

TR500015

Improving Your Workflows Using the Dynamo Player Capabilities

Michael Günther-Geffers
Autodesk

Learning Objectives

- What is new in Alias this year (2021) for the Dynamo Player
- Understand all the different possible application areas for Dynamo
- How to create a Dynamo Player tool, including icon

Description

Dynamo is capable of much more than patterning. In this class, we will cover the broad variety of possible applications for Dynamo and Dynamo Player, including NURBS, subdivision, and construction element generation tools, as well as tools to modify such geometry types. We will also provide insight into how to use Dynamo to exchange data live between VRED virtual reality (VR) and Alias software. Dynamo Player can help you create highly customized tools and increase the efficiency of the way you handle daily routine tasks in all kinds of different areas. Since the introduction of Dynamo Player in Alias 2021.2 software, each Alias release has come with a variety of new Dynamo and Dynamo Player tools. We'll also share examples of how to use Dynamo and the Dynamo Player to create your own tools inside Alias.

Speaker

While Michael Günther-Geffers achieved his diploma in mathematics and computers in 2006, he has already been in touch with CAD programs for the automotive industry since the year 2000.

He started as a quality assurance engineer for ICEM Surf, and later also tested its integration into Catia V5 (ICEM Shape Design at that time, later renamed to ICEM Catia).

In 2010 he joined Virtual Shape Research (VSR) as a QA, support and content creator for a rendering and class A plugin for Rhinoceros 3D. Joining Autodesk with the acquisition of VSR in 2013, he then worked as a UX designer for SpeedForm and later Alias.

2018 he transitioned back to the QA role, becoming the technical lead for the testing of Alias.

Since 2019 he is the QA manager for all automotive products (Alias, VRED, ShotGrid), and became a free time enthusiast in using Dynamo and writing scripts to solve problems for Alias users.

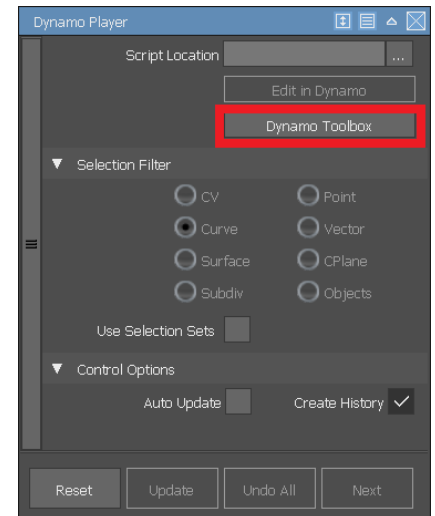


What is new in Alias this year for the Dynamo Player

In the past, new Dynamo Player scripts would only show up in the What's New shelf of Alias. As that one is reset every year, a different approach was needed to grant each user easy access to all the scripts within the installation. To achieve this, in Alias 2022.2, we have added the button "Dynamo Toolbox" to the Dynamo Player tool window. When clicking on it, the Dynamo Toolbox shelf is opened, which gives you a visual overview over each Dynamo Player script shipped with Alias.

The same shelf can be opened via "Help – Dynamo Resources – Dynamo Toolbox". Similar to the What's New shelf, it cannot be edited, as it represents the state of the software the way it ships. Instead, its intent is to allow the user to see what's available. From here, all tools of interest can be dragged via the middle mouse button to the user editable shelf.

For now, the shelf is divided into three sections.



Subdivision

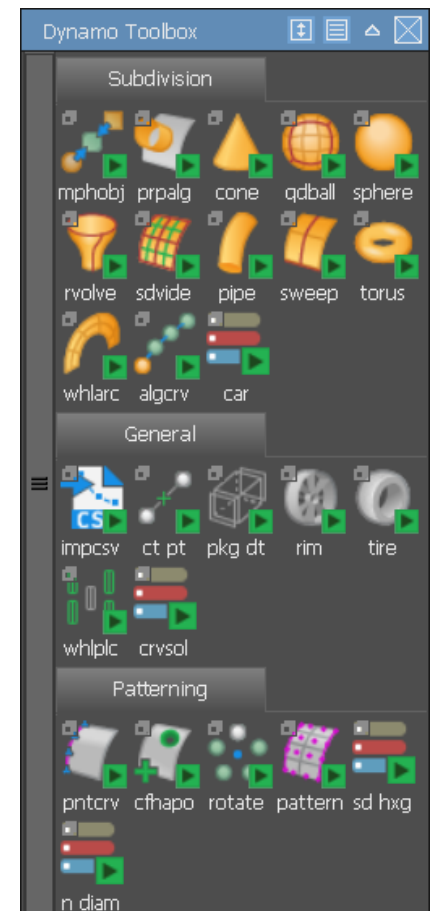
This tab contains all scripts which create or "modify" subdivision bodies. Modify is in quotation marks as the original input currently still must be manually deleted, but we are already looking into an automated solution for that. Make sure you don't miss to add useful Dynamo Player scripts to your subdivision tools. One script which saw some improvements this year is the Sweep function, which, due to that, has now become a daily used tool in our customers workflow. One of the newly added tool is the car script, which demonstrates that it is possible to create even complex bodies with minimal input.

General

All sample scripts which are not solely dealing with subdivision bodies or patterning can be found here. Examples of this are the package data generation script, but also the improved tire script (can now also generate a 3D tread). We also added a tool to create 3D Nurbs solids (optionally filleted and/or beveled) from closed curves, as well as an example on how to implement a solution for a Center Pivot problem a customer had. The latter one is shown live in the class video.

Patterning

Every script which is patterning related can be found in this tab. This now includes sample Nurbs and subdivision scripts to create hexagon respectively diamond shapes. While we already provide a script, which uses two curves to place patterns across multiple surfaces, we are still working on an even easier and better approach.



Dynamo Player Application Areas

While Dynamo is obviously strong in the area of creating patterns and such, the goal of this class is to highlight the other, not that well known areas where the Dynamo Player can help improving workflows.

Nurbs Templates

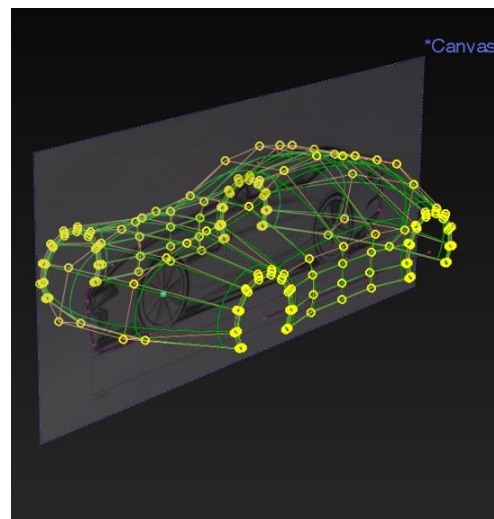
In case you have reoccurring Nurbs shapes, it might make sense to capture the process of their generation into a Dynamo Player script. Tires are a perfect example for that. Their shape always follows certain rules, and the resulting geometry does not necessarily have to be Class A.

In 2022.0, we added the possibility to create a 3D tread to our tire script, by using Boolean operations on the Dynamo side. As this operation is rather slow (can take up to 1-2 minutes), we added a quick preview option in 2022.2. You can make your design decision based on a curve preview, and by that you only must execute the slower surface tread generation once.

In 2022.2 we also added the ability to extrude a solid from a closed curve, with a user given distance and direction. The resulting surfaces can optionally be filleted and/or beveled. One possible application of this script is to use the Alias text feature with the desired font to create characters, and then use this script to easily create 3D text solids.

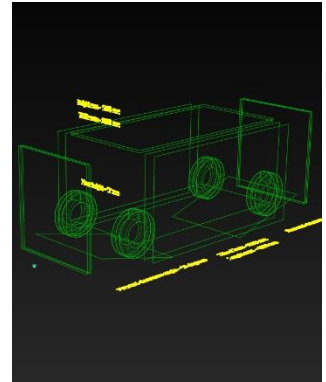
Subdiv Templates

Also, for 2022.2, we added a script to generate a complete car shape, based only on one curve for the side profile (optional), plus the needed information for wheel arch radius and width of the car. The amount of subdiv faces to be created can be individually controlled for the wheel arch radius, for the front to the back, and for the left to the right. It allows you to directly start working from a car shape, without having to do the first 5-10 minutes of modeling to get to the base shape.



General Templates

Obviously, you can also choose to create any mixture of curves, Nurbs and subdivision surfaces, as well as construction entities with your template script. One example for this is the package data script, which has been added as a Dynamo Player tool in Alias 2022.0. It creates 4 base wheels, as well as limiting minimum and maximum planes inside which your design has to stay. It also provides the technical data information as text out of curves. Please be aware that for the last feature to work, you need to have the package “Text” installed for Dynamo. To do so, in Dynamo, please use “Packages – Search for a Package”.

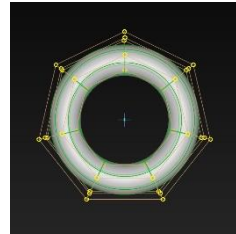


T-Spline Library

The T-Spline library is the backbone for most of the subdivision operations in both, Alias and Dynamo. Be aware that on the Dynamo side, the term “T-Spline” will be used for everything in regard to subdivision operations. This is due to the fact that Dynamo is also integrated in other Autodesk products, which use T-Splines, instead of (like Alias) subdivision surfaces. The T-Spline functionality in Dynamo can be used in several ways to deliver value for the subdivision workflow in Alias.

T-Spline Primitives

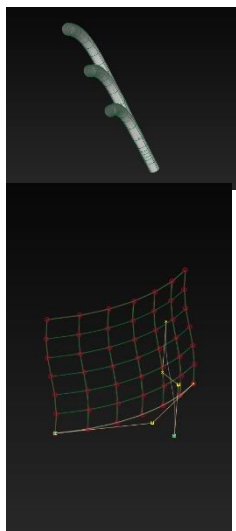
In this area, nothing really has changed in 2022. Nevertheless, it is worth mentioning that, as the primitive tools for a Cone, Quadball, Sphere and Torus are not available in native Alias yet, they do exist as Dynamo Player scripts. You can specify the default values to be used by saving the Dynamo Player script with the corresponding values. Note though, that for data integrity and security reasons, you cannot save an existing script back into the installation directory.



General T-Spline Tools

Beside primitive tools, the T-Spline library also offers regular subdivision tools, as the subdivide functionality, the Revolve, the Pipe and the Sweep. All four tools are available as Dynamo Player scripts, and the latter two have been improved in Alias 2022.1. In the Pipe tool, now the caps at the end of the pipes are optional.

The Sweep tool now creates the sweep by default at the path curve, not the profile curve position (the latter one is still possible by switching on the according option).

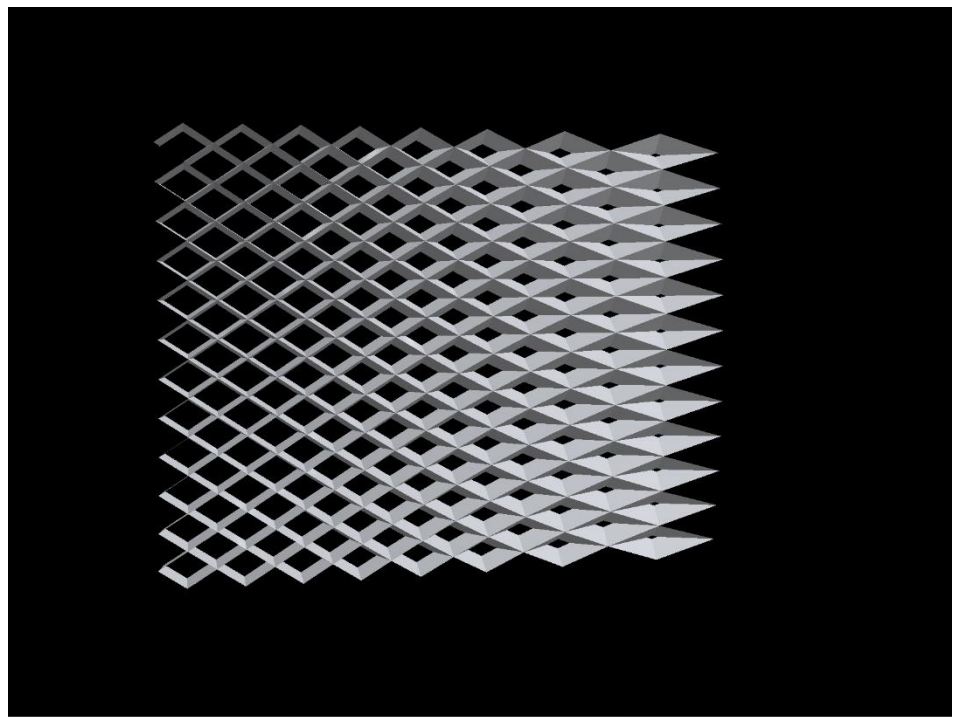
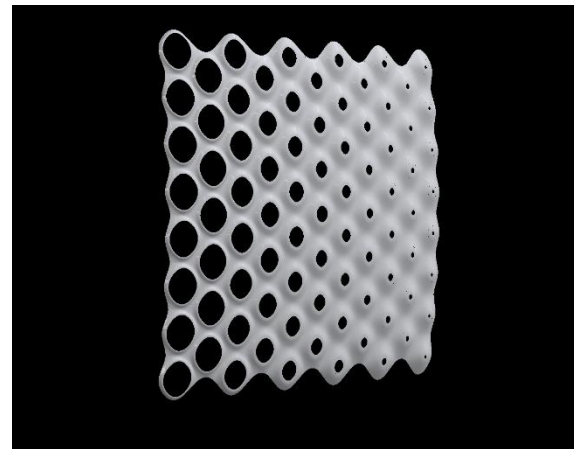
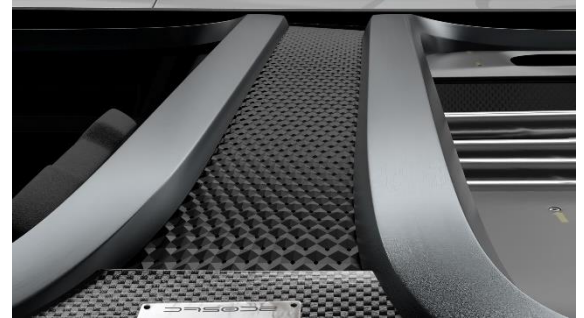


Generative Modeling

A classical application area of Dynamo is generating a lot of objects and shapes in a parametric way. Alias ships with two sample scripts to demonstrate possible use of this.

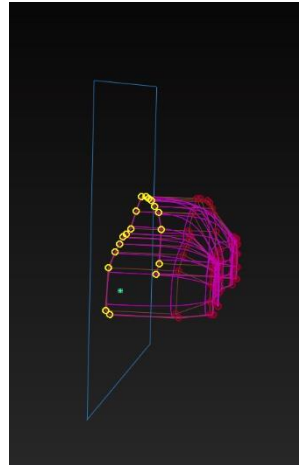
The first one is the subdiv hexagon pattern script. It takes a single, untrimmed surface as input, and creates the wanted amount of hexagonal subdivision bodies on it. Depending on whether you want to crease the bodies or not, the result can look quite different. The script also supports a point or a curve to control an alteration of shape.

The second script also takes an untrimmed surface as input, to then create Nurbs surfaces with a diamond pattern onto it. This script also allows to use an attractor point or curve to control the shape of the output.

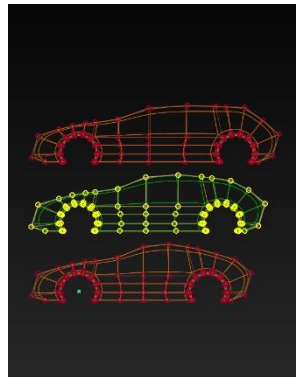


Modification Tools

As mentioned before, modification of Alias geometry is only possible in an indirect way. Dynamo creates a copy of the element(s), which can then be modified and sent back to Alias. The user then must manually delete the input (if wanted). Nevertheless, the ability to change elements on the Dynamo side is very powerful. To demonstrate that, the Align Perpendicular script has been created, and was shipped first with Alias 2022.1. It allows you to “pull” the CV’s of an open edge of a subdivision surface onto a reference plane or surface. Then, the next rows of CV’s are adjusted, to align the subdiv perpendicular to the reference object. This can e.g., be useful to achieve the needed continuity to the center symmetry plane, in case you are only working with one side of the model. Another possible application area is to align open subdivision spokes to the rim, as demonstrated in the beginning of [this video here](#).



Another “only kind of modification” script which has been improved in Alias 2022.1 is the “DP-Subdiv-Morph-between-2-Objects.dyn” script. It still creates an intermediate shape of two subdivision bodies (must have originated from the same body), but now also optionally allows the newly created intermediate shape to stay in place of the first selected object.

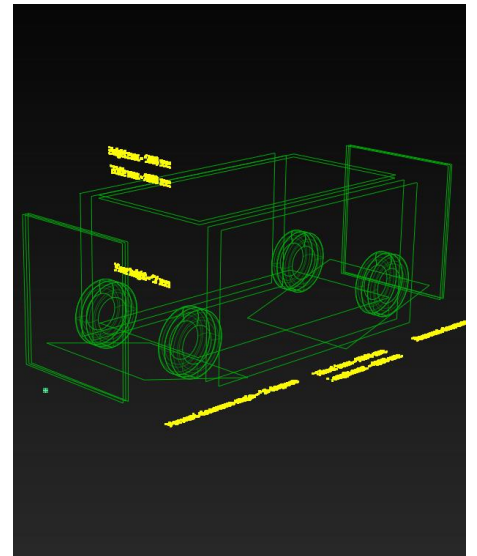


Dynamo File Import / Export

It is also worth noting that Dynamo has its own capability to import and export data. This can be used to read geometry into Alias or export it from there, as well as to drive Dynamo scripts by the ability to read from various possible file formats.

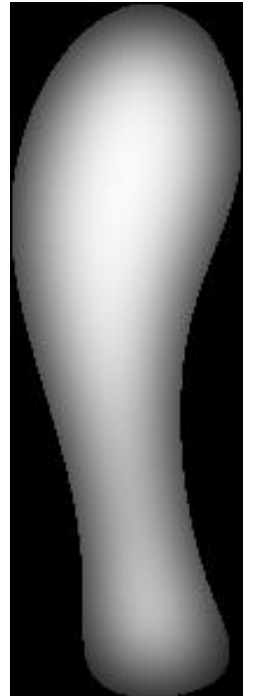
Text based formats

Dynamo can read text files, Excel sheets and comma separated value files (.csv). You can e.g., use such files to drive the dimensions of the package data script, which has been mentioned earlier in this handout.



Images

Dynamo can also read images. You could e.g., use grey scale images to drive parameters of a script. In the shown data model on the bottom, the image on the right has been used to drive the scaling of the spikes on the shoe sole. By that, a designer can use image programs like SketchBook or Photoshop to drive the geometry creation in Alias.



TSpline format

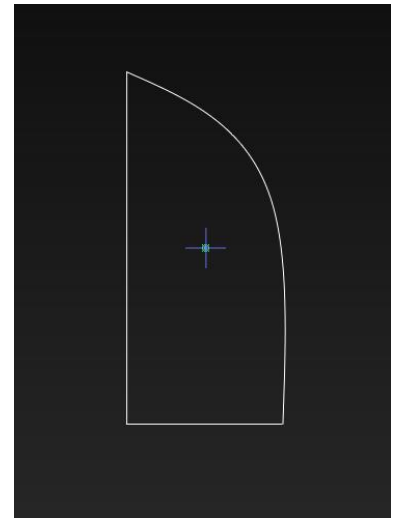
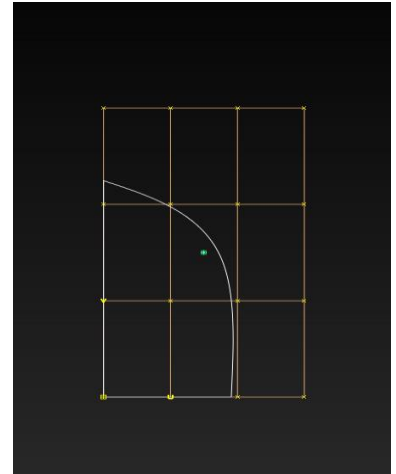
Dynamo can also read and write .tsm and .tss files. This e.g., allows you to write scripts for the direct data exchange of subdivision surfaces between Alias and Fusion.



Workflow improvements

One of the most interesting ways to use Dynamo is to solve little tasks directly, without having to report them to Autodesk, and waiting for the next Alias release to fix it. Earlier this year, a customer had a problem with getting pivot points to the center of trimmed objects. For the “Center Pivot” option, Alias respects the CV distribution of the object, while the customer needed it to be in the center of just the visible part of the trimmed surface. With Dynamo, it was possible to compute this position, and to create a construction point there. The pivot point could then be snapped to that position. By sending the according script, the problem was solved immediately, without the customer having to wait for the next Alias version to solve the task.

Another customer task to solve was a cloud of points, which consisted of a lot of duplicates. The goal was to filter those points, so only one point would exist at each position. This is also very easy to solve in Dynamo and shall serve as a detailed example of how to write a Dynamo script, and then make it available as a Dynamo Player instance, using an own customized icon.



Creating a Dynamo Player tool from Scratch

Please note that Alias provides a lot of general information about Dynamo and the Dynamo player in [this part of the online help](#).

In Alias, open the “Transform” tab in the palette, and keep the left mouse button pressed on the “dynply” icon in the bottom right corner, to expand the tool group. Then left mouse button click on the “dynamo” icon to start Dynamo. When starting a new script, or doing major edits to an existing one, it is usually better to start Dynamo instead of the Dynamo Player. The “normal” Dynamo icon maintains the connection to Alias, which is needed to transfer selected items from Alias to Dynamo. This is necessary if you want to see if your script works as expected with Alias input geometry while editing the script.

In Dynamo, click on “New” to start a new script. As mentioned before, we would like to write a script which only returns unique copies of given points back to Alias. The first thing we need is the node to select the points from Alias, to send them to Dynamo. For this, right mouse button click in the canvas to open a search window, and type “sel” into it. The first resulting hit in the list is the node we need, which is “Select from Alias”. Left mouse button (LMB) click on it, to add the node to the canvas. Most of the time it makes sense to also specify what kind of elements you expect to come from Alias. This way, the according selection filter will be set on the Alias side, making it easier for the user to pick only the intended entities. To do so, LMB click on the “Unspecified” drop down in the “Select from Alias” node, and select “Point”, as that is the type we want to work with.

Next thing we need is the node which shall get rid of possibly duplicate points. RMB click in the canvas to open the search again. Type in “pru”, and LMB click on the PruneDuplicates entry to add the corresponding node to the canvas.

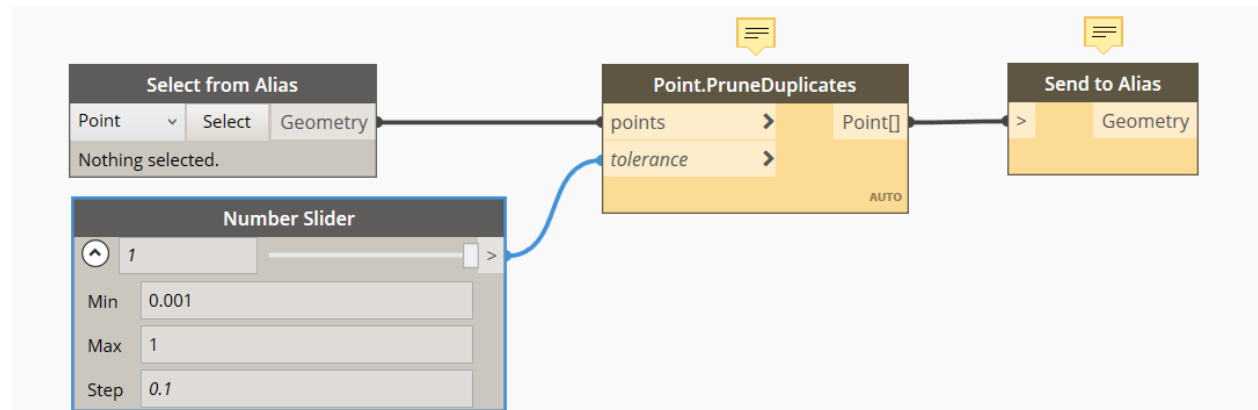
We now need to feed the points coming from the Alias selection into the PruneDuplicates node. To do so, LMB click on the “Geometry” text on the right of the “Select from Alias” node, and then LMB click on the “points” entry on the left of the PruneDuplicates node. The two nodes are now connected. You will mostly likely see a yellow warning popping up. This is only because the current selection from Alias is empty and can therefore be ignored.

As you can see, the PruneDuplicates node also offers a tolerance parameter. If not explicitly set, it defaults to 0.001. You can see that by hovering the mouse pointer over the “tolerance” text of the node. We would like to give the Alias user the option to set this explicitly.

For that, we need a slider. Click RMB in the canvas to open the search, type in “sl”, and click on the Number Slider entry in the list. Good tolerance values probably range from 0.001 to 1. To only allow the user to set values in this range, LMB click on the little downward pointing arrow on the left of the number slider. Type in 0.001 as Min value, and 1 as Max value. You can also set the wanted step size, but be aware that this value does not control the slider sensitivity on the Alias side yet, it only works on the Dynamo side so far. Now connect the number slider to the PruneDuplicates node, by first LMB clicking on the little arrow on the right of the number slider node, and then on the “tolerance” entry on the left of the PruneDuplicates node.

To make the number slider show up in the Alias tool window later, we must let Dynamo know that this slider shall be an input parameter coming from Alias (this is already set by default for all “Select from Alias” nodes). To do so, RMB click on the number slider node, and in the upcoming list, activate the check mark before the “Is Input” entry.

Now we need to send our unique copy of points back to Alias. For that, RMB click in the canvas, and type “send” into the search window. LMB click on the “Send to Alias” entry, to add the node to the canvas. Now LMB click on the “Point[]” entry on the right of the PruneDuplicates node, and then LMB click onto the little arrow on the left of the “Send to Alias” node. The two nodes are then connected, and our script is complete.



Go to “File – Save As”, and save the Dynamo script somewhere, e.g., as Filter-Points.dyn. Now go back to Alias, and double LMB click on the “dynply” icon, to bring up the Dynamo Player tool window. In that window, click on the “...” button on the top right, and browse to the location where you saved your script. Once there, in the file browser double LMB click on your script to load it. The Dynamo Player tool window should now update its UI to reflect the loaded Dynamo Player script.

Now the Dynamo Player has loaded your script, you can create an instance of your script on your shelf. For that, keep the LMB pressed again on the tool group of the Dynamo tool icons in the Transform tab, to display both icons. Now use the MMB to drag the Dynamo Player icon onto your shelf. Note that it is important to only drag and drop the Dynamo Player icon, and not the complete group, otherwise you won’t be able to rename your shelf entry in the next step. We want to rename this icon now, to distinguish it from possible other Dynamo Player instances on our shelf. For that, press the ctrl key on your keyboard, and then double LMB click on the icon. You can rename your tool icon in the upcoming window.

Creating an icon for your Dynamo Player script

In the location where you saved your script, you need to create a folder, named depending on the icon sizes you are using for Alias. A folder named “small” is needed for small icons, a folder named “medium” for medium ones. The icon you want to use needs to be saved in the tif file format, and the name of the icon needs to be the same as the name of your Dynamo Player script. Please save the icon in the size of 32x32 pixels into the “small” folder in case you are using small icons, and as 48x48 pixels into the “medium” folder in case you are using medium sized icons.

Alias checks for these possible icons when the script is loaded, and in case an icon is found, it immediately replaces the standard Dynamo Player icon in Alias by the one being found.