Knowledge Base

Creating custom material calibration plug-ins in Abaqus/CAE

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

QUESTION

How can I create a custom material calibration plug-in that can be used with the Calibration functionality of Abaqus/CAE?

ANSWER

(The following applies to Abaqus/CAE 6.10-EF and later releases.)

Abaqus/CAE allows you to create custom material calibration plug-ins, which appear as new options in the **Create Calibration Behavior** dialog box from the **Property** module.

This article gives directions on how to build a custom material behavior plug-in and utilize the core calibration functionality offered in Abaqus/CAE. Files for a representative material behavior plug-in are attached for convenience. A separate plug-in should be used for each different calibration.

Note: The example file names are prefixed with *myBehavior*. You may change the names as desired, but they need to be consistent as outlined below.

1. All the files related to a customized material calibration behavior must be located somewhere under the abaqus_plugins directory. See **Installation** below for details. This is similar to any regular plug-in which is accessed from the **Plug-ins** menu in Abaqus/CAE.

2. The plug-in files under the abaqus_plugins directory must follow this naming convention.

   - *typeName.py* - kernel file of behavior
   - *typeName_plugin.py* - register the behavior
   - *typeNameForm.py* - GUI form
   - *typeNameDB.py* - GUI dialog box

   The attached example uses the following naming convention:
   myBehavior.py, myBehavior_plugin.py, myBehaviorForm.py and *myBehaviorDB.py*.

   The Abaqus/CAE code infrastructure keeps track of the directories and adds them to the path (both kernel and GUI).

3. To register your user calibration behavior when Abaqus/CAE launches, set the following registration command in the *myBehaviour_plugin.py* file:

   registerMaterialCalibrationBehavior(displayName, TypeName)

   where the *displayName* is what will be listed in the **Create Calibration Behavior** dialog and the *TypeName* is the name that is used as the behavior kernel class name. Please note that *Type* in *TypeName* is capitalized. The class name in *myBehavior.py* must be the same: *MyBehavior*.

4. The kernel calibration behavior class must derive from the **CalibrationBehavior** base class. The base class takes care of the following:

   - Storing the name, *typeName* and repository path
   - Extracting the *modelName* and *calibrationName* from the path
   - Providing setValues method

   You must implement the *mapToMaterial* method in the kernel file.

5. The form class must be derived from the **MCBehaviorEditForm** base class. The form base class takes care of the following:

   - Creating the command
   - Creating a material keyword
   - Setting values for *modelName, calibrationName, behaviorName*
   - Getting the first dialog
   - Issuing *mapToMaterial* if necessary

   You must implement createKeywords method in the form file.

6. The dialog box class must be derived from the **MCBehaviorEditDB** base class. The base class takes care of the following:

   - Creating the dialog
   - Creating the name field and setting its value
   - Creating the type field and setting its value
   - Creating the **Material** combo box and registering its query and creating **Create Material** button

   You must implement createContents method in the dialog box file.

The files for a representative material behavior plug-in are attached. You may refer to the sample files, or enhance them to create your own customized material calibration behavior. Our example maps density values to the selected material object.

Installation

To install the sample material behavior 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

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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 CustomCalibBehavior.zip** at the command prompt. A folder named CustomCalibBehvior will be extracted with the required plug-in files. Note that the calibration behavior plug-in will not function properly if this procedure is not followed.
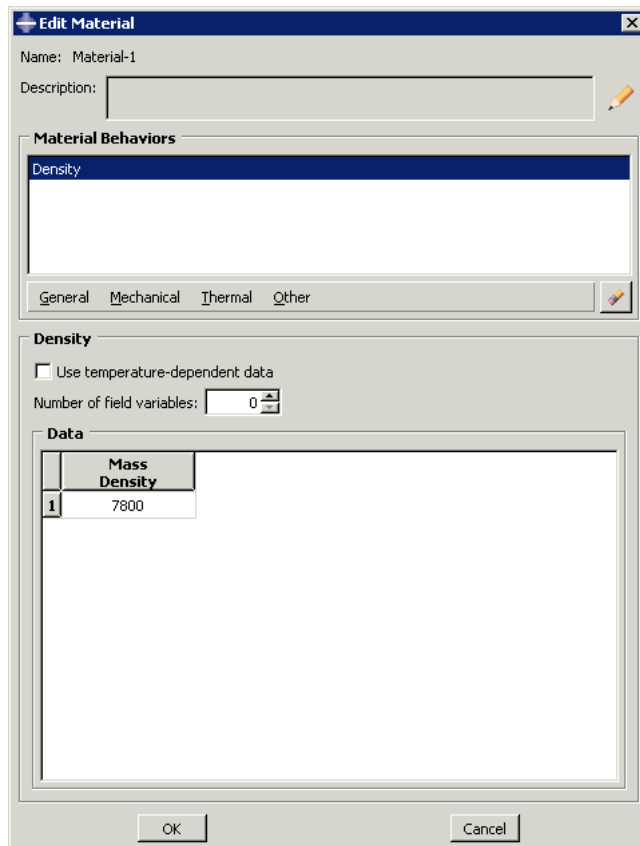
Usage

As shown below, when you interactively create a **Calibration** in Abaqus/CAE from the **Model Tree** the sample behavior name is populated in the list of behaviors in the **Create Calibration Behavior** dialog. The first two behaviors (Elastic Isotropic and Elastic Plastic Isotropic) are offered as the native functionality within Abaqus/CAE and the customized calibration behaviors are added to the list.
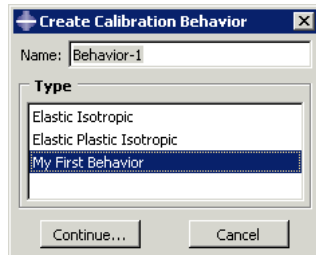
You can enter the **Density** in the text field and select the **Material** name in the **Material** combo box which is to be calibrated. You can also create a new material using the button that is avaialble next to the combo box. See the image below:
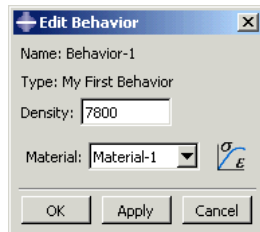
Committing the **Edit Behavior** dialog will map the density to the given material name. The following image shows the mapped material:

Disclaimer

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

ATTACHMENT

| answer_4418_fig1.png | answer_4418_fig2.png | CustomCalibBehavior.zip | answer_4418_fig3.png |

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