AUTODESK UNIVERSITY

AS500019

10 Yrs’ Worth of Dynamo and Revit Classes from 1 Speaker in 60 Min Volume 3

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Learning Objectives

- Learn helpful tips on how to push Revit to its limits
- Learn helpful tips on how to push Dynamo to its limits
- Learn eight years’ worth of Revit classes in just one session
- Learn eight years’ worth of Dynamo classes in just one session

Description

This class is part three of the top-rated 2019 and 2020 Autodesk University lecture classes of the same name. It will highlight more of the 25 classes that Marcello Sgambelluri has taught at Autodesk University since 2012. Presented in a high-speed format that’s guaranteed to be fun, fast, and entertaining, we’ll cover various subjects from modeling a cow in Revit software to modeling complex structures to using Dynamo software. So sit back and enjoy the ride through 10 years’ worth of classes, volume three. You’ll be energized by Marcello’s infectious, passionate style of presenting complex topics in a way that’s easy to understand. No matter your discipline or how you use Revit, you’ll learn something of value and discover different ways to use Revit and Dynamo. Marcello Sgambelluri has won the top Autodesk University speaker award a record eight times since 2012.
About the Speaker

Marcello currently serves as the Building Information Modelling (BIM) director at John A. Martin & Associates Structural Engineers in Los Angeles, California. Marcello has worked on many BIM projects over the last 23 years including the Walt Disney Concert Hall in Los Angeles; the Ray and Maria Stata Centre at the Massachusetts Institute of Technology; and the Tom Bradley International Terminal Expansion at Los Angeles International Airport. Sgambelluri is internationally recognized as one of the top BIM leaders and contributors to the education and implementation of BIM technology in the building industry. He continually speaks at Autodesk University and the Revit Technology Conference, and he has received a record total of 17 1st place speaker awards between both conferences. Marcello Sgambelluri received his bachelor’s and master's degrees in civil engineering, and he is a licensed civil and structural engineer.

Marcello also has a new book on Dynamo for Revit:

Grasshopper and Dynamo for Revit Reference Manual

THE DATASET

The Entire DATASET OF all 10 years and 25 classes could be downloaded here. This includes every handout, every dataset and every presentation slide. That's over 13GB worth of datasets, and about 1000 total pages of handouts.

https://a360.co/361XgcN
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Customizing the Graphical Column Schedule (GCS) 2012

CREATE SMART TAGS AT BOT OF GRAPHICAL COLUMN SCHEDULES

STEP 1
CREATE A COLUMN TAG FAMILY WITH BOUNDARY AND GRAPHICS AS SHOWN.

STEP 2
CREATE SHARED PARAMETERS IN COLUMN FAMILY THAT SHOULD BE DISPLAYED IN COLUMN TAG (BASE PLATE DIMENSIONS AND BOLT INFO SHOWN)

STEP 3
ADD SHARED PARAMETERS OF COLUMN TO TAG

STEP 4
ADD TAG TO BASE OF COLUMN SCHEDULE

BASE PLATE DIM, DETAIL INFORMATION PARAMETRIC IN COLUMN SCHEDULE

NOTE:
The graphical column schedule is not customizable therefore adding a smart tag at the base of the column schedule allows for information such as base plate sizes and detail information to show up.
CREATE A ROTATION RIG IN REVIT AC OR MASSING FAMILY

RIDE THE RAIL METHOD

STEPS
1. CREATE A REFERENCE CIRCLE
2. PLACE TWO POINTS ANYWHERE ON THE CIRCLE.
3. CHANGE THE MEASUREMENT TYPE TO "ANGLE" IN THE PROPERTIES FOR BOTH POINTS.
4. CREATE PARAMETER TO THE FIRST POINT
5. CREATE APARAMETERS FOR THE SECOND POINT THAT IS 180 DEGREES OF THE FIRST
6. SELECT BOTH POINTS AND CLICK "SPLINE THRU POINTS"
7. CHANGE NEW LINE TO "REFERENCE LINE" (THIS IS THE NEW HOSTING REFERENCE LINE.)
8. HOST WHATEVER YOU WANT TO THE REFERENCE LINE.
9. WHEN THE ANGLE PARAMETER IS CHANGED IT IS STABLE AT ANY PRACTICAL ANGLE INCLUDING 0 AND 90 AND 180

NOTES: THIS METHOD USES THE MASSING OR ADAPTIVE COMPONENTS TO CREATE A STABLE FAMILY ROTATION RIG. THIS IS A GENERAL USE RIG. AND COULD BE LINKED TOGETHER TO FORM MULTIPLE ROTATION RIGS.
CREATE A DROPPED CEILING USING A DIVIDED PATH+AC

STEPS

1. OPEN POWER_POINT_POWER_PLAY_2012_START.rfa

2. SELECT ON BOTH LINES AND DIVIDE PATH

3. CHANGE THE PATH SETTINGS AS SHOWN

4. PLACE THE 2-PT ADAPTIVE COMPONENT "SINGLE COMPONENT" SUCH THAT PT 1 AND PT 2 ARE AT THE ENDS OF THE DIVIDED PATH AS SHOWN

4. CLICK ON ADAPTIVE COMPONENT AND CLICK THE REPEATER COMMAND.

5. RESULTS ARE SHOWN BELOW

6. CHANGE THE PATH SETTINGS OR LINE GEOMETRY AND WATCH DYNAMIC CHANGES

NOTES: THIS METHOD IS GOOD FOR PLACING FRAMING IN EARLY DESIGN. THESE ARE NOT STRUCTURAL FRAMING ELEMENTS AND MAY NEED TO BE CHANGED AT A LATER TIME AS THE DESIGN IS FINALIZED
CREATE REVIT PUMPKIN

STEPS

1. Open up a new adaptive component family. Sketch in profiles as shown.

2. Create reference lines in a radial pattern and place the profiles with the dimensions shown. The profiles will be located at 5 degrees intervals.

3. Select the 13 splines shown in the figure below that were selected and click “create form” bottom.

4. Repeat these 13 profiles around entire pumpkin. Should look as shown.

NOTE: THE METHOD ABOVE COULD BE USED ON OTHER FAMILIES THAT HAVE REPEATING PROFILES AROUND IN A CIRCLE.
CREATE SPIRAL IN REVIT

STEPS

1. Start an in place mass
2. Place a circle at the base of the project
3. Break the circle into two semi-circles
4. Select each semi-circle and click "create form"
5. Simply grab the top end of the extruded half cylinder node and drag to desired height. Behold, a spiral in Revit!

drag end...
Spiral!

NOTE: THE METHOD ABOVE COULD BE USED TO CREATE SPIRALS AND THE EDGE COULD HOST LINES OR DIVIDED PATHS AS WELL
CREATE BEAMS THAT FOLLOW CURVES

NOTE: THE METHOD ABOVE COULD BE USED TO HAVE FLOORS FOLLOW ALL TYPES OF WALL SHAPES. ROOF ELEMENTS ALSO WORK. THE IMPORTANT STEP IF TO JOIN THE FLOOR WITH THE WALL SO THE RESULTING JOINED SOLID HAS A “PICKABLE” EDGE.
SCALE AND MORPH IN REVIT

STEPS

Add lines between the start and end shapes, it also helps to have the same number of points, and host points onto that line and make a parameter that drive that location of the points. Place a line thru those points shown in red, flex and morph.

It is possible to make scale and morph together! To do this simply make the profile on the left scalable by connecting lines from the origin to all the points that make up the profile, do the same for the line profile in the right.

NOTE: THE METHOD ABOVE COULD BE USED TO SCALE AND MORPH FAMILIES
HARDSCAPE FOLLOW TOPO STRAIGHT ROAD

STEPS

1. Open Topo and “split surface” element, which is now a separate topography element.

2. Isolate and export that new topography element as a .dwg.

3. Insert the newly exported .dwg as origin to origin level orient to view IN THE PROJECT.

4. First add beams to the .dwg.

5. Add the roof boundary by clicking on the “roof by footprint”

6. Now, the “pick supports” command, then picking the (beam) supports. Select each boundary beam individually and as you do, the roof element will automatically begin to snap into the same location of its generative topography.

NOTE: THE BUILDING PAD IS SACRIFICIAL GEOMETRY TO CREATE THE STRAIGHT WALL AND YOU WILL BE USING ITS UPPER EDGE TO LOCATE THE WALL. IF A DWG IS NOT PREFERRED TO BE LEFT IN REVIT THEN DELETE IT, NOT USING THIS METHOD IS ALSO AN OPTION.
MAKING A GREAT SET OF EXAMPLES TO PRESENT

Creating a great set list
Every good technical presentation has a set of concrete examples to help illustrate the topics. I refer to them as a set list because the list of examples that you choose is like a list of songs that a band would choose before they go out on stage and perform. If you’re a presenter you are an entertainer and is important to choose the right set lists.

I like to put the most interesting and complex set list item at the end of my presentation for two reasons. The first is a like everyone to walk away with what could be possible if you took this method and push it to its extreme limit. Also you’ll want to save your best material for last similar to how a band plays their hit song at the end of their concert.
Creating Surfaces with Profile Order

**Dynamo Nodes**
- These nodes select the profile curves.
- This node creates a list in the correct profile order.
- This node creates the surface lofted over the correct profile order.

**Dynamo Geometry**

**Revit Geometry**

**Steps & Notes**

1. Open Revit file “PROFILEORDER_START.RVT”
2. Open a new Dynamo file and add nodes as shown.
3. Select element 0,1,2 in that order using the “Select” node and run.

Note: The Revit Massing family does not allow for profiles to be selected in order.
GET AND SET INSTANCE PARAMETERS WITH LINK FILE

SELECTIONS LINKED FILE IN REVIT

GETS THE WALL ELEMENTS FROM THE LINKED FILE IN REVIT (AMAZING!) (NOTE: THIS IS A CUSTOM NODE IN THE SPRING NODE PACKAGE)

SETS THE WALL CAT.

SELECTS ALL THE COLUMN TYPES IN THE PROJECT

SETS THE BASE OFFSET PARAMETER VALUE

WALL IS FROM A LINKED FILE!

ORIGINAL LOCATION OF BOTTOM OF COLUMNS

NEW LOCATION OF BOTTOM OF COLUMNS

STEP 1: OPEN FILE "GET_SET_PARAMETERS_START_LINK.RVT"
STEP 2: OPEN A NEW DYNAMO FILE, PLACE NODES AS SHOWN AND RUN SCRIPT FOR EACH COL
SELECT THE LINKED FILE USING THE "SELECT MODEL ELEMENT" UI NODE
NOTES: LINKED FILES ARE "READ ONLY"
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Dynamo for Contractors 2015

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**SURFACE AREA OF RAMPS**

**Dynamo for Revit**

**Steps & Notes**

**1. Select Model Element**

- **Element**: 309385

**2. Element.Faces**

- **element**: Surface

**3. Code Block**

- **x[3]**

**4. Surface.Area**

- **Surface**: double

---

**Dynamo Nodes**

**Part 2: Revit**

**Ramp Geometry**

**Note:** If the ramp is straight, use [0].

**Note:** Use the method above to extract other areas from Revit solids such as roofs, floors, foundation slabs, etc.

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**Steps & Notes**

1. Open file "RAMP_AREA_START.RVT"
2. Open a new Dynamo file, place nodes as shown and run script

**Notes:** To get the area of the sides and bottoms, simply delete the top surface area from the total surface area.
CREATE A ROTATION RIG IN REVIT USING A REVOLVE

REVOLVE ELEMENT
(WITH CONSTANT LENGTH)

END ANGLE

HOST CONTENT
ON THIS REFERENCE LINE

REFERENCE LINE

CONTROL ROTATION VIA
START AND END ANGLES OF
REVOLVE EXTRUSION

REVOLVE METHOD

3D VIEW

NOTES: THIS METHOD USES THE START AND END ANGLES TO CONTROL THE ANGLE NOT THE ANGLE PARAMETER. THIS WAY, THE REVOLVE ELEMENT COULD BE A CONSTANT ARC LENGTH AND ANGLE AND THE END ANGLE IS "CHASING" ITS START ANGLE. THIS COULD BE USED ON FAMILIES AT ROTATION POINTS SUCH AS FOR THIS TELEHANDLER FAMILY.
TEXT TO UPPERCASE ROOM NAMES

1. This node selects the room category.
2. This node selects all the instances of rooms in the Revit project.
3. These nodes "GET" or display the current name of the room.
5. Element.SetParameterByName("RoomName", "OFFICE").
6. Element.SetParameterByName("RoomName", "STORAGE").
7. This node sets all the upper case text to the room name parameter.

Steps & Notes:
1. Open Revit sample project "TEXT_TO_UPPERCASE_ROOM_TEXT_START.RVT".
2. Open a new Dynamo file, place nodes as shown and run script.

Notes: The method above works well when changing many room text notes to upper case.
CORRECT BEAMS USING ANALYTICAL MODEL

1. Select the analytical model and click “analytical adjust”
2. Adjust the node location so it is at the same location as the other node
3. Align the physical beams to the analytical lines. To model a line in the beam family, simply click on the structural beam and click the edit family button and add a model line.
4. Reload the beam back into the project. To align the beam to the analytical line, select the align tool and select the analytical line then select the MODEL LINE that you just modeled into your structural beam. The physical beam is now in the correct location.
5. Select the analytical beam > select analytical adjust > select analytical reset.

NOTES: THIS METHOD USES THE ANALYTICAL MODEL SO CONSIDER NOT TURNING IT OFF ALL THE TIME.
CREATE CABLE MOVEMENT WITH DAVIT EXAMPLE

STEP 1
1. Draw a circle as a surface that is hosted on the end point of the davit and the radius is the max travel radius of the cable. Place a point anywhere on the surface.

STEP 2
Select the new placed node and the node in the slider cradle as shown in the figure below and click "spline thru points." This will create the cable. Next we need to place the cable in the correct location.

NOTES: THIS METHOD USES THE PROPERTY OF HOSTED POINTS. ADD PARAMETERS IF DESIRED
FLAT FRAMING TO CURVED (PROJECTION)

STEP 1: OPEN FILE "FLAT_FRAMING.RVT"
STEP 2: OPEN A NEW DYNAMO FILE, PLACE NODES AS SHOWN AND RUN SCRIPT
NOTE: ALT METHOD: CONSIDER USING THE "SET LOCATION" NODE INSTEAD OF PROJECTION

FLAT ROOF FRAMING PROJECTED TO ROOF
CHANGE FLOOR LAYER THICKNESS USING LOGIC

SELECTS DIMENSION STRING AND GETS VALUES

SELECTS SLAB ELEMENT AND ELEMENT TYPE

SETS MIN THICKNESS PER RULES OF THUMB AND GETS MAX VALUE

NOTE: CUSTOM NODE FROM CLOCK WORK PACKAGE

SETS THE FLOOR SLAB THICKNESS TO MIN

STEP 1: OPEN "ONE WAY_BEAM_SLAB_SYSTEM_START.RVT"
STEP 2: OPEN NEW DYNAMO AND ADD NODES
STEP 2: SELECT SLAB AND SELECT LOWER DIMENSION STRING W/ "SELECT" AND RUN DYNAMO
Revit to Max Interactive 2017

INTERACTIVE: CONTROLLING MOVING EQUIPMENT

OPEN MAX FILE AND EXPORT VIA MANUAL FBX EXPORT AND SAVE FILE.

OPEN IN UNIT EDITOR AND ADD CONTROL FLOW NODES

DEPLOY FROM INTERACTIVE TO A STAND ALONE GAME. THE LIVE TEMPLATE WORKS BEST.

NOTE
GETTING AN ASSET FROM MAX TO INTERACTIVE THAT REQUIRES FLOW NODES TO CONTROL THE MOVEMENT WORKS BEST WITH USING THE MANUAL FBX EXPORT NOT THE LIVE LINK OF MAX TO INTERACTIVE
Who Should Model the Structural Analysis Model? 2017

The image below shows what should not happen within an office if everyone is to work together.

DON'T TOUCH MY MODEL!
REVIT WALL BY COMPLEX FACE

**Wall Location**
- FinishFaceInterior → Wall Location

**Wall Types**
- THINWALL → Wall Type

**Select Face**
- Select → Surface
- Face of Element id: 549676

**List.Create**
- Item0 → list
- Item1

**Wall.ByFace**
- locationLine → Element
- wallType
- surface

**Steps**
1. Open Revit file "REVIT_WALL_BY_FACE_COMPLEX_START.RVT"
2. Open a new Dynamo file, add the nodes as shown. Select the cow mass faces
3. Run graph. Add doors and windows as desired.
Create Revit Levels via ZT via Transactions and Wrapping

```csharp
namespace MY_LIBRARY_FOLDER
{
    public class Create_Revit_Elements
    {
        private Create_Revit_Elements()
        {
        }

        public static Revit.Elements.Element createZTSomething(double inElevation)
        {
            // Get Current Document (standard stuff) + 
            // Start Transaction because changing the Revit DataBase 
            Autodesk.Revit.DB.Document doc = 
                DocumentManager.Instance.CurrentDBDocument; 
            TransactionManager.Instance.EnsureInTransaction(doc);

            // End Transaction because changing the Revit DataBase 
            Autodesk.Revit.DB.Level newLevel = 
                Autodesk.Revit.DB.Level.Create(doc, inElevation); 
            TransactionManager.Instance.TransactionTaskDone();

            // wrapit! since Revit element generated in Code and sent to Dynamo 
            Revit.Elements.Element wrappedLevel = newLevel.ToDSType(false);

            return wrappedLevel;
        }
    }
}
```

Open Visual Studio folder "CREATE_REVIT_LEVEL...START" open SLN file.
Type code as shown. Build the solution.
Open Revit file "CREATE_REVIT_LEVEL...START.rvt"
Open Dynamo and start a new file, load the DLL from Bin folder.
Add nodes as shown. Open "Final" file folder if needed. Note value is always in decimal feet.
SAP GET LENGTHS OF ALL FRAMES

**Dynamo Nodes**

- These nodes get the X, Y, Z of SAP points.
- These nodes create Dynamo points from X, Y, Z input.
- This node creates Dynamo lines by start + end points.

**Dynamo Geometry**

- Frames get all the frames and names and pt names.
- This node gets CSYS name.

**ETABS Geometry**

**Steps & Notes**

- 1. Open any ETABS model "QM_FINAL.sdb" and open Dynamo.
- 2. Add the nodes above.

**Notes**

- 1. Best if Dynamo for ETABS is run in manual - read node if it's not updating.
- 2. Don't forget to use all those other OOTB Dynamo nodes to help you.
GET ETABS GEOMETRY TO GAME ENGINE

Steps:
1. Open any ETABS model "ETABS Model Viewer.EDB" open Dynamo
2. Open Add the nodes above

Notes:
1. Best if Dynamo for ETABS is run in manual-
2. Only frames elements are shown in game engine
CREATING THE QUEEN MARY STRUCTURAL MODEL

STRUCTURAL REVIT MODEL

ORIGINAL DRAWINGS

DYNAMO

NOTE: DYNAMO IS A VERY POWERFUL TOOL AND COULD BE USED TO HELP YOUR PROJECTS. ONE CASE IS SHOWN ABOVE WHERE DYNAMO WAS USED TO CREATE THE ENTIRE STRUCTURAL MODEL OF THE QUEEN MARY CRUISELINER
Connecting Dynamo with RAM via API 2019

CREATE GRIDS IN RAM FROM REVIT!
USING DYNAMO VIA RAM API AND C#

SELECTS X GRIDS IN REVIT
GETS NAME OF X GRIDS
GETS X ORDINATE OF GRIDS
GETS NAME OF Y GRIDS
GETS Y ORDINATE OF GRIDS
CREATES NEW X AND Y GRIDS WITH NAMES IN RAM ON SINGLE EXISTING GRID SYSTEM

REVIT DYNAMO NODES
RAM DYNAMO NODES

REVIT MODEL GRID
RAM MODEL GRID

STEP 1: OPEN VISUAL STUDIO FOLDER "REVIT_TO_RAM_GRID" OPEN SLN FILE
STEP 2: OPEN REVIT FILE "REVIT_TO_RAM_GRID_START.RVT" AND OPEN DYNAMO FOR REVIT
STEP 3: LOAD DLL, SELECT THE RAM FILE "REVIT_TO_RAM_GRID_START.rss"
NOTE: RAM DOES NOT NEED TO BE OPEN. SEE SIMPLEX PACKAGE AND RAM API MANUAL
LEARN HOW TO GET YOUR REVIT FAMILIES TO MOVE IN THE AUTODESK STINGRAY GAME ENGINE (CLASS PROPOSAL 2017)

NOTE:
THE TYPICAL WORKFLOW IS REVIT TO STINGRAY, SOME FAMILIES REQUIRE REVIT TO 3DSMAX TO STINGRAY
INTERACTIVE: BALL ROLLING PHYSICS

STEP 1
OPEN AN INTERACTIVE PROJECT WITH TOPO, BEST TO CREATE WITH LIVE SERVICE FROM REVIT

STEP 2
CREATE A SPHERE IN MAX AND IMPORT INTO INTERACTIVE VIA FBX. OPEN THE SPHERE ASSET IN THE UNIT EDITOR AND ADD A DYNAMIC PHYSICS ACTOR WITH A SPHERE SHAPE AS SHOWN

STEP 3
PLACE THE SPHERES IN SCENE ABOVE THE GROUND PLANE AND TEST THE LEVEL IN GAME MODE. THE PHYSICS WILL AUTOMATICALLY ACTIVATE AND SIMULATE FALLING SPHERES

NOTE
INTERACTIVE HAS A PHYSICS ENGINE AND SHOULD BE USED! THIS MEANS ADDING SPHERES TO SCENES TO SEE HOW "RAIN" WATER WILL RUN OFF AND HOW SITES ARE GRADED TO "CATCH" WATER. ALSO, THIS COULD BE DEPLOYED AS A STAND ALONE GAME TO BE SHARED TO TEAM
### REVIT FAMILY GEOMETRY TO RHINO GEOMETRY

**Steps**
1. Open Revit model Rhino_to_Revit.rfa
2. Activate Rhino inside Revit
3. Open new Grasshopper file
4. Open new Rhino file
5. Add Grasshopper nodes as shown
6. Right click on “Face” node and multi-select Revit faces and click “Finish”
7. Right click on “Geometry” node and select “Bake”
   - Note: “Bake” writes Grasshopper geometry to Rhino

**Grasshopper Nodes**
- Node selects faces on Revit family

**Revit Family**
- RHINO_TO_REVIT.RFA file
  - (Yes it is a Rhino in Revit)

**Rhino**
- RHINO_TO_REVIT.3DM file
  - (Yes it’s a Rhino in Rhino)

**Notes**
- There are many ways to bring Revit geometry into Rhino. This is only one method. Use Face node to select geometry directly from Revit family. For a family in a project file use Select Element node.
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GRAHAM HOPPER FOR REVIT

INTEROPERABILITY

RHINO CURVES TO REVIT BMS SIZES VIA USER TEXT

GETS THE USER ATTRIBUTES IN KEY VALUE PAIR FORM FROM BM CL IN RHINO (USES ELEFRONT COMPONENT)

KEY VALUE PAIR

0 BM SIZE
0 W12X26

0 BM SIZE
0 W12X26

SELECTS THE BM CL IN RHINO

CURVE

GETS COL SIZE (TYPE) FROM KEY VALUE PAIR

MODEL

STRUCTURAL FRAMING

CATEGORY

FAMILY NAME

NAME

QUERY TYPES

FILTER

REVIT AND REVIT

REVIT

NOTE: THESE BMS WERE SIZED BASED ON USER ATTRIBUTES/KEY VALUE PAIRS ASSIGNED IN RHINO. KEY VALUE PAIRS HELP PASS DESIGN INFO BEYOND JUST GEOMETRY TO REVIT.

STEP 1: OPEN FILE "GH_RHINO_TO_REVIT_BM_START.RVT" OPEN *.3DM
STEP 2: PLACE NODES AS SHOWN RUN AND SEE RESULTS (NOTE ELEFRONT CUSTOM NODE)
10 Yrs’ Worth of Dynamo and Revit Classes Volume 3 2021

AUTODESK UNIVERSITY

GRASSHOPPER INSIDE REVIT

RHINO SURFACE TO REVIT TOPO

SELECTS TOPO BREP FROM RHINO

SETS UV COORDINATES

ADDs PTS BREP SURFACE IN UV

FLATTENS LIST

CREATES TOPO REVIT ELEMENT VIA GH PTS

NOTES & STEPS

STEP 1: OPEN FILE "GH_RHINO_TO_REVIT_TOPO.RVT" OPEN "GH_RHINO_TO_REVIT_TOPO.3DM"

STEP 2: PLACE NODES AS SHOWN RUN AND SEE RESULTS

NOTE: THIS METHOD SELECTS THE BREP IN RHINO MANUALLY. ALSO CONSIDER USING AN AUTOMATED SELECTION METHOD SUCH AS SELECTING ELEMENTS ON LAYER VIA GH.
SOFTWARE WORK TOGETHER

DYNAMO VS GRASSHOPPER VS WORKING TOGETHER IN REVIT 2021

RHINO GRASSHOPPER REVIT DYNAMO

STRENGTHS?
WEAKNESSES?
EXISTING WORKFLOWS?(PLAYER)