An ANSYS Mechanical Scripting Example

by Matt Sutton January 5, 2011 1:56 pm Leave a comment The Focus

Creating Unique Named Selections for Every Face in A Body.

I've put together a simple example of creating a unique named selection for each face associated with a selected set of bodies. This example demonstrates the some of the techniques described in Part 3 of this series. I recommend you read that post first to get a feel for the selection manager and ANSYS B-Rep data structures before returning to this post.

The unique name for each face is built up from a base name with the part ID and face ID appended to this name. The function call used to create the named selection was taken directly from the ANSYS source code. I used the technique described in Part 2 to find this function. That is, I searched first for the string "Create Named Selection" and then for the string "ID_ComponentAdd" which led me to this XML code in dstoolbar.xml

```
1:  <contextToolbar handle="NamedSelections">

2:      <display id="2500">

3:        <entry type="button" tipid="ID_ComponentAdd" icon="ad
```

```
4:          <visibilityFilter name="idMeshing"/>
5:          <visibilityFilter name="idMeshingAlbionSimAddin"/>
6:          <visibilityFilter name="idAlbionSimAddin"/>
7:          <actionCallback objectId="1" methodName="doAddComponent",
8:          <visibilityCallback objectId="11" methodName="CanAddComponent"
9:      </entry>
```

Which, as you can see on line 7, there is a method call named doAddComponent(). If we look into the call for this function, we see that it calls a function called addNamedSelection(bDialogFlag, specifiedName, criteria). We can use this function to create a named selection with a programmatically generated name.

The flow of the example code is as follows:

1. Check to see that at least one body is selected, if not, warn the user and quit.
2. If one or more bodies are selected, build up a list of face ids and part ids associated with each body.
3. Clear the selection manager so that nothing is selected.
4. Iterate over the structure of part ids and face ids constructed in step 2 .
5. For each face, create a unique name that is comprised of the part id and the face id concatenated to a base string.
6. When finished, clear the selection manager so that nothing is selected. This is sort of a clean up operation. One enhancement might be to remember the bodies that were selected and clear out the faces from the selection manager and reselect these bodies so that the program is in the same state after this macro as it was when the macro was invoked.

Here is the code. You can copy and paste this into a text file and save it somewhere on your hard drive. The, select a body and choose Tools->Run Macro and navigate to the text file to see it work.

```
/*************************************************************************
 *                                                          Phoenix Analysis
 *                                                           Design Technolo
 *************************************************************************
 *  This script is designed to be run from the Tools->Run Macro menu fro
 *  within ANSYS Mechanical.  The purpose of the script is to create a n
 *  selection for each individual face within the currently selected bod

 *  This script makes use of the addNamedSelection() ANSYS Mechanical fu
 *  to actually create the component once the selection has been made.
 *************************************************************************

//  NOTE: The base name below is used as the first part of each named
//  selection name.  Change this to something more appropriate if you de
var basename = 'faces';

//  Here are a series of global variables that hold references to some
//  of the main objects in the mechanical application.

//  NOTE: The DS object is defined by the script engine ahead of time.
//  object references the main ANSYS Mechanical application

//  The script code object is a reference to the javascript engine embed
//  inside the mechanical application.  This object has all of the funct
//  that are defined in the ANSYS mechanical javascript files
var SC = DS.Script;

//  The selection manager object is a reference to the ANSYS mechanical
//  geometry selection tool.  This is a complex object that contains
//  references to the currently selected set of geometric entities.  Mor
//  importantly, it contains back pointers to entity ids within the
//  Mechanical BREP structure.
var SM = SC.sm;

//  NOTE:  The ANSYS Mechanical BREP structure is a classical topologica
//  data structure that defines the connectivity of the geometry wi
//  the currently opened model.  This structure consists of lists o
//  vertices, edges, faces, shells, bodies and parts.  More importa
//  the connectivity between these entities is represented in the data
```

```
//  the connectivity between these entities is represented in the data
//  structure as "use" lists.  For example, a vertex contains a list
//  of edges to which it is attached.  Likewise, an edge contains a list
//  of faces to which it is attached, as well as a pointer to the start
//  and end vertices of the edge.  With this information, one can "walk"
//  the topology of the part by iterating over the various use lists.
//  For this macro, we will grab all of the faces attached to a given
//  body using the BREP structure as a guide.

//  These type constants are encoded into the top two bits of a given
//  brep entity id.
var BODY_TOPO_TYPE = 3;
var FACE_TOPO_TYPE = 2;

var EDGE_TOPO_TYPE = 1;
var VERT_TOPO_TYPE = 0;

//  There is no concept of "main" in javascript, but it makes it easy to
//  find the entry point to the script.  There is a call to this functio
//  the bottom of this script
function main() {
    // First, see if we have a body selected.  If not, report to
    // the user that a body must be selected first.
    if (SM.Parts > 0) {
        // Do the real work
        create_faces_ns_from_body();
    } else {
        SC.WBScript.Out('You must select a body before running the \
FacesFromBody.js macro.  Please select a body and re-run this \
macro.', true);
    }
}

// This function simply picks off the top two bits of a given topo id
// and returns the decimal value [0, 1, 2 or 3]  This corresponds to
// the topological types:
//      BODY_TOPO_TYPE = 3
//      FACE_TOPO_TYPE = 2
//      EDGE_TOPO_TYPE = 1
//      VERT_TOPO_TYPE = 0
function classify_entity_type(topo_id) {
    // The top two bits store the topological entity type within the
    // id value
    var type = topo_id >>> 30;
    return type;
```

```
    return type;
}



// This function creates a named selection of all the faces associated w
// the currently selected body(s).
// Pre Condition:   At least one body must be selected.
// Post Condition:  The selection manager will be cleared and a new name
//                  selection will exist for each face in the body.  The
//                  named selection will be of the form:
//                  basename_partid_faceid
function create_faces_ns_from_body() {

    // See structure definition below.
    var face_id_map = new Array(SM.Parts);

    // First we want to iterate over the selected parts and create
    // a list of all of the face ids for each selected part
    for (var i = 1; i <= SM.SelectedCount; i++) {
        var topo_id = SM.SelectedEntityTopoID(i);
        var part_id = SM.SelectedPartID(i);

        // Make sure this is a body.  If not, just continue around
        if (classify_entity_type(topo_id) != BODY_TOPO_TYPE) {
            continue;
        }
        var part = SM.PartMgr.PartById(part_id);
        var brep = part.BRep;
        // Pull the body object out of the BRep structure.  The call
        // for this is the Cell function with the topological id for
        // the body of interest
        body = brep.Cell(topo_id);

        // This array will be used to hold a list of face ids for a give
        // body.
        var face_ids = new Array();
        // These are the actual face objects associated with this body
        var faces = body.Faces;
        // Now store all of the face ids in our face id list
        for (var f = 1; f <= faces.Count; f++) {
            face_ids.push(faces(f).Id);
        }
        // Now that we have the face ids, put them into an array of
        // that each look like the following:
```

```
            // that each look like the following:
            // |-------|
            // |   0   |-> Part ID
            // |-------|
            // |-------|
            // |   1   |-> List of face ids for this part ID
            // |-------|
            face_id_map[i - 1] = new Array(2);
            face_id_map[i - 1][0] = part_id;
            face_id_map[i - 1][1] =
                face_ids.slice(0, face_ids.length); // Slice creates a copy

        }

        // Now that we've built up our datastructure of face ids, we need to
        SM.Clear();
        var name = null;
        for (var i = 0; i < face_id_map.length; i++) {
            var part_id = face_id_map[i][0];
            var face_ids = face_id_map[i][1];
            for (var j = 0; j < face_ids.length; j++) {
                SM.Clear();
                // Create a unique name based on the part id and face id
                name = basename + '_' + part_id.toString() + '_' + face_ids
                SM.AddToSelection(part_id, face_ids[j], false);
                // Create the component
                SC.addNamedSelection(false, name, SC.id_NS_UnknownMultiCrite
            }
        }
        // Clear out the selection manager
        SM.Clear();
    }

    // Make it happen...
    main();
```

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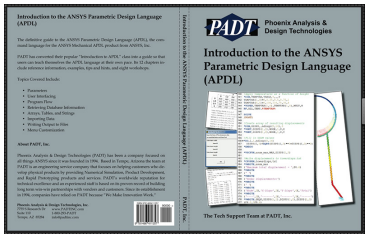

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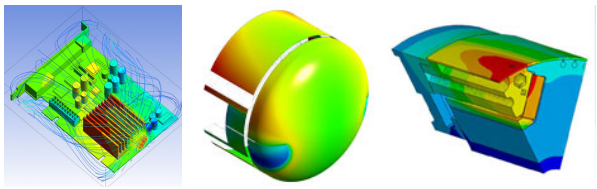

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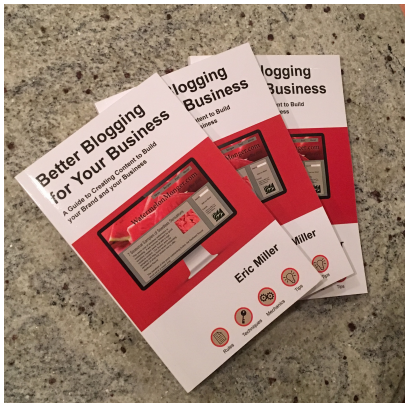

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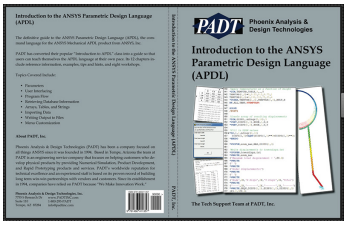

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