ANSYS WORKBENCH分析应用基础

LESSON25 齿轮案例预备：接触中的一个小技巧

机械人读书笔记

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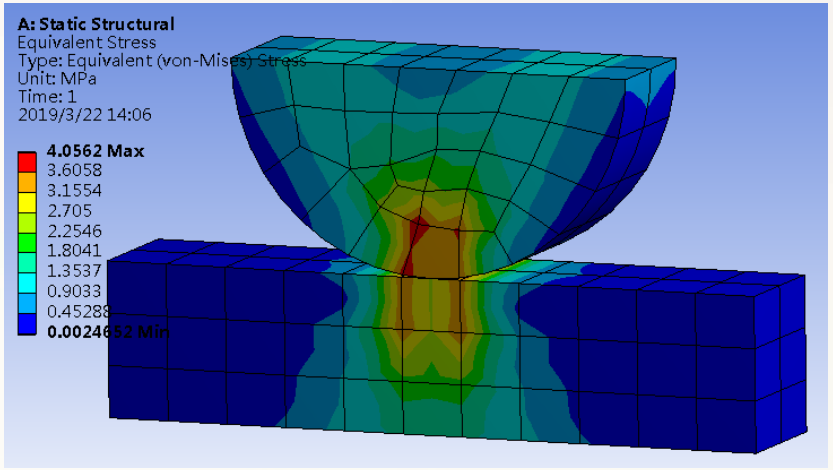
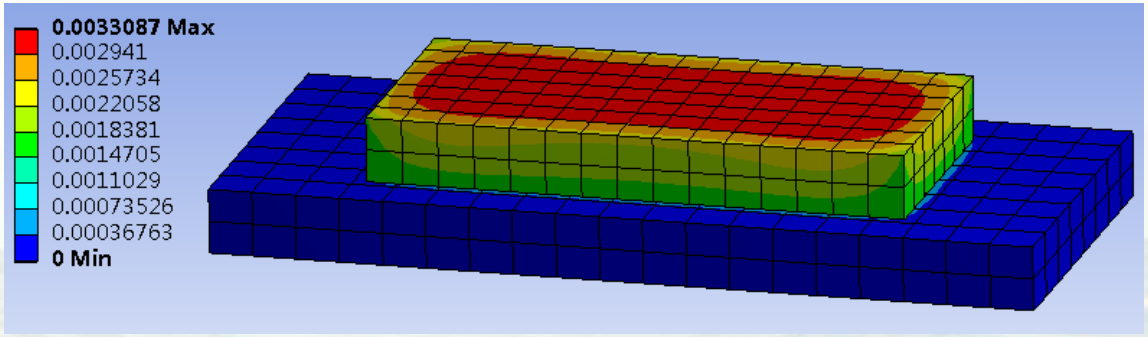
接触中到底哪个参数才是我们最需要关注的？接触算法？接触刚度？容差？还是pinball区域？

很遗憾，虽然以上4个名词在教材里或者在有限元学习过程中出镜率极高，但是困扰新手学习者由于接触参数设置问题导致无法解决分析问题的原因多数时候却不是他们，而是间隙！

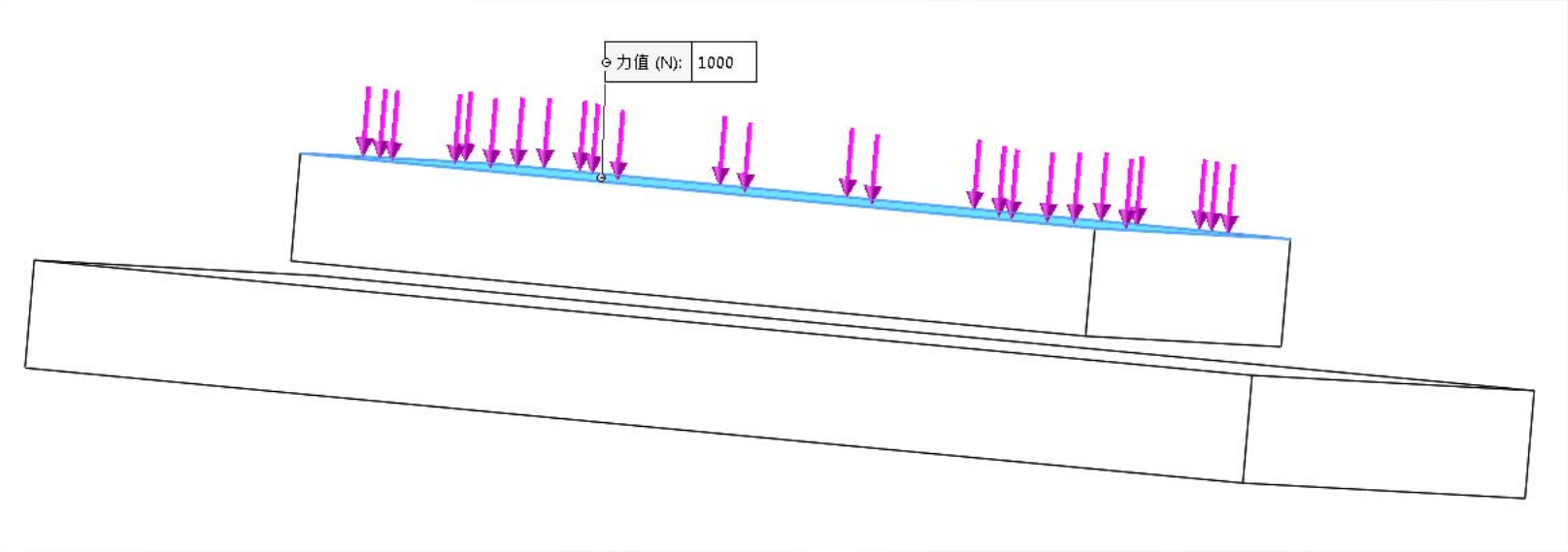
本课重点内容

1. 平面间隙问题；
2. 接触中OFFSET的使用；
3. 曲面接触间隙的形成；
4. 一个接触设置的小技巧。



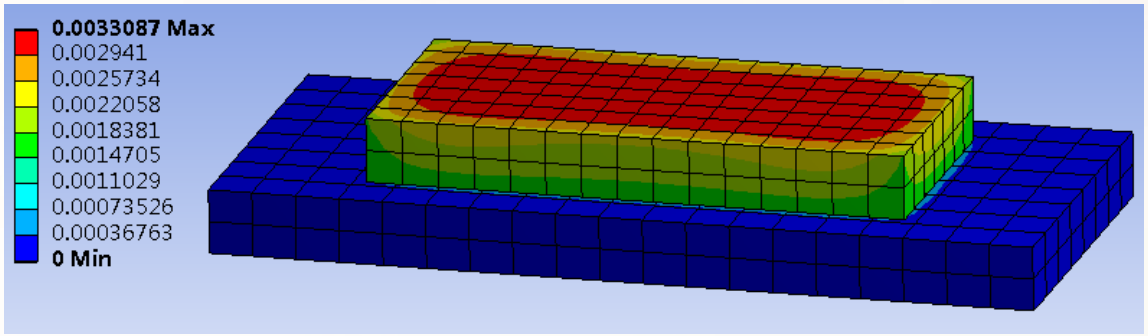


如果建模的时候存在间隙怎么办



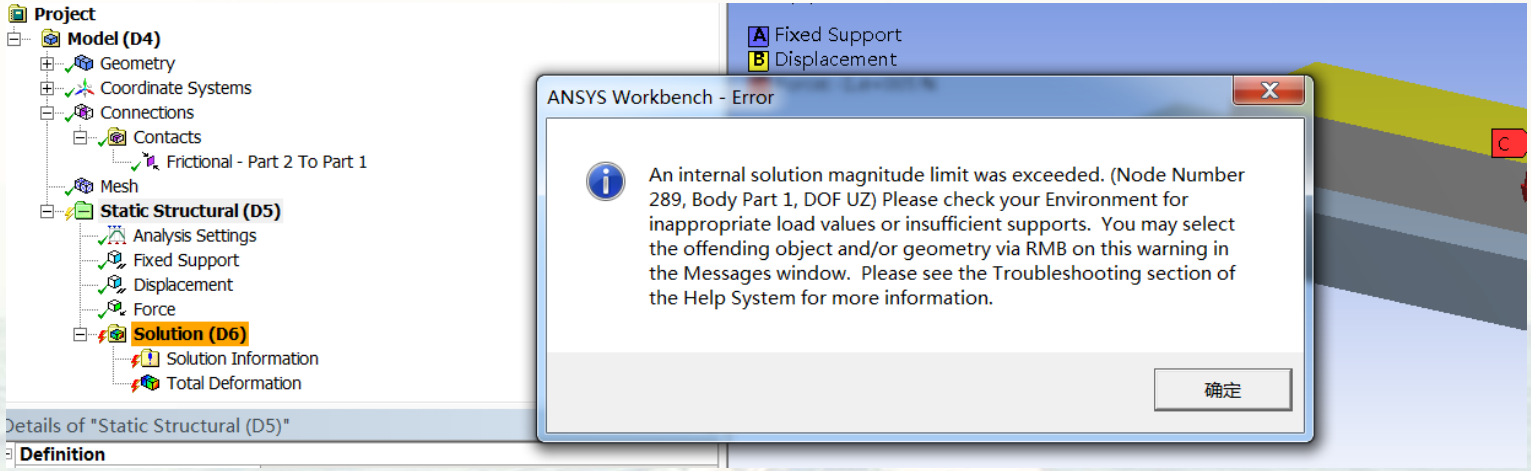
在实际产品过程中，很多时候由于设计问题，原本的接触面因为三维建模定位问题会出现间隙，如上图所示，此时如果不对模型进行处理，分析能正常进行么？

分析结果对比

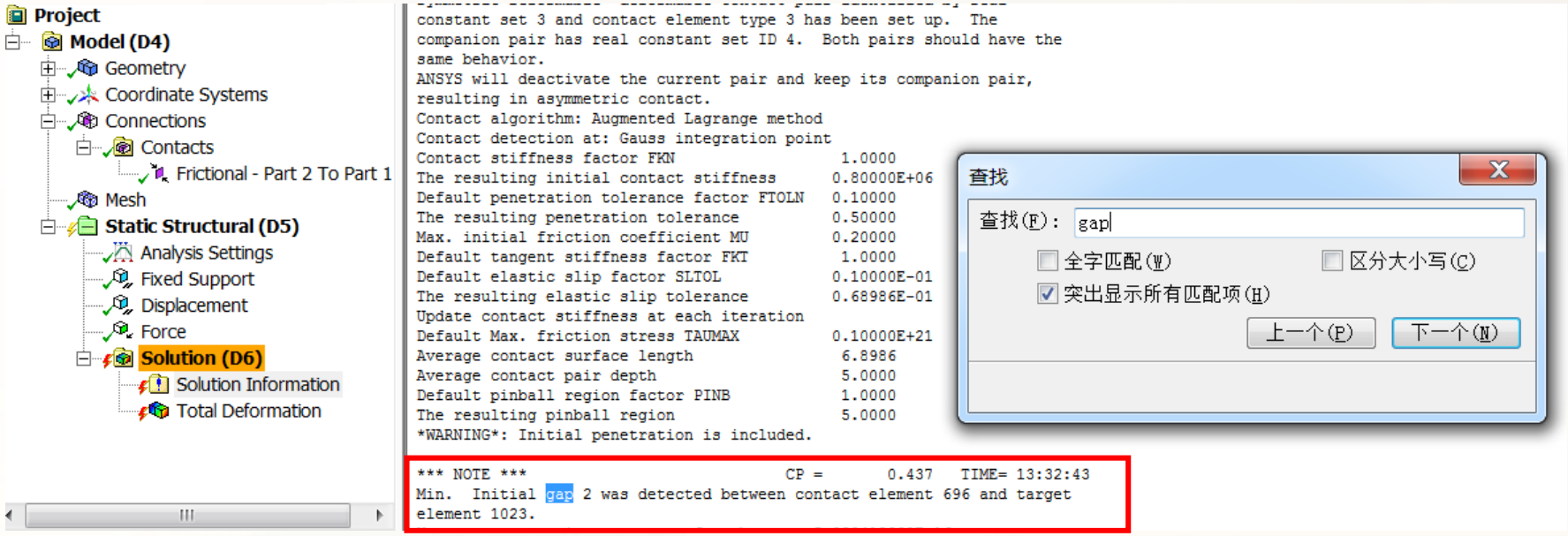


不存在间隙的分析结果

存在间隙的
计算结果



间隙的信息获取



如图所示在Solution Information的页面下搜索gap，获取到一段上图红色框框内的信息，这段信息的意思是有一对接触初始最小间隙为2（mm）。

OFFSET设置

Advanced	
Formulation	Program Controlled
Small Sliding	Program Controlled
Detection M...	Program Controlled
Penetration ...	Program Controlled
Elastic Slip T...	Program Controlled
Normal Stiff...	Program Controlled
Update Stiff...	Program Controlled
Stabilization...	0.
Pinball Regi...	Program Controlled
Time Step C...	None
Geometric Modification	
Interface Tre...	Add Offset, No Ramping
Offset	2
Contact Geo...	None
Target Geo...	None

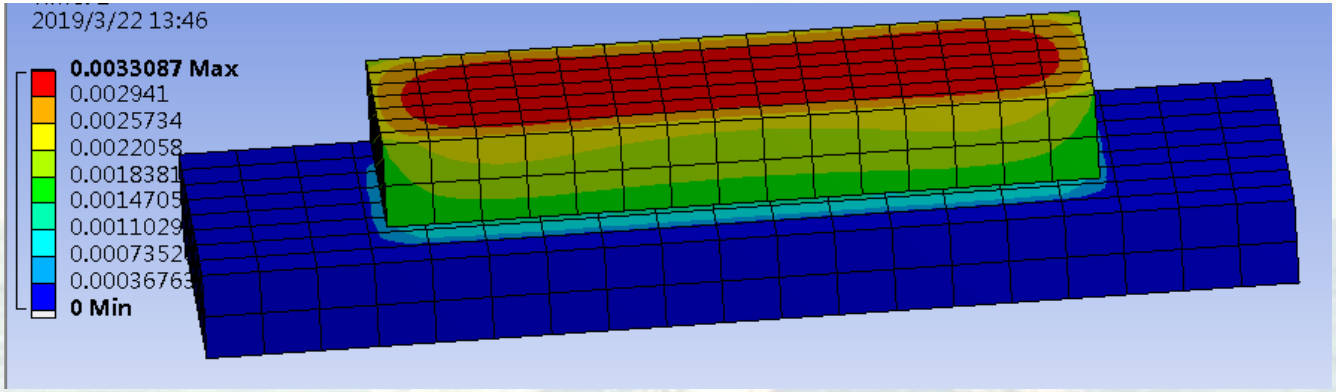
设置为**OFFSET 为**1mm

```
*** NOTE ***                                CP =       0.437   TIME= 13:43:20
Min.  Initial gap 1 was detected between contact element 696 and target
element 1023.
```

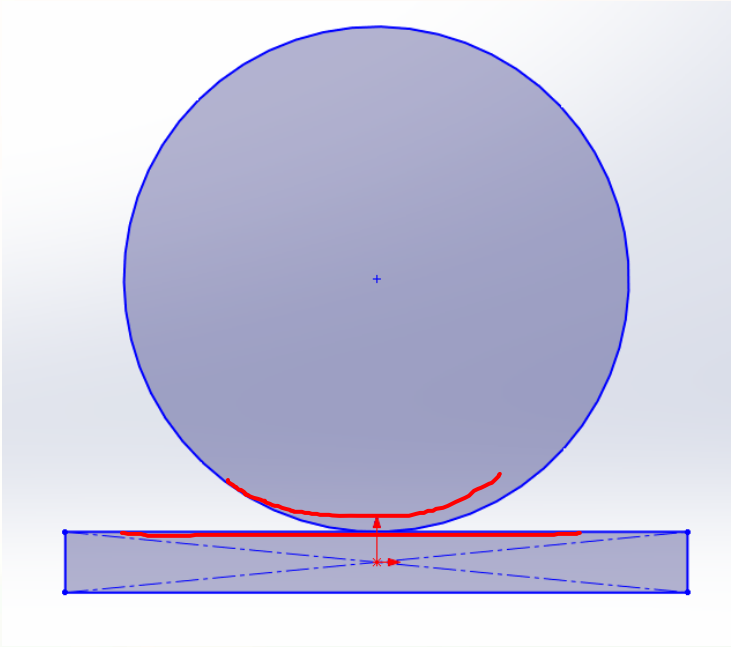
设置为**OFFSET 为**1.5mm

```
*** NOTE ***                                CP =       0.374   TIME= 13:44:45
Min.  Initial gap 0.5 was detected between contact element 726 and
target element 997.
```

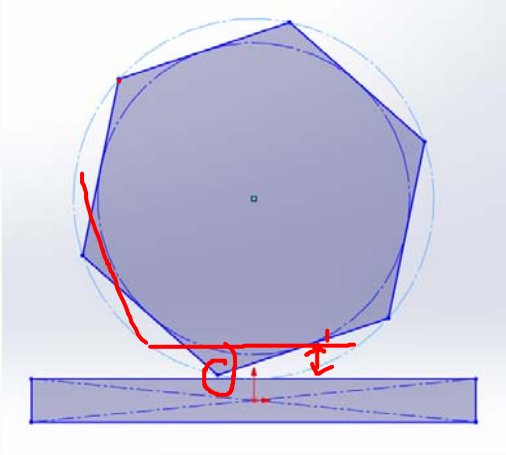
设置为**OFFSET 为**2mm，就无法搜索到gap信息



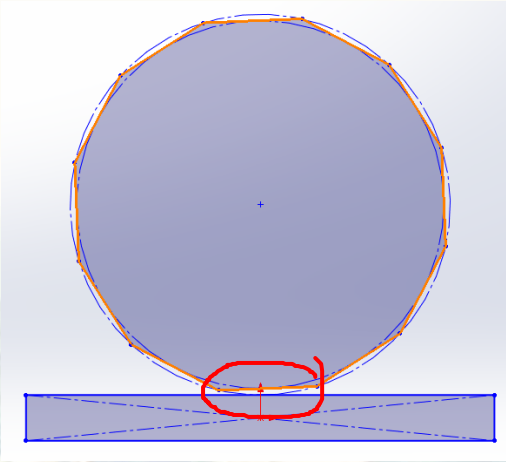
曲面接触的间隙产生



在三维模型状态下，底板表面
和圆相切

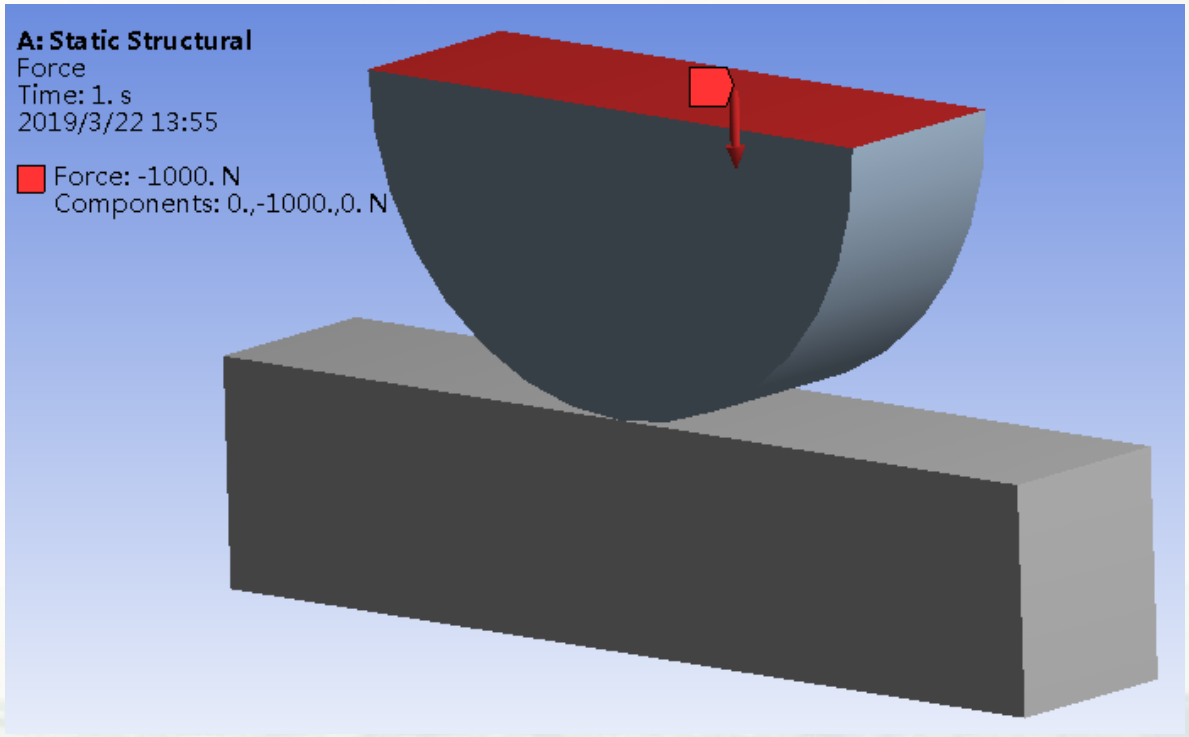


六边形



十二边形

曲面和平面接触问题


A: Static Structural
Force
Time: 1. s
2019/3/22 13:55
Force: -1000. N
Components: 0.,-1000.,0. N

间隙统计

10mm网格间隙

```
*** NOTE ***                                CP =       0.374   TIME= 13:56:40
Min.  Initial gap 0.106759356 was detected between contact element 138
and target element 127.
```

5mm网格间隙

```
*** NOTE ***                                CP =       0.421   TIME= 13:58:00
Min.  Initial gap 2.925615872E-02 was detected between contact element
793 and target element 757.
```

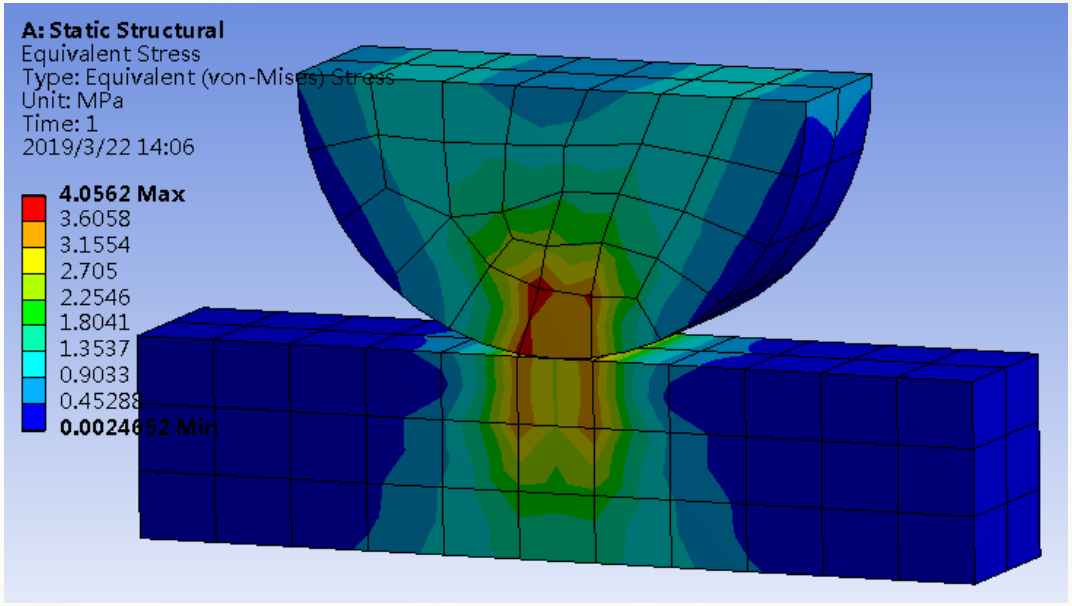
2mm网格间隙

```
*** NOTE ***                                CP =       0.952   TIME= 13:59:04
Min.  Initial gap 2.782378028E-03 was detected between contact element
11195 and target element 11338.
```

对于工程师来说，了解到这一步就足够解决接触间隙的问题，至于这个间隙阙值电脑是如何定义的对于多数软件使用者来说并不需要知道，对于我们工程人员来说这个值最好限制在0.01以下。

一个简单粗暴的设置方式：自动消除间隙

Advanced	
Formulation	Program Controlled
Small Sliding	Program Controlled
Detection Method	Program Controlled
Penetration Tolerance	Program Controlled
Elastic Slip Tolerance	Program Controlled
Normal Stiffness	Program Controlled
Update Stiffness	Program Controlled
Stabilization Damping Factor	0.
Pinball Region	Program Controlled
Time Step Controls	None
Geometric Modification	
Interface Treatment	Adjust to Touch
Contact Geometry Correction	None
Target Geometry Correction	None




```
Auto contact offset used to close gap        0.11774
Initial penetration is excluded.

*** NOTE ***                            CP =       0.374   TIME= 14:06:40
Min.  Initial gap 0.116578779 was detected between contact element 130
and target element 143.
The gap is closed due to initial settings.
*****************************************
```

曲面接触问题

齿轮

轴承


下一期视频，我将和大家一起交流关于
《齿轮案例预备：赫兹接触和齿轮失效》