Altair

HyperWorks

Altair HyperStudy 2019 Tutorials

HS-1060: Linking Variables of a Model to Output Responses of Other Models

HS-1060: Linking Variables of a Model to Output Responses of Other Models

In this tutorial you will learn how to link variables of a model to output responses of other models. The input variables are the thickness of each of the three components, defined in the input deck via the PSHELL card. The thickness should be between 0.05 and 0.15; the initial thickness is 0.1 (shown below).

The sample base input template files used in this tutorial can be found in `<hst.zip>/HS-1060/`. Copy the file from this directory to your working directory.

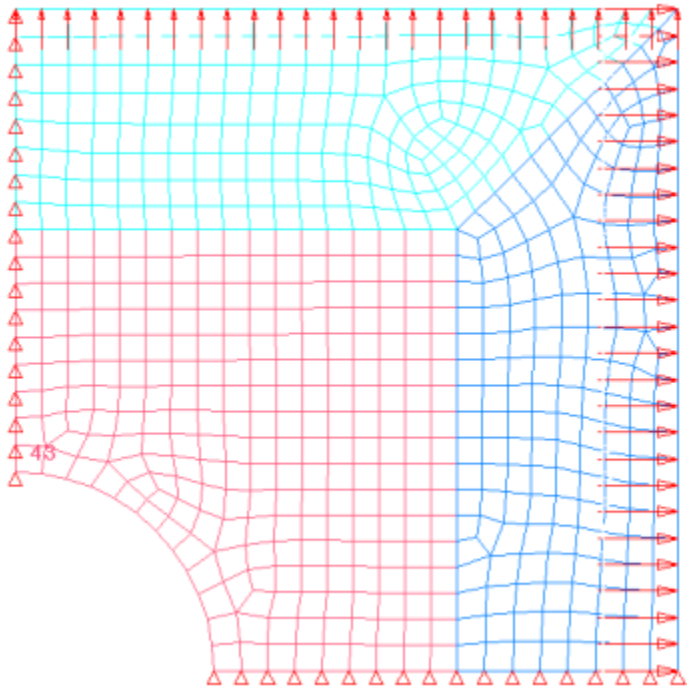
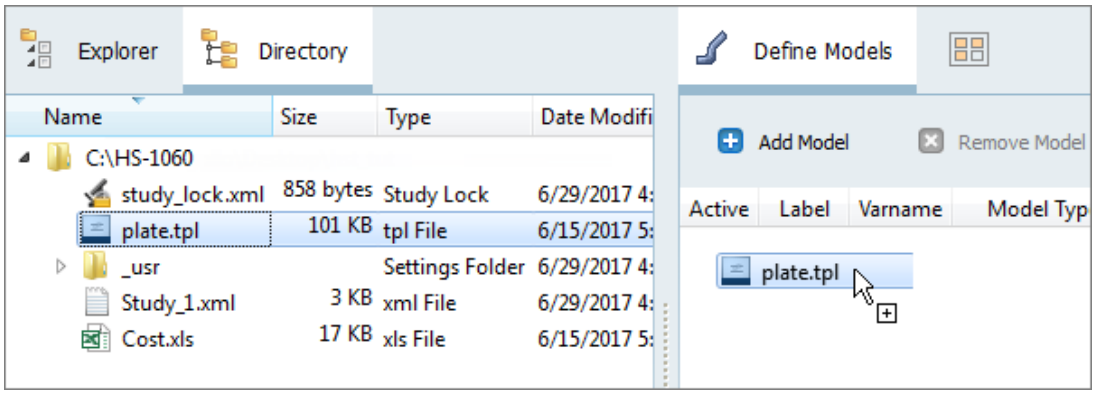


Figure 1: Double Symmetric Plate Model

Step 1: Perform the Study Setup

1. Start HyperStudy
2. To start a new study, click ***File*** > ***New*** from the menu bar, or click on the toolbar.
3. In the **HyperStudy – Add** dialog, enter a study name, select a location for the study, and click ***OK***.
4. Go to the **Define Models** step.
5. Add a Parameterized File model.
   a. From the **Directory**, drag-and-drop the `plate.tpl` file into the work area.



b. In the **Solver input file** column, enter `plate.fem`. This is the name of the solver input file HyperStudy writes during any evaluation.

c. In the **Solver execution script** column, select ***OptiStruct (os)***.

6. Add a Spreadsheet model by dragging-and-dropping `Cost.xls` file from the **Directory** into the work area.

   The **Resource**, **Solver input file**, and **Solver input arguments** fields become populated. The **Solver input file** field displays `hst_input.hstp`, this is the name of the solver input file HyperStudy writes during an evaluation.

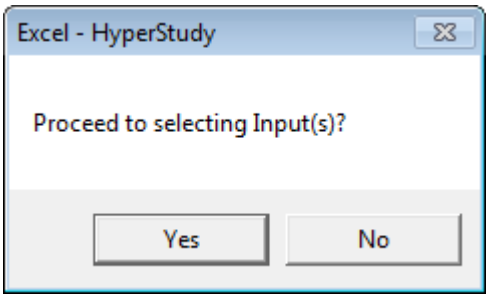
   Note: When you create an Excel spreadsheet model, it is important that you format it correctly. A variable's value and label can be formatted in two consecutive rows or two consecutive columns. Variable labels should only contain English characters, or a combination of English characters and numbers. If you do not create a label for a variable, HyperStudy will assign one by default.

	Active	Label	Varname	Model Type	Resource	Solver input file	Solver execution script	Solver input arguments
1	☑	Model 1	m_1	Parameter...	C:/.../HS-1060/plate.tpl	plate.fem	OptiStruct (os)	${file}
2	☑	Model 2	m_2	Spreadsheet	C:/.../HS-1060/Cost.xls	hst_input.hstp	SpreadSheet (SpreadSheet_HST)	

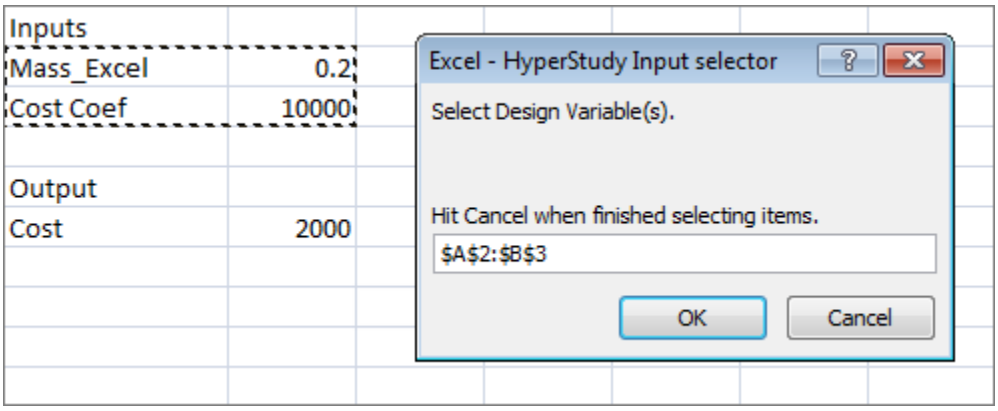
7. Click ***Import Variables***. The `cost.xls` spreadsheet opens.

8. Add input variables.

   a. In the **Excel - HyperStudy** dialog, click ***Yes*** to begin selecting input variables.



   b. In the spreadsheet, select the cells that contain the input variable's labels and values.



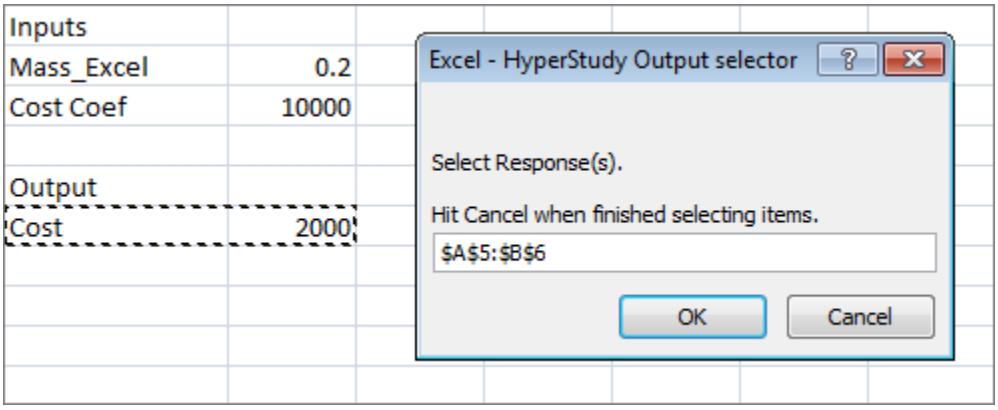
c. In the **Excel - HyperStudy Input selector** dialog, click ***OK***.

d. Click ***Cancel*** to stop selecting input variables.

9. Add output responses.

a. In the **Excel - HyperStudy** dialog, click ***Yes*** to begin selecting output responses.

b. In the spreadsheet, select the cells that contain the output response's label and value.



c. In the **Excel - HyperStudy Output selector** dialog, click ***OK***.

d. Click ***Cancel*** to stop selecting output responses. Two input variables and one output response are imported from the `cost.xls` spreadsheet.

10. Go to the **Define Input Variables** step.
11. Review the input variable's upper and lower bound ranges.
12. Go to the **Specifications** step.

Step 2: Perform the Nominal Run

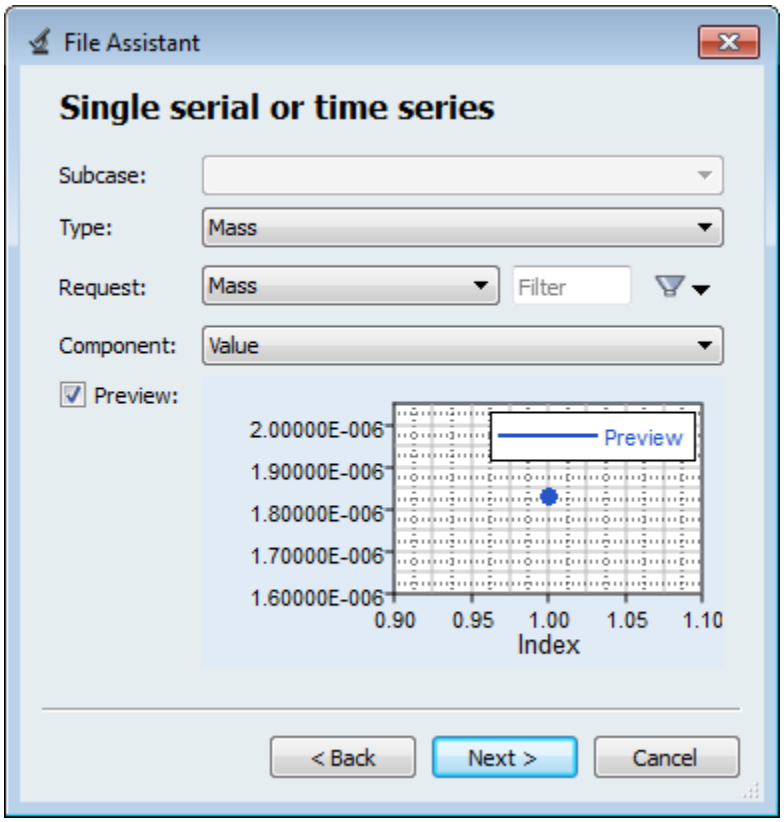
1. In the work area, set the **Mode** to ***Nominal Run***.
2. Click ***Apply***.

3. Go to the **Evaluate** step.
4. Click ***Evaluate Tasks***.
5. Go to the **Define Output Responses** step.

Step 3: Create and Define Output Responses

In this step you will create two output responses: Mass and Displacement.

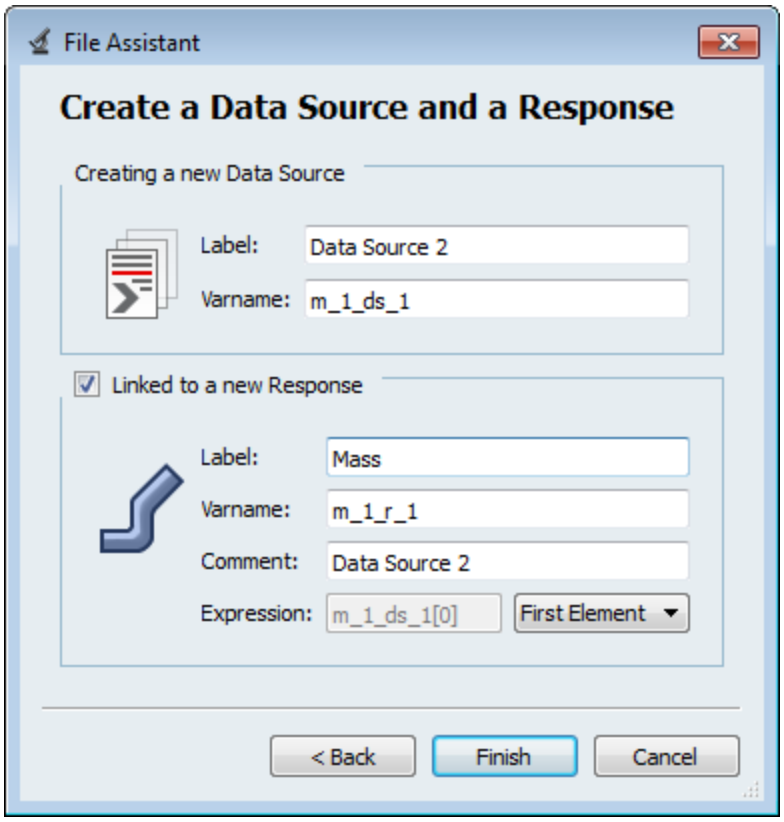
1. Create the Mass output response.
   a. From the **Directory**, drag-and-drop the `plate.out` file, located in `approaches/nom_1/run_00001/m_1`, into the work area.
   b. In the **File Assistant** dialog, set the **Reading technology** to ***Altair® HyperWorks®*** and click ***Next***.
   c. Select **Single item in a time series**, then click ***Next***.
   d. Define the following options, and then click ***Next***.
      - Set **Type** to ***Mass***.
      - Set **Request** to ***Mass***.
      - Set **Component** to ***Value***.



e. Label the output response Mass.

f. Set **Expression** to ***First Element***.

Note: Because there is only a single value in this data source, `[0]` is inserted after `m_1_ds_1`, thereby choosing the first (and only) entry in the data source.



g. Click ***Finish***. The Mass output response is displayed in the work area.

2. Create the Displacement output response.

a. From the **Directory**, drag-and-drop the `plate.h3d` file, located in `approaches/nom_1/run_00001/m_1`, into the work area.

b. In the **File Assistant** dialog, set the **Reading technology** to ***Altair® HyperWorks®*** and click ***Next***.

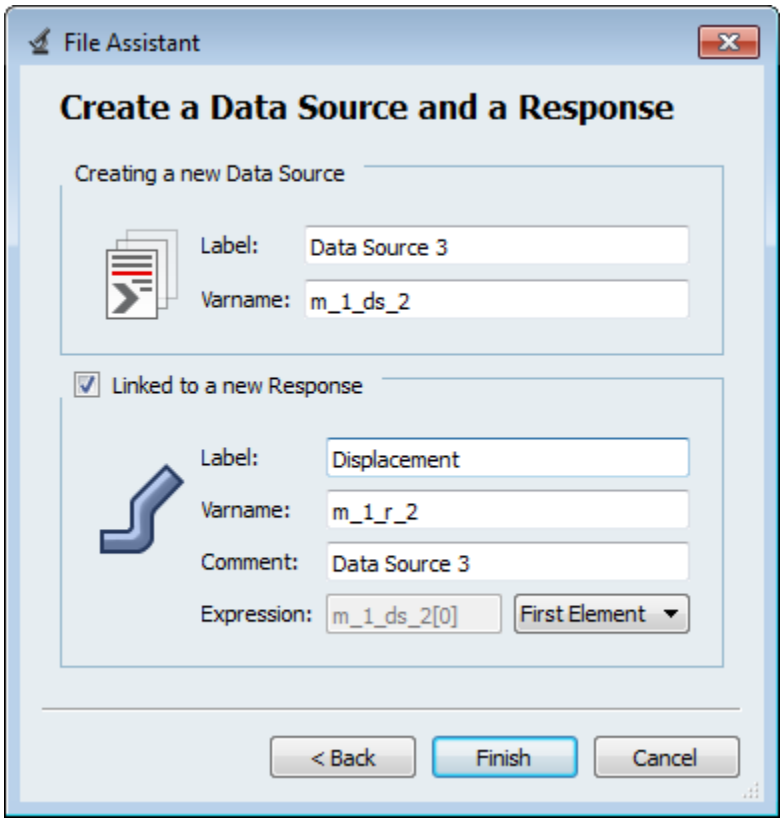
c. Select **Single item in a time series**, then click ***Next***.

d. Define the following options, and then click ***Next***.

- Set **Subcase** to ***Subcase 1 (Load)***.
- Set **Type** to ***Displacement (Grids)***.
- Set **Request** to ***N298***.
- Set **Component** to ***MAG***.

e. Label the output response Displacement.

f. Set **Expression** to ***First Element***.



g. Click ***Finish***. The Displacement output response is added to the work area.

3. Click ***Evaluate*** to extract the output response values.

	Active	Label	Varname	Expression	Value	Comment
1	☑	Cost	r_1	ds_1[0] ...	2000.0000	...
2	☑	Mass	m_1_r_1	m_1_ds_1[0] ...	1.83e-06	Data Source 2 ...
3	☑	Displacement	m_1_r_2	m_1_ds_2[0] ...	0.0024906	Data Source 3 ...

Step 4: Linking Mass_Excel Input Variable of Model 2 to Mass Output Response of Model 1

1. In the **Explorer**, click **Define Input Variables**.
2. Click the ***Links*** tab.
3. In the **Expression** column of the input variable **Mass_Excel**, click ***...***.
4. In the **Expression Builder**, click the ***Output Responses*** tab.
5. Select the output response ***Mass***.
6. Click ***Insert Varname***. The expression `m_1_r_1` appears in the ***Evaluate Expression*** field.

7. Click ***OK***. The input variable **Mass_Excel** of **Model 2** is now linked to the output response **Mass** of **Model 1**.

	Active	Label	Varname	Expression
1	☑	t1	m_1_Variable_01	...
2	☑	t2	m_1_Variable_02	...
3	☑	t3	m_1_Variable_03	...
4	☑	Mass_Excel	var_4	m_1_r_1 ...
5	☑	Cost Coef	var_5	...

8. Go to the **Specifications** step.
9. In the work area, set the **Mode** to ***System Bounds Check***.
10. Click ***Apply***.
11. Go to the **Evaluate** step.
12. Click ***Evaluate Tasks***.
13. Click the ***Evaluation Data*** tab.
14. Verify that the input variable **Mass_Excel** is equal to the output response **Mass**.

	t1	t2	t3	Mass_Excel	Cost Coef	Cost	Mass	Displacement
1	0.1000000	0.1000000	0.1000000	1.83e-06	10000.000	0.0183045	1.83e-06	0.0024906
2	0.0900000	0.0900000	0.0900000	1.65e-06	9000.0000	0.0148267	1.65e-06	0.0027674
3	0.1100000	0.1100000	0.1100000	2.01e-06	11000.000	0.0221485	2.01e-06	0.0022642

Last modified: v2017.2 (12.1156684)