

Knowledge Base

Information



Abaqus/CAE plug-in utility to generate a 3D cylindrical model from an axisymmetric part

Portfolio / Domain: SIMULIA Abaqus Unified FEA / SIMULIA Abaqus Unified FEA
Product: SIMULIA Abaqus/CAE

QA Article: QA0000009962e
Applicable Level: 6.9
 1)
Last Update Date: 08.
Rating: Not
Views: 662

QUESTION

I have an axisymmetric model in Abaqus/CAE. How can I generate a 3D model with cylindrical elements?

ANSWER

(The following applies to Abaqus 6.9 and higher)

An Abaqus/CAE plug-in application for this purpose is attached below. The plug-in was developed around threaded connection workflows but can be used for any application where a 3D model containing cylindrical (CCL) elements needs to be generated from an axisymmetric model containing regular axisymmetric (CAX) elements. The application uses the *SYMMETRIC MODEL GENERATION and *SYMMETRIC RESULTS TRANSFER keywords.

Installation

To install the plug-in, save the attached archive file caxccl.zip to one of the following directories:

abaqus_dir\abaqus_plugins where *abaqus_dir* is the Abaqus parent directory

home_dir\abaqus_plugins where *home_dir* is your home directory

current_dir\abaqus_plugins where *current_dir* is the current directory

Note that if the abaqus_plugins directory does not exist in the desired path, it must be created. The *plugin_dir* directory can also be used, where *plugin_dir* is a directory specified in the abaqus_v6.env file by the environment variable **plugin_central_dir**. You can store plug-ins in a central location that can be accessed by all users at your site if the directory to which **plugin_central_dir** refers is mounted on a file system that all users can access. For example, `plugin_central_dir = r\\fileServer\sharedDirectory'`

On Windows platforms, right click on the archive file and select WinZip → Extract to here. On Linux platforms, type **unzip caxccl.zip** at the command prompt. Folder named abq_SymmModelGen and file named symmModelGen_plugin.py will be extracted. Note that the plug-in will not function properly if this procedure is not followed.

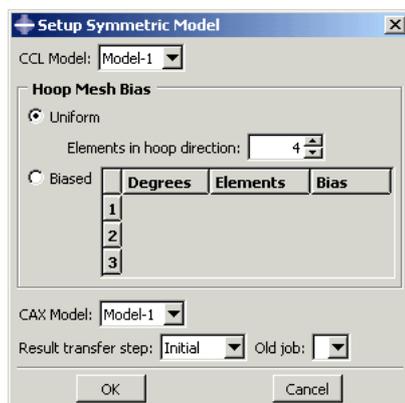
Usage

From the **Job** module, a new toolbar named **Symmetric Model Generation Workflow** will be available. This toolbar contains one icon:



Using this utility is similar to running a restart analysis; the axisymmetric results must be generated before creating the cylindrical model. Also, the cylindrical model should be defined (constraints, loads and boundary conditions) before the plug-in is invoked.

When the plug-in is invoked, the following dialog box gathers the cylindrical model generation parameters (mesh definition, result transfer step, etc) and writes them in session.customData.CaxCcl under the model repository in your Abaqus/CAE database. For example, a model named "CAX-to-CCL" will have its corresponding symmetric model generation parameters written in session.customData.CaxCcl.models["CAX-to-CCL"].



In addition to writing the parameters, the plug-in will also change the cylindrical model into a restart model. When you create a job and submit it for analysis, the plug-in is internally called back to generate the cylindrical model (using the *SYMMETRIC MODEL GENERATION and *SYMMETRIC RESULTS TRANSFER keywords).

Suggested Workflow

1. Create a new model (**Model** → **Create**) to be used as the cylindrical model
2. Copy (**Model** → **Copy Objects...**) only the instances for which the cylindrical model should be created.
3. Define the kinematic coupling (if applicable) between the reference point and the surface on which the load/boundary condition will be applied. Note: The plug-in requires all the regions (on which the coupling, load or boundary condition are applied) be defined as named sets.

4. Define the load/boundary condition on the named sets (region) as required.
5. Invoke the plug-in from the **Job** module to generate the symmetric model parameters for the model:
 - Select CCL model in the **CCL Model** drop-down menu
 - Set **Hoop Mesh Bias** parameters
 - Select CAX model in the **CAX Model** drop-down menu
 - Select the step in the CAX model from which the results should be read (step information will be written out with ***SYMMETRIC RESULTS TRANSFER** keyword) in the **Result transfer step** drop-down menu
 - Select the job in the CAX model from which the analysis should be restarted (job name will be used with "-old job" option for restart analysis) in the **Old job** drop-down menu
 - Press **OK**
6. Create a new job for the CCL model and run the job to generate result.

Limitations

The plug-in:

- writes the *SYMMETRIC MODEL GENERATION with ELEMENT OFFSET=100,000 and NODE OFFSET=100,000. Hence, using a CAX model which contains more than 100,000 nodes may lead to errors in the symmetric boundary condition definition (which assumes that the model contains less than 100,000 nodes) and may lead to unexpected results.
- stores the symmetric model parameters in the session.customData.CaxCcl repository and hence the data is not persistent. If an Abaqus/CAE database with a CCL model (after defining the symmetric model parameters) is saved and the session is closed, the information will not be stored and hence have to be redefined before running the job again.
- can be used only for generating 180 degree cylindrical models from an axisymmetric model. Generation of 360 degree models is not supported.
- does NOT support imported input files or orphan meshes in the CCL model.

Notes

- The loads and boundary condition in the CCL model should be applied to part level sets created in the CAX model. Assembly-level reference points normally used to define loading and constraints are not transferred to the symmetric model.
- Avoid use of blank space when naming model instances, material or any other parameters. The plug-in may not function properly otherwise.
- More information about Degrees, Elements and Bias option mentioned in the GUI can be obtained from ***SYMMETRIC MODEL GENERATION** section in the Abaqus Keywords Reference Guide.

Revision History

15 Oct 10	Release 1.1-1
15 Jun 11	Release 1.1-2
7 Jul 2014	Release 1.1-3

Disclaimer

The attachments to this article are subject to certain usage conditions. Please [click here](#) for details.

KEYWORDS **plug-in, plugin, Symmetric, Model, Generation, Symmetric Model Generation,**

ATTACHMENT [answer_4586_picture1.png](#) [answer_4586_picture2.png](#) [caxccl.zip](#)

SUBSCRIBE TO CHANGES

RATING **On a scale of 1-5, how would you rate the technical content of the article?**
 Please rate this article...

LET US KNOW IF THIS ARTICLE NEEDS TO BE ENHANCED

[UNCLEAR](#) [MISSING INFO](#) [DUPLICATE](#) [OUT OF DATE](#) [ERROR DETECTED](#)