Knowledge Base

Plug-in utility to unwrap a cylindrical shell orphan mesh into a flat mesh and create 2D geometry

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

QUESTION

I have an orphan mesh that is cylindrical. How can I 'unwrap' it into a flat shape and create the associated geometry?

ANSWER

(The following applies to Abaqus 6.10 and later.)

An Abaqus/CAE plug-in application for this purpose is attached below. It will unwrap the mesh of an orphan shell part in a cylindrical shape and create a new orphan mesh part that contains the unwrapped mesh and 2D flat geometry.

Installation

To install the plug-in, save the attached archive file 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 unwrapMesh.zip** at the command prompt. A folder named abq_UnwrapMesh and a file named unwrapMesh_plugin.py will be extracted.

Note that the plug-in will not function properly if this procedure is not followed.

Usage

The plug-in can be executed from the **Part** module only. Select **Plug-ins → Tools → Unwrap Mesh….** The following dialog will be posted:

Under **Create/Select a Datum Axis** group box, the use can create a datum axis by picking two points (the points can be vertices, interesting points or datum points) or select one of the existing datum axes for the displayed part. The unwrapping of the mesh part will take place about the created/selected datum axis.

Specify a new part name, the unwrapping reference cylinder radius and pick a node on the original orphan mesh part from which the unwrapping occurs.The plug-in has an option for creating a 2D flat geometry part along with a 2D flat orphan mesh.

If **Generate geometry** is checked, the user has two alternatives for creating a geometry:

 1. Using piecewise linear segments
 2. Using splines that break at the specified feature angle.

Notes

Using splines can cause the plug-in to consume more time compared to using piecewise linear segments.

For the unwrapped part geometry name this utility appends '_Geometry' at the end of the specified unwrapped part name.

Application

The plug-in has an important application in the area of vascular stent modeling. The unwrap mesh plug-in can unwrap a deformed mesh of a stent from tubular shape into a 2D flat geometry, which can be used to validate the FE solution by comparing it to a 2D image taken for the actual stent; or it can be used by a laser-cutting tool to create a stent based on the deformed shape. See below for a representative vascular stent example:

Notes: The plug-in only supports 4-noded elements. The plug-in performance can be slow if a large number of nodes are used in a model.

Revision History

26 April 12	Release version 1.1-1

Disclaimer

The attachments to this article are subject to certain usage conditions. Please click here for details.

KEYWORDS   **plug-in, plugin, 4698**

ATTACHMENT | ans_4698_figure1.png | ans_4698_figure5.png | ans_4698_figure3.png | unwrapMesh.zip |
                  | ans_4698_figure2.png | ans_4698_figure6.png | ans_4698_figure4.png |

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