Question 36

Q: Can Femtet perform the analysis associated with nonlinear geometry?

A: Yes, Femtet can perform an analysis of large displacement and large strain associated with nonlinear geometry.

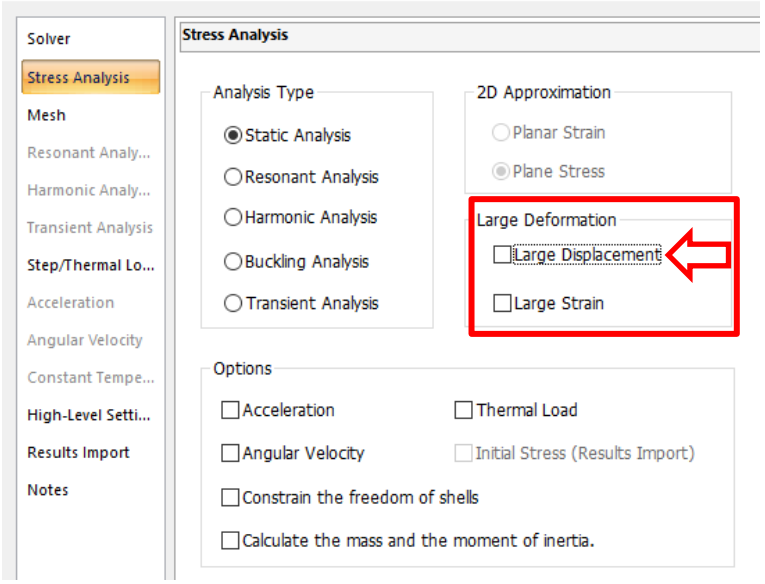
1. Large displacement
Used when the rotation is quite large and cannot be ignored. Large deformation or large rotation sometimes means this large displacement.

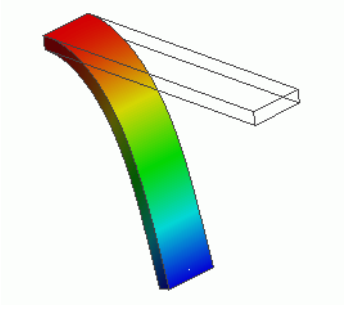
2. Large strain
Used when the strain is large, more than several %.

Two Types of Nonlinear Geometry

Murata Software

Analysis Condition Setting

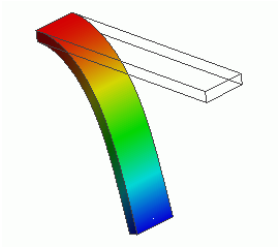




Large displacement

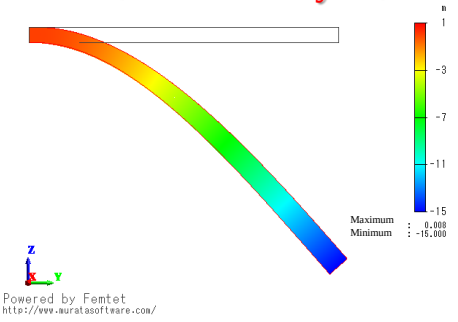
The effect that a small strain at the base will cause a large displacement at the tip is taken into account.

Large Displacement



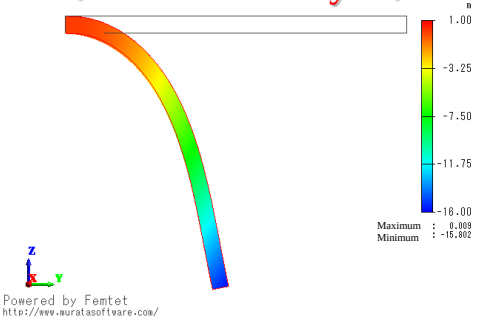
Large displacement
Curling that is ignored in the micro deformation analysis is taken into account (See the example 6).

Large Displacement deselected (Linear Analysis)



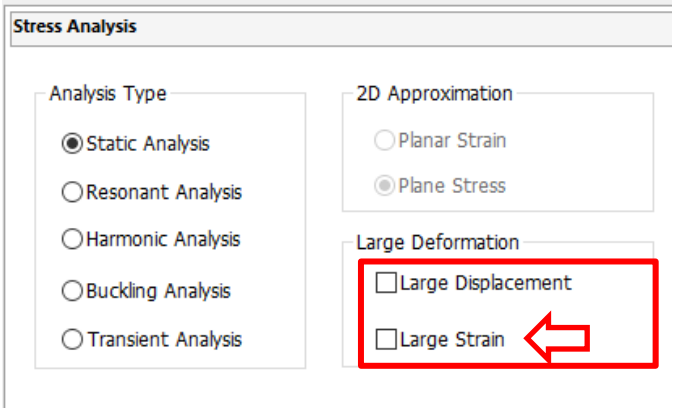
A micro displacement is only expanded.
It does not align with the observed results.

Large Displacement selected (Nonlinear Analysis)



Calculate for small deformation, and then remodel. Repeat the process. (Nonlinear Analysis)

Two Types of Nonlinear Geometry

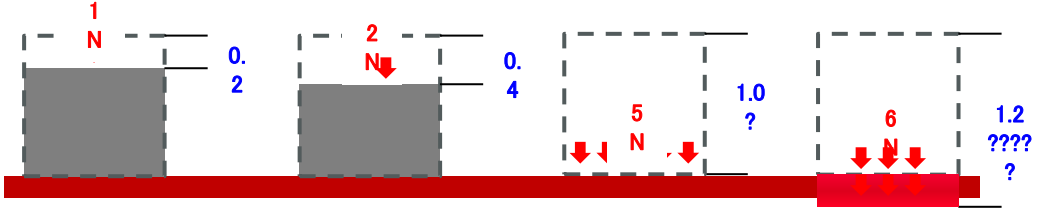


Large Strain

If the strain is large, more than several %, please select [Large Strain] to perform nonlinear analysis.

- If superelastic material, selecting the large displacement will also take into account the large strain.

Contradiction in the linear analysis

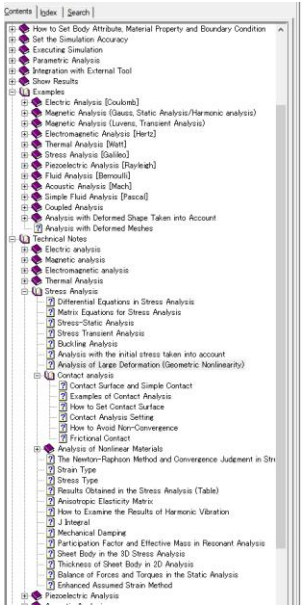


Selecting the large strain will repeat the process of deforming a little and remodeling (Nonlinear analysis). The form of the equations has been modified.

Additional Information

Please refer to the technical notes of the help menu below for more information:

Home/Technical Notes/Stress Analysis/Analysis of Large Deformation (Geometric Nonlinearity)



Analysis of Large Deformation (Geometric Nonlinearity)

Large Deformation Options

There are 2 types of large deformation (geometric nonlinearity).

1) Large displacement
Used when the rotation is quite large and cannot be ignored.
Large deformation or large rotation sometimes means this large displacement.

2) Large strain
Used when the strain is large (more than several %).

When these are selected, the loading is updated in accordance with the deformation.
For example, the direction of pressure will be normal to the deformed face.
Total load and torque load distribution will reflect the resulting area and length.

Explanations on why this option is needed and its formulation follow.

Large Deformation (Geometric Nonlinearity)

In linear analysis, it is assumed that the deformation of model shape is not large.
Therefore, if the deformation is going to be large, the deformed shape and conditions need to be taken into consideration.
This kind of deformation is geometric nonlinearity.
It is nonlinear because the displacement is not proportional to the stress.

The definition of deformation is as follows.
The transformation from A to B involves the following three steps.

1) Translation A to B′
2) Strain (enlargement, reduction, shear) B′ to B″
3) Rotation B″ to B