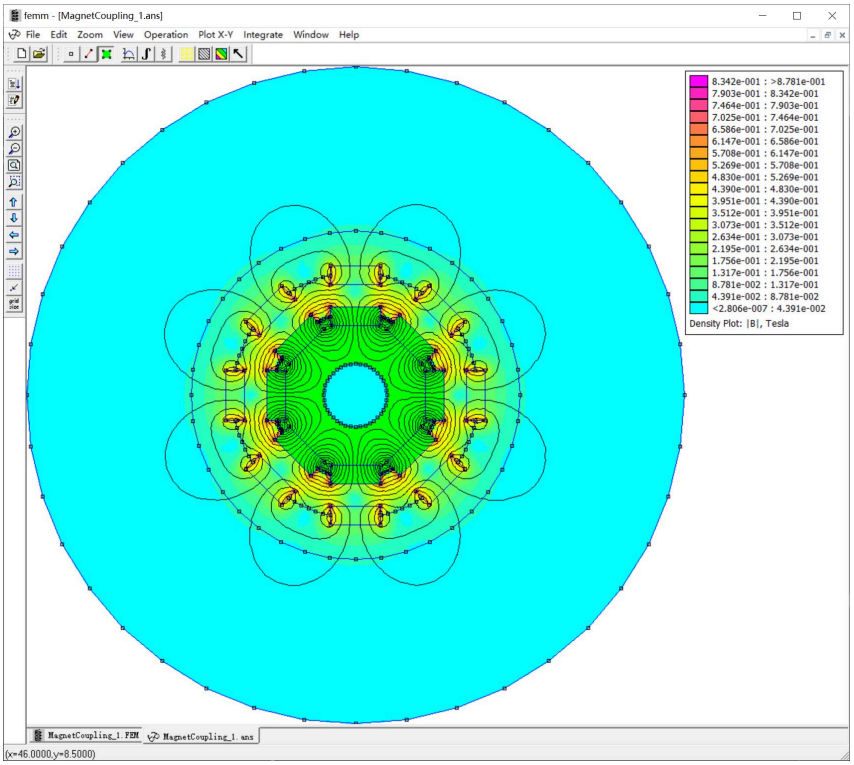
```
    Conn= Conn.solve();
    Conn=CalMagneticField(Conn);
    Torque(i)=Conn.output.FEA_Force(3);
end

figure
plot(Angle,Torque)
```

在Baffalo中建立磁力联轴器，程序会调用FEMM计算磁场和扭矩。

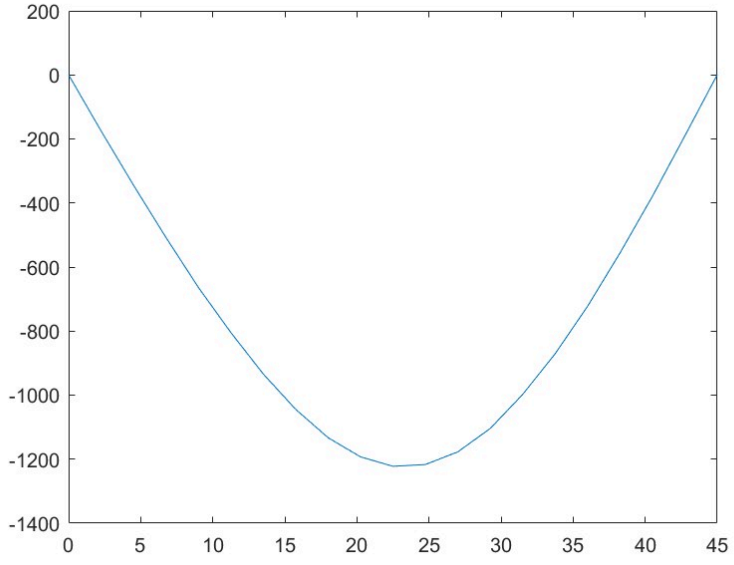


通过设置旋转的角度，来计算其峰值扭矩，下图分别为0°，22.5°，45°下的磁场





得到扭矩和角度的关系如下，最大扭矩在1200 Nmm左右。



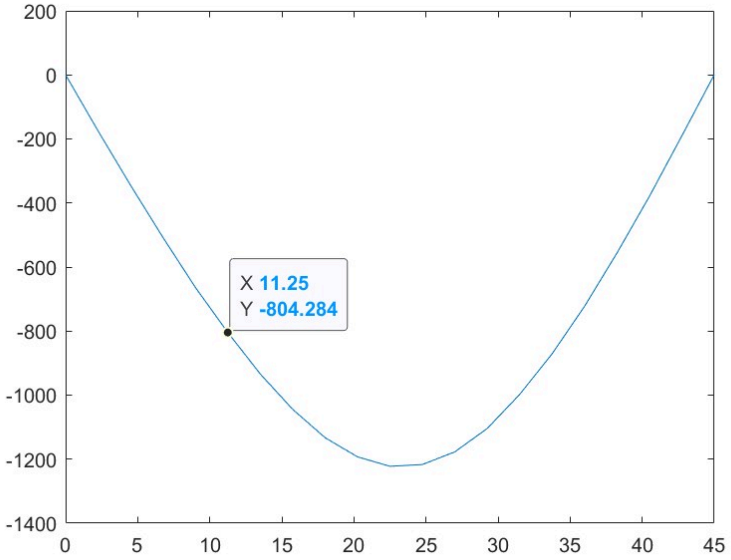
3.2 Magnet Coupling stiffness (Flag=2)

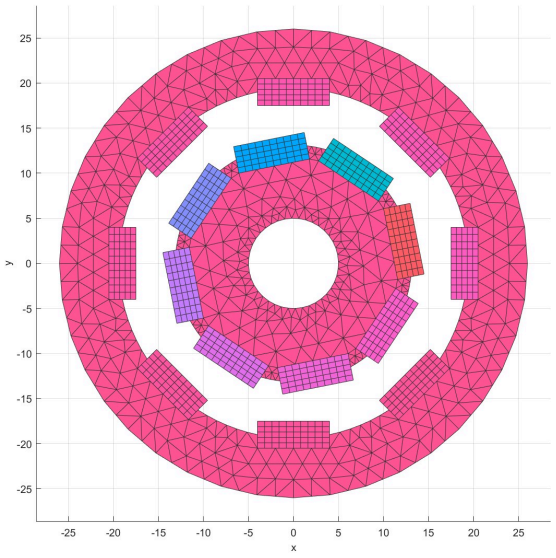
联轴器参数不变，定义额定扭矩在800Nmm左右，计算X方向的刚度。

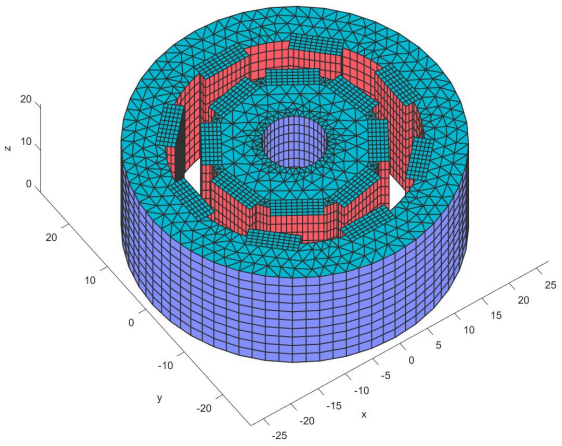
```
S=RMaterial('Magnetic');
Mat=GetMat(S,[36,72,92]'); % Set Material
PairNum=8;

Mat{1,1}.Mux=1.124;
Mat{1,1}.Muy=1.124;
Mat{1,1}.Hc=800000;
Mat{1,1}.BHPoints=[];

inputStruct1.Pair=PairNum;
```

```
inputStruct1.A=10;
inputStruct1.B=28;
inputStruct1.C=35;
inputStruct1.D=52;
inputStruct1.OuterMagnetSize=[8,3];
inputStruct1.InnerMagnetSize=[8,3];
inputStruct1.Width=20;

paramsStruct1.Material=Mat;
paramsStruct1.Rot=11.25;
paramsStruct1.Dy=0;

Conn= connection.MagnetCoupling(paramsStruct1, inputStruct1);
Conn= Conn.solve();
Plot2D(Conn);
Plot3D(Conn);

Step=2/10;
Angle=NaN(1,11);
Fx=NaN(1,11);
for i=1:11
  Angle(i)=Step*(i-1);
  paramsStruct1.Dx=Step*(i-1);
  Conn= connection.MagnetCoupling(paramsStruct1, inputStruct1);
  Conn= Conn.solve();
  Conn=CalMagneticField(Conn);
  Fx(i)=Conn.output.FEA_Force(1);
end

figure
plot(Angle,Fx)
```

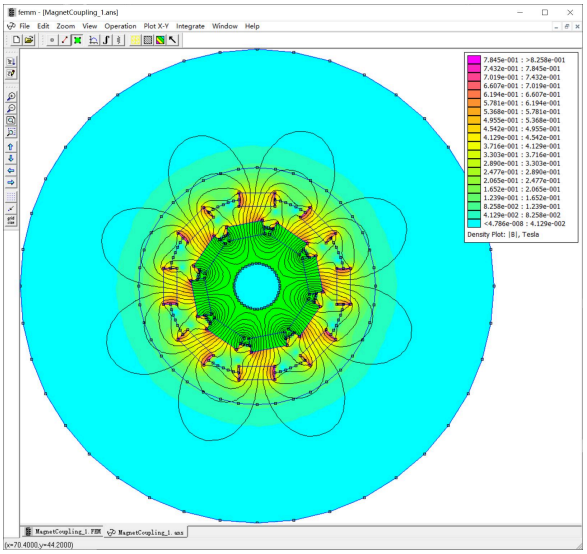
根据上一案例中，设置旋转角度为11.25°。

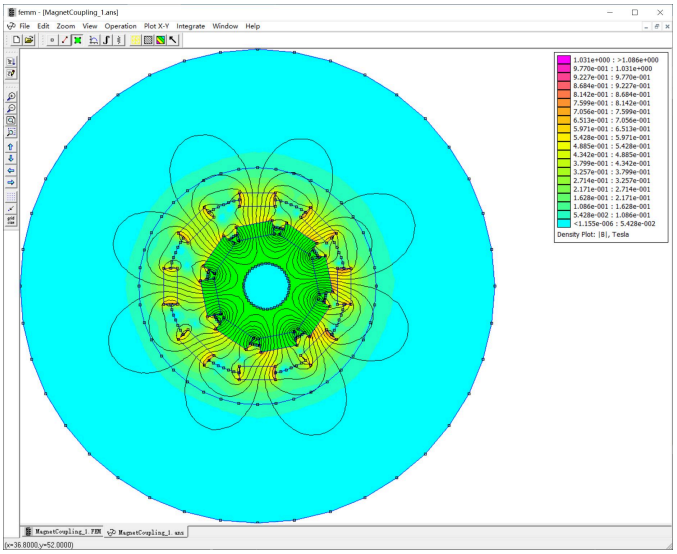




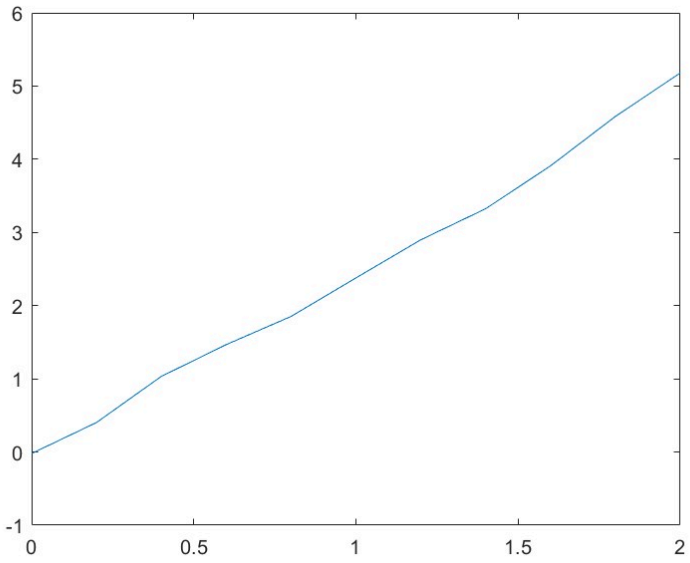


磁场分布如下(0mm,2mm):





位移和力的关系:



4 参考文献