USING DYNAMO

> Using parameters to design

> Using parameters of a design

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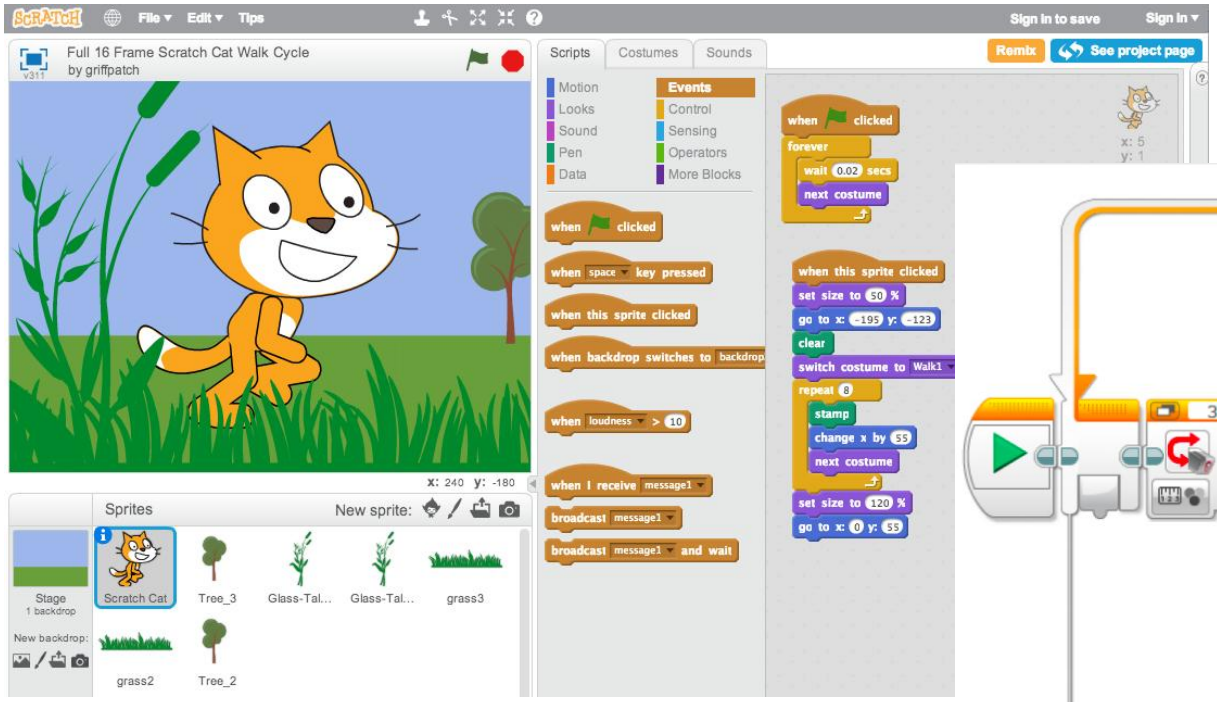
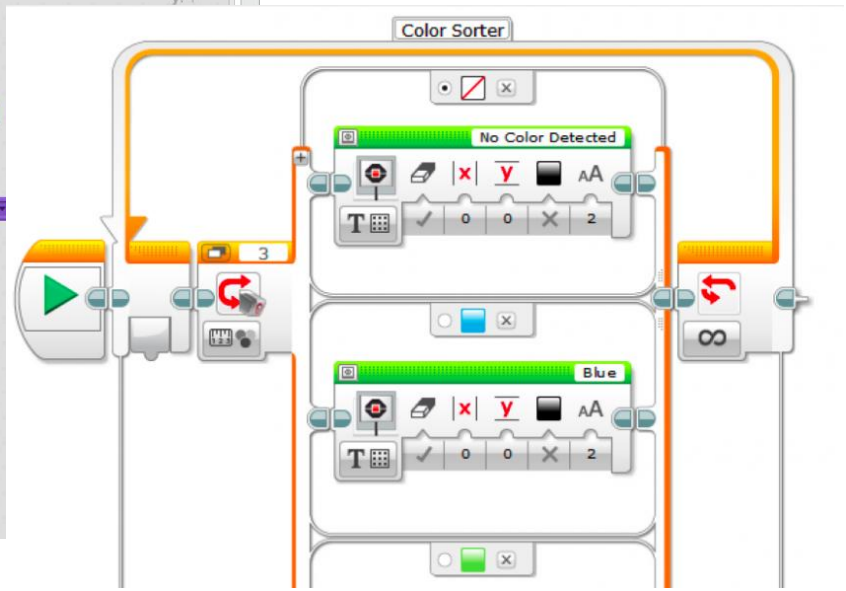
WHAT'S VISUAL PROGRAMMING?

Visual programming was created to allow non expert to program software easily. Anybody including childs can use Visual programming. There are many Visual Programming software like Grasshopper , Scratch, App Inventor, Lego EV3 or Dynamo.



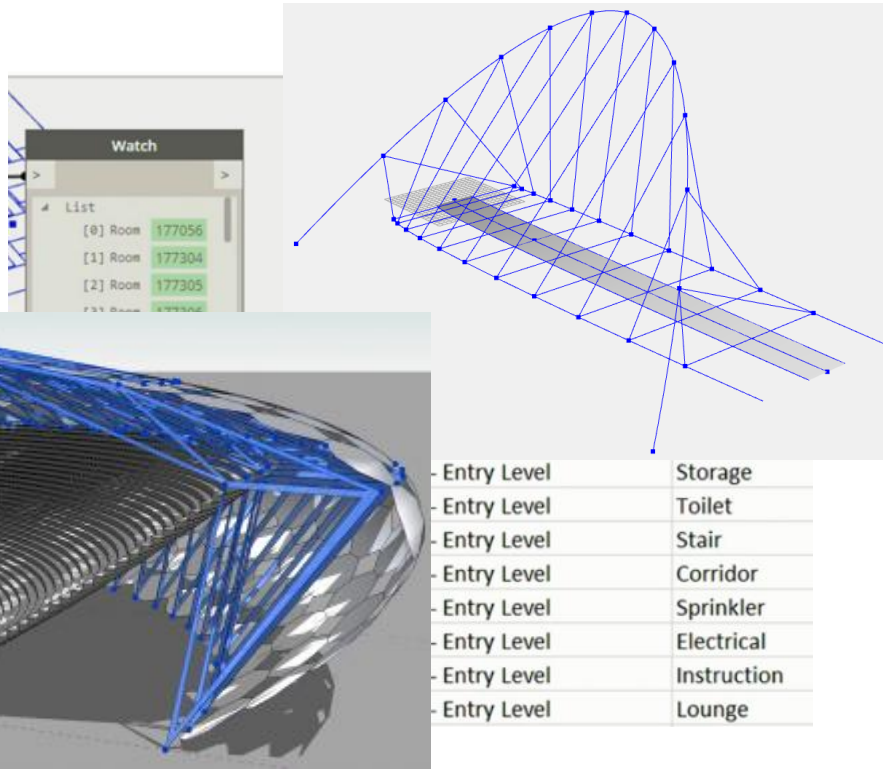


WHAT'S DYNAMO?

Dynamo is a VISUAL programming software for Autodesk@ products. On Autodesk@ products, we can program without using complex languages like C++, Visual Basic, Phyton...etc.

Dynamo works whith geometry and whith data, but it was designed mainly for managing geometry.

Dynamo is associated with Revit, Robot, Naviswork , React(all Autodesk software).... and can work with its elements.



Dynamo manages:

- Geometry elements
- Model elements (From associated software)
- Data

HOW CAN I LEARN DYNAMO?

You can learn Dynamo on:

- Dynamo Primer: a great tutorial.

http://dynamoprimer.com/

- Dynamo Tutorials: interesting video tutorials.

http://dynamobim.org/learn/

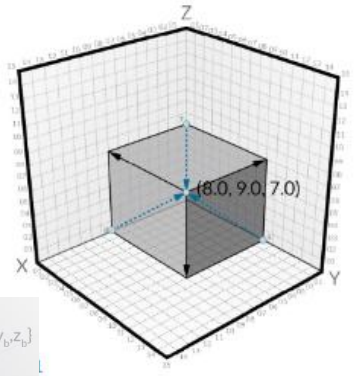
- Dynamo Forum:

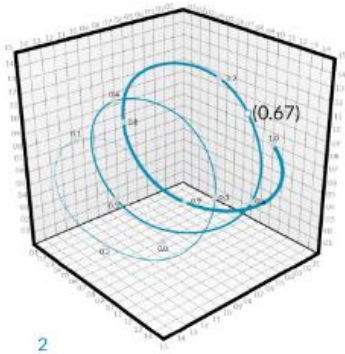
https://forum.dynamobim.com/

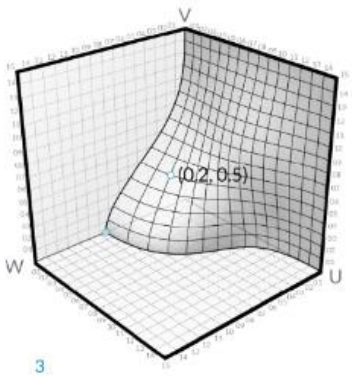
GEOMETRY ELEMENTS

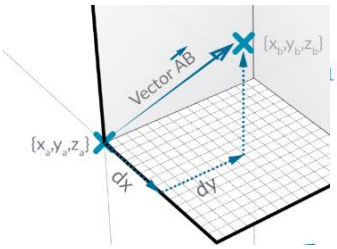
Dynamo manages geometry elements independently from other software associated.

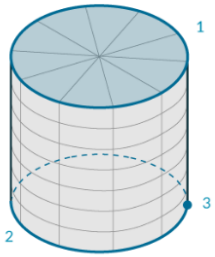
- Points
- Curves
- Surfaces
- Solids
- Vectors
- Planes

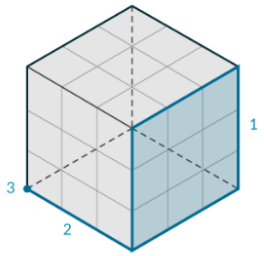


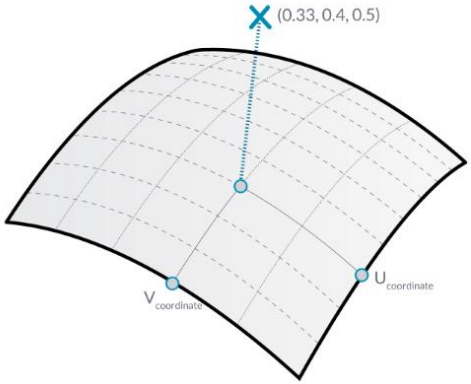


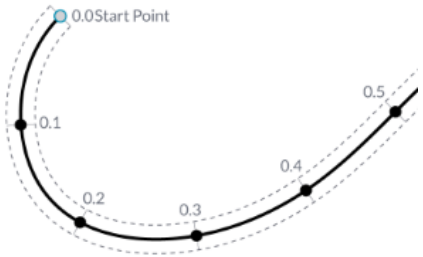












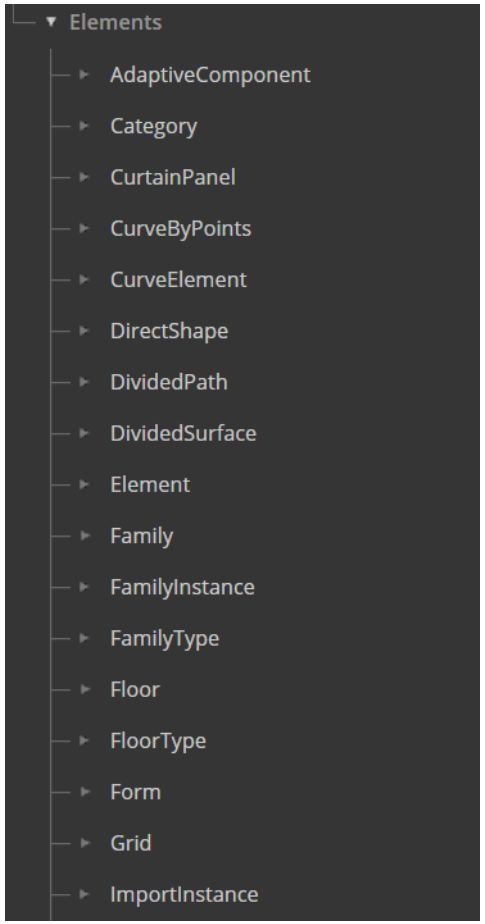
In Dynamo, You see geometry on back of workspace.

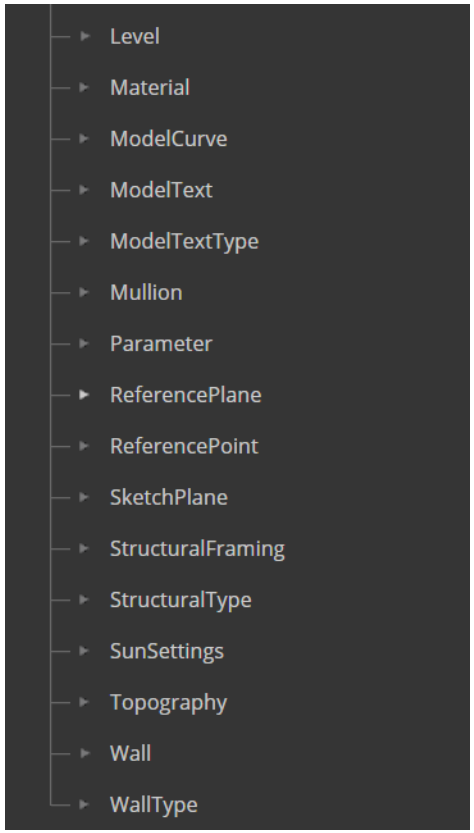
MODEL ELEMENTS

Associated with a program, Dynamo manages model elements. Dynamo Studio is a stand alone version not associated with another software.

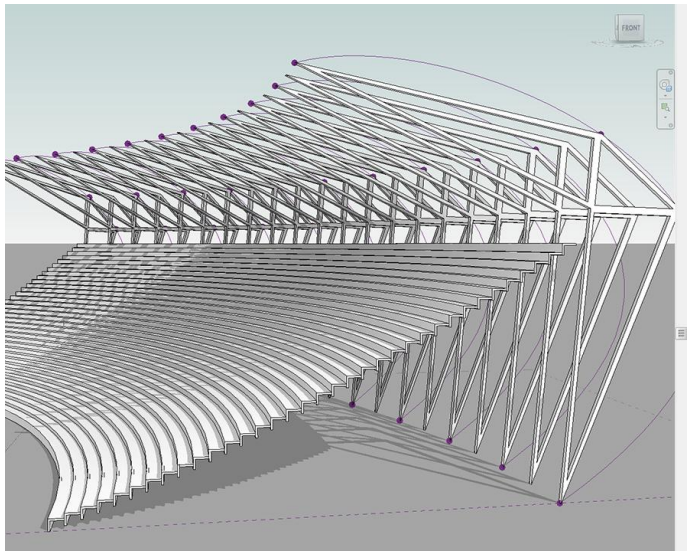
- You can manage almost all elements in model.
- You can create model elements from geometry elements.
- You can get geometry elements from model elements.

In Dynamo you don't see model elements.

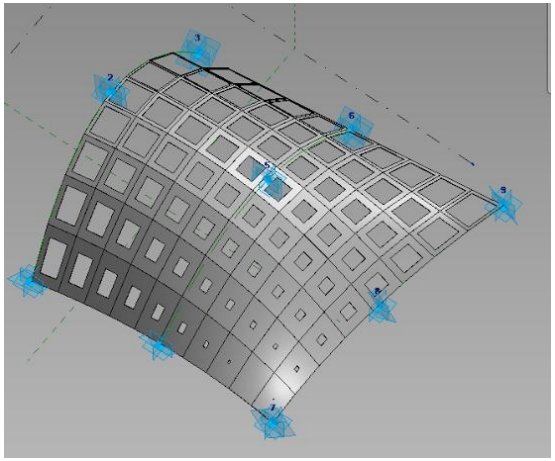




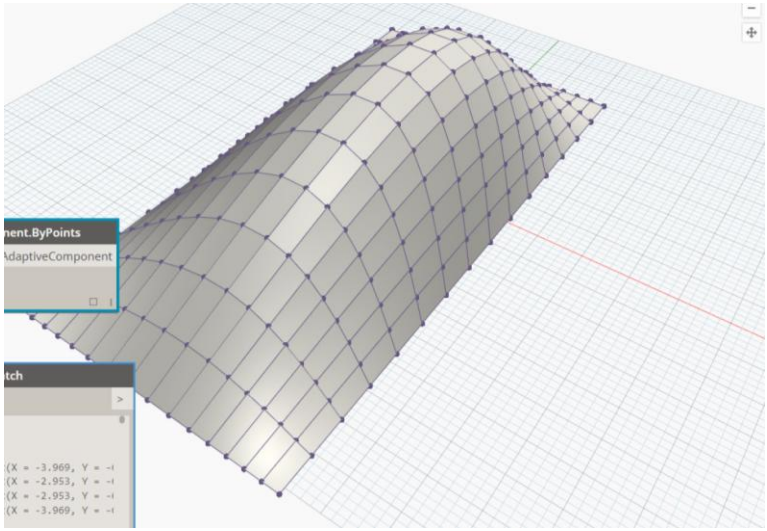
What to manage



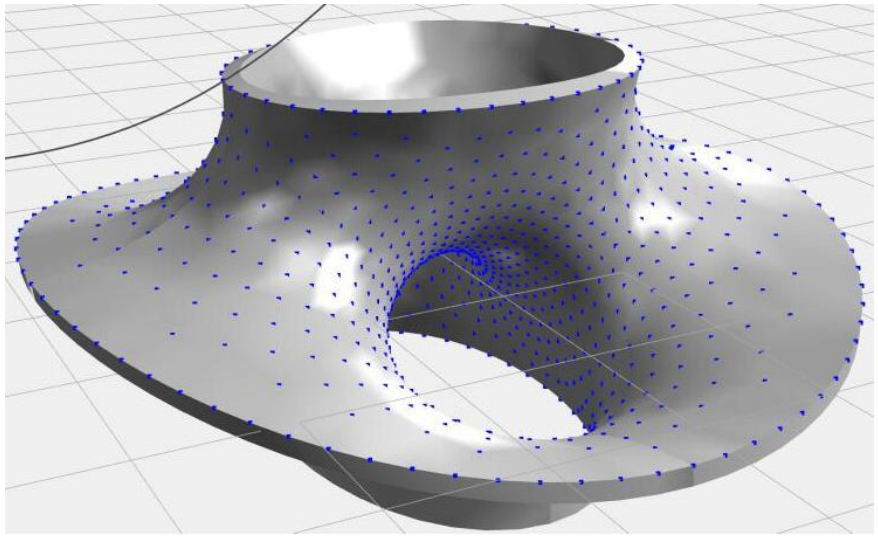
Structural faming, columns, floors (closed curve) and walls from Curves



Adaptative families from Points



Roofs and Topography from Surfaces

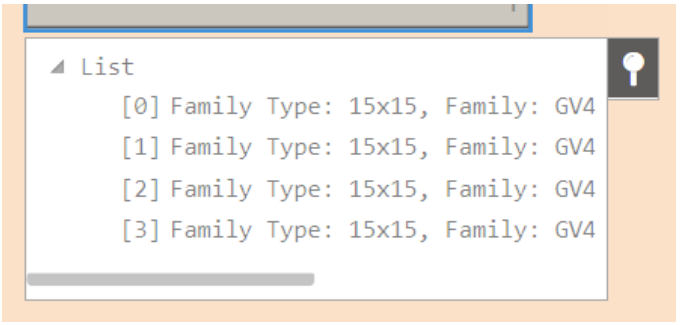


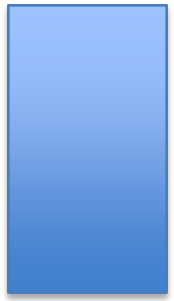
Masses/Form from Solids

DATA ELEMENTS

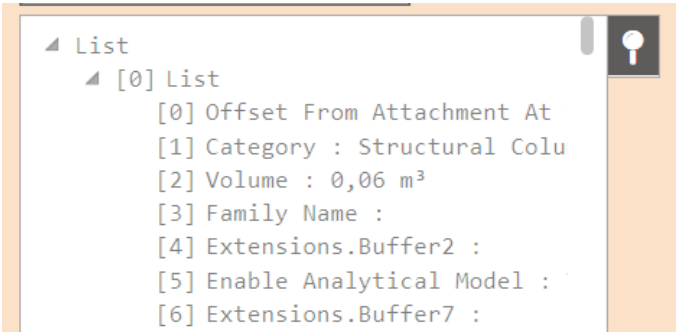
Dynamo can manage data with Lists. Lists are databases of any dimension and with any kind of data.

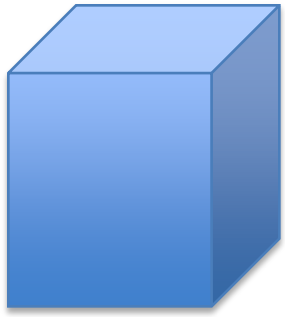
Data: numbers, string, boolean, elements id, element parameters, colors, etc...





1D





2D

And more dimensions ..... 3D, 4D.....

FUNCTIONS

In Dynamo you can make three type of functions. Functions are called “Nodes” and you can find them in “Library”. People can create new Nodes based on existing ones. You can increase your library with more Nodes.

- Query: ask elements about their properties or characteristics.

- Create: create new geometry and elements depending of software associated.

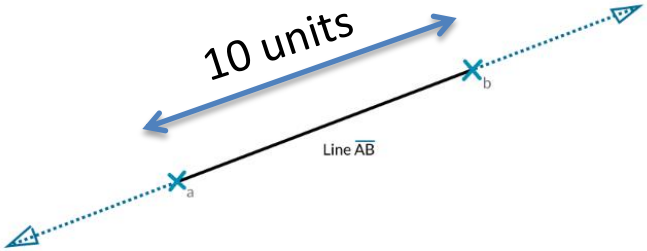
- Action: modify elements or data.

UNITS

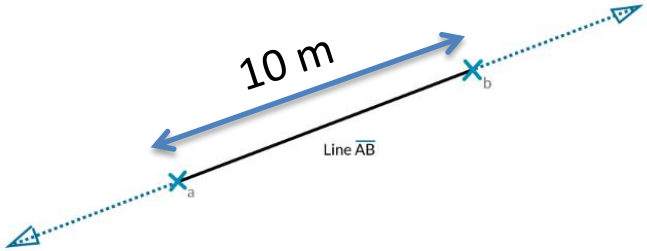
Geometry Functions in Dynamo are non dimensional.

Take dimensions when convert geometry to model elements of an associated software. Then, numbers of Dynamo take units used in Revit/Robot/etc.

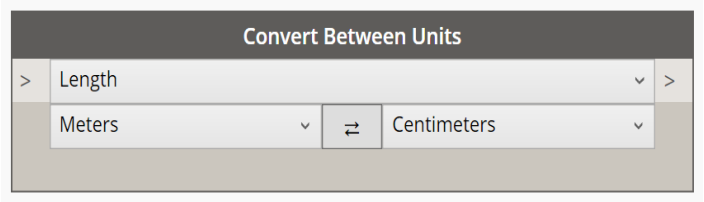
DYNAMO ALONE



DYNAMO ASSOCIATED
[m] as length units

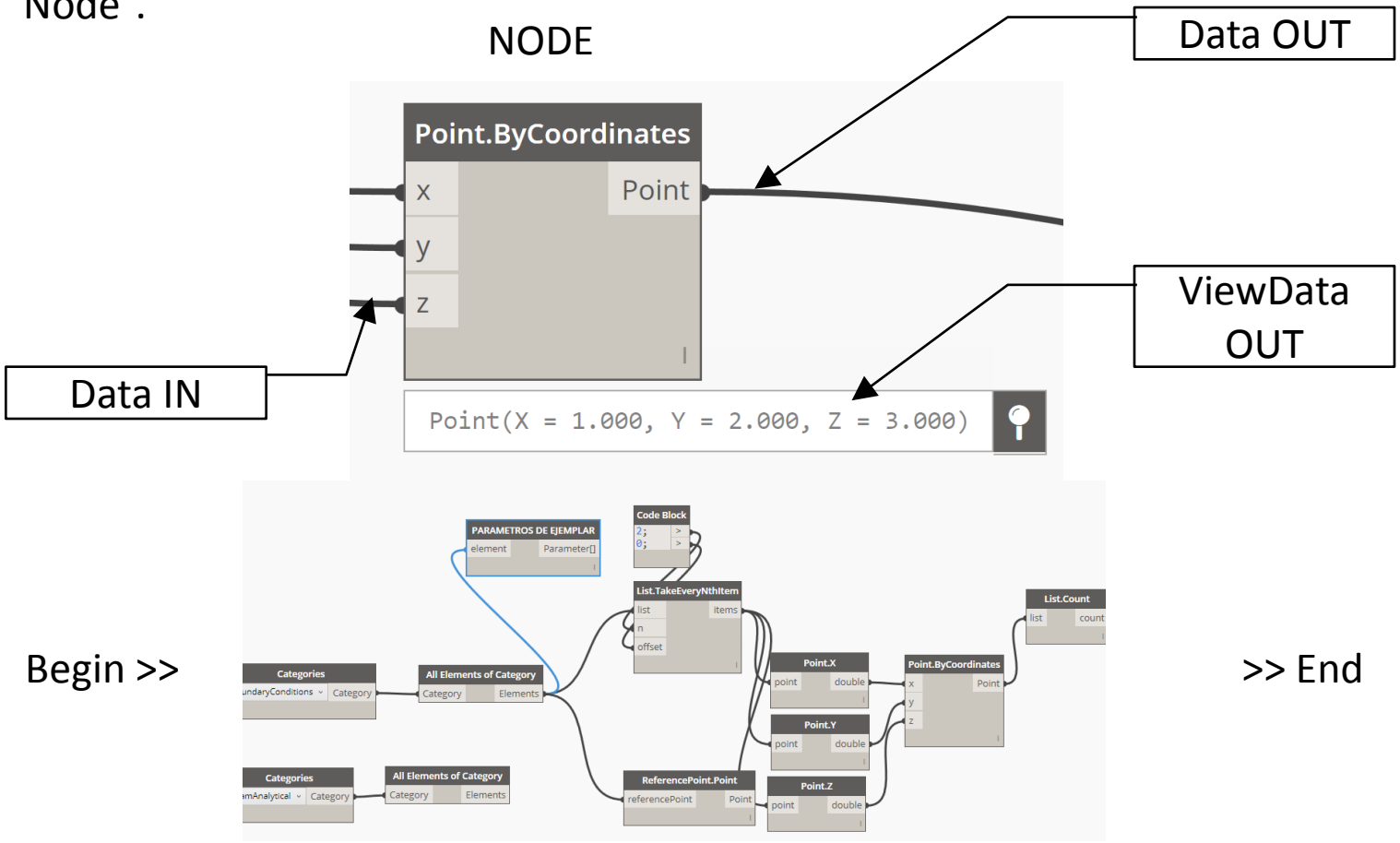


You can convert between units using special functions or multiplying by factors:



PROGRAMMING

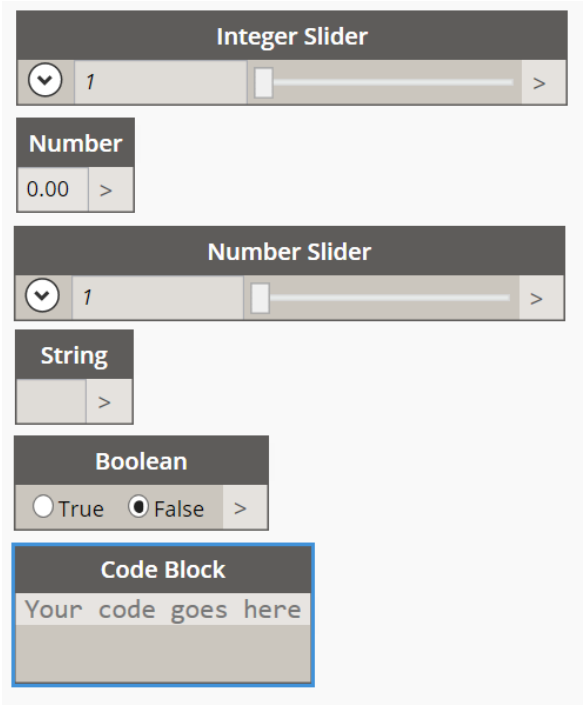
In Dynamo program works as a flow between “Nodes”. Data go to one Node to another until end. Nodes have data to go in and data to go out after operation of “Node”.

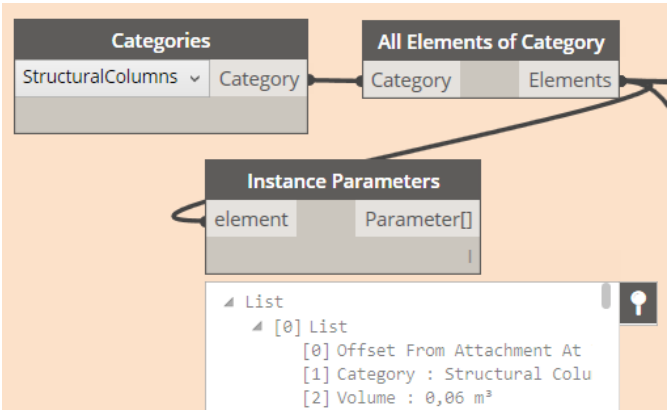


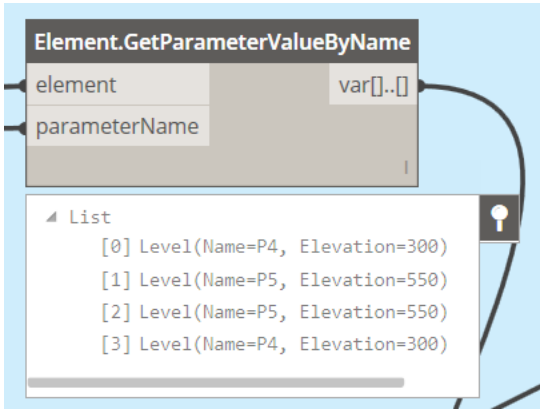
INTRODUCING DATA

You can introduce data in Dynamo with:

- From other Node by calculations.
- From user selection: Sliders, introducing data, etc.
- From Paremeter of model elements.







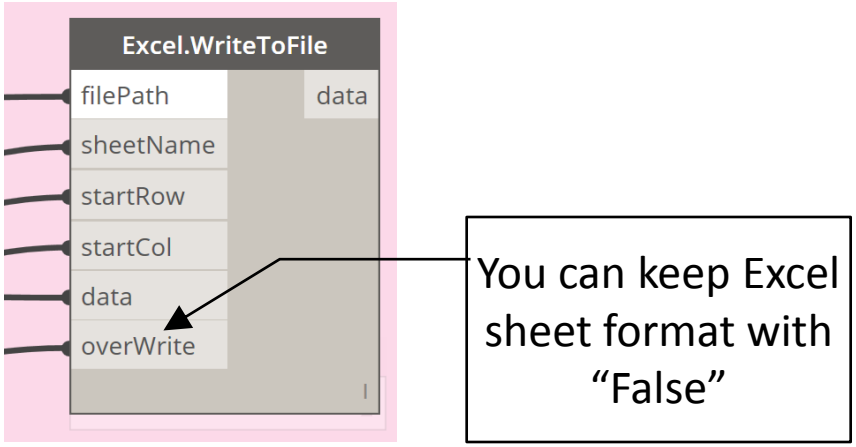
Code Blocks have many other Possibilities.

IMPORTING AND EXPORTING DATA

You can import/export data or geometry in Dynamo with:

- Formated data: CSV format
- Solid geometry: SAT format
- Formated data: XLS/XLSX format with excel@
- Objects: DWG format (Only Dyanmo Studio)
- Data with Flux.io

You can work with Folders and Files. Move, Copy, Delete...etc.



OPERATING DATA

As with other software that manage numeric or string data (like excel) in Dynamo you can operate with data.

- Arithmetic Operators.

(+, -, x, /, <, =.....)

- Condicional Operators.

(And, If, Or....)

- Maths Functions.

(Max, min, ABS, Sin, Cos....)

- String Operators.

(Change, Split, Find, Replace....)

- List Operations.

(Count, Flatten, Add, Remove....)

Etc.....

Icon	Name
	Add
	Subtract
	Multiply
	Divide

Icon	Name
	If
	Formula
	Code Block

HOW TO DO A DYNAMO PROGRAM?

First of all, you need a TARGET.

1. What problem do yo want to resolve with Dynamo? Will you spend more time programming or resolving the problem?
2. What geometry/elements/data do you want at last?
3. What geometry/elements/data do you have at begining?
   Then we need to think which steps are necessary to go from 2 to 3.
4. Which chain of Nodes we need to do that?
   Then we need to search our ideal “Nodes” and to check them.

We learn by doing because for each problem We need a diferent answer.

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