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Youtube tutorials | ***Forum*** | *Spline mesh deform documentation*
Spline plus Documentation | *Spline plus Scripting reference*
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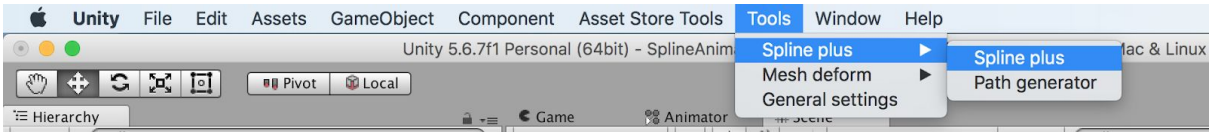
Introduction

Spline plus is the ultimate path following solution for unity. It can manage all path following complexities.
In version 2.0 and above the main focus was on simplifying, you can see this clearly by comparing the inspector of the new and the oldest version, “less fields that you have to deal with”, also as simplification of path editing process, I managed to reduce all the path editing operations under one keyboard key which is the “shift key”,
And lastly one of the most interesting additions in version 2.0 is the scene view menu which makes life a lot easier with tooltips for each button as a brief explanation on its utility ,

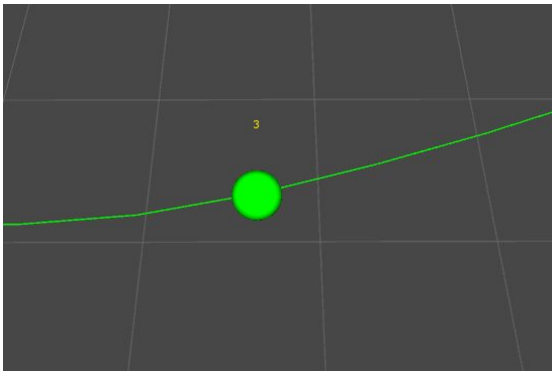
In version 3.0 the main new features added to spline plus were
-Converting all inspector custom GUI lists in spline plus to Unity reorderable lists
-Use of dictionaries instead of lists in order to introduce accessing objects using keys instead of indices which made code more flexible
-Use of gizmos instead of GUI handles for optimization purpose
-Introduction of follower settings window
-Introduction of general settings window for Spline plus shared settings
-Trains followers logic improvement
-Introduction of Projected & Strict path following types
-Improved events

Add Spline plus to your scene:



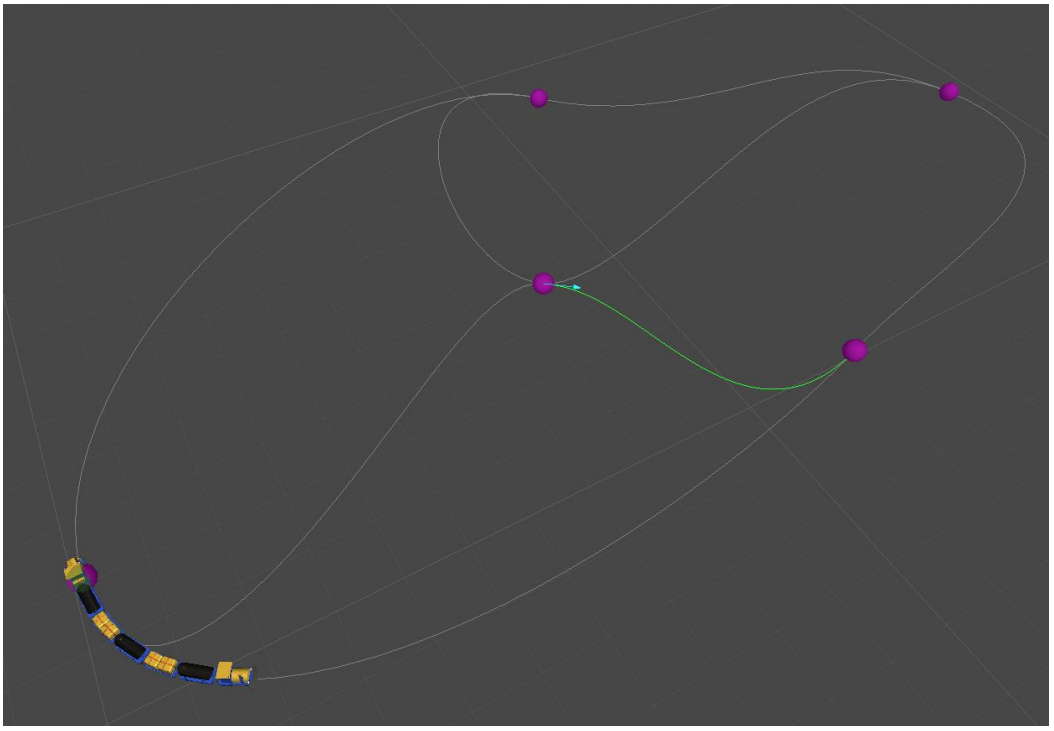
- General information

Nodes: they form a branch, they are marked in the scene view with their indices and a sphere as bellow in the image ,



Select a node:
You can select a node directly from scene view by clicking on the node
Ps: for the node selection to succeed, you need to select the branch where the node is located first.

Branch : it's formed by nodes, the selected branch is marked with a green line ,
To select a branch click on it in your scene view.



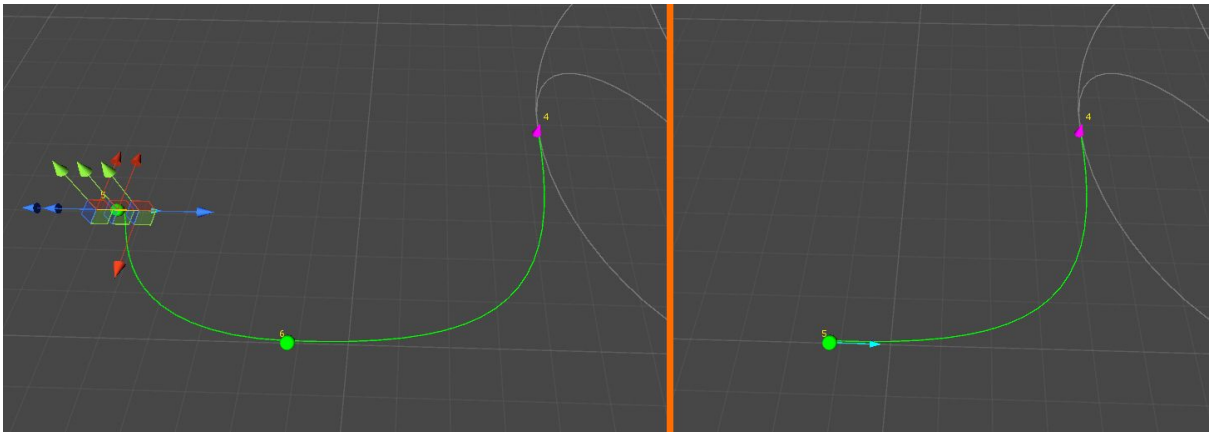
- Spline Editing

All spline plus editing can be done using one shortcut key which is the **"Shift key"** from your keyboard

Add node :

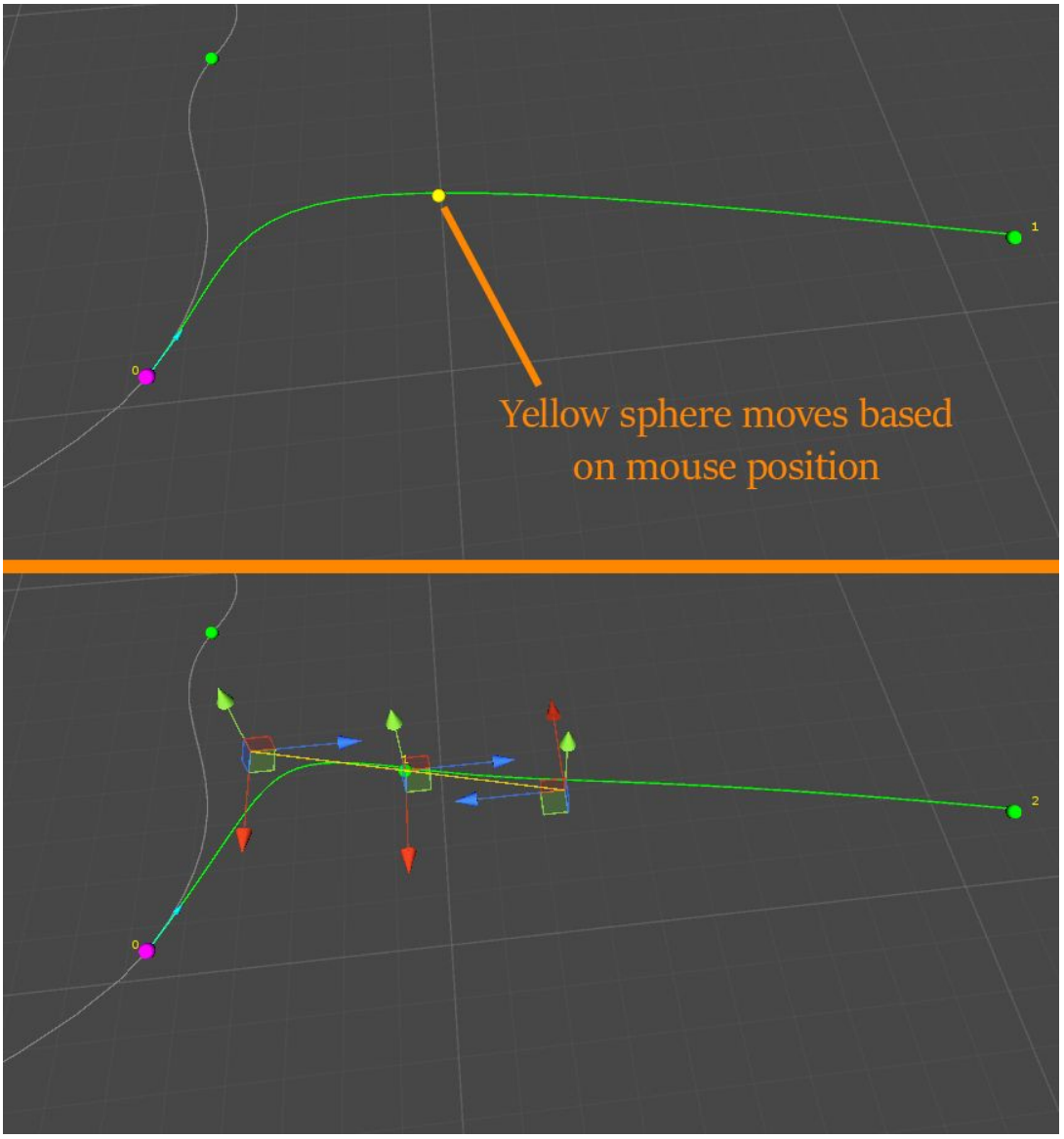
Adding the first node of your spline plus game object:
-Press "Shift key" on the keyboard and click anywhere on scene view to add a node

Adding a node at the end of a branch:
-Press "Shift key" on keyboard and click anywhere on scene view to add a node at the end of the selected branch,
In case both branch forks are welded then the addition of the new node will not be taken into consideration,
If the branch has both forks unwelded then the connection to the new node added will be established with the branch fork with less distance to the mouse position,



Adding a node in the middle of a branch:

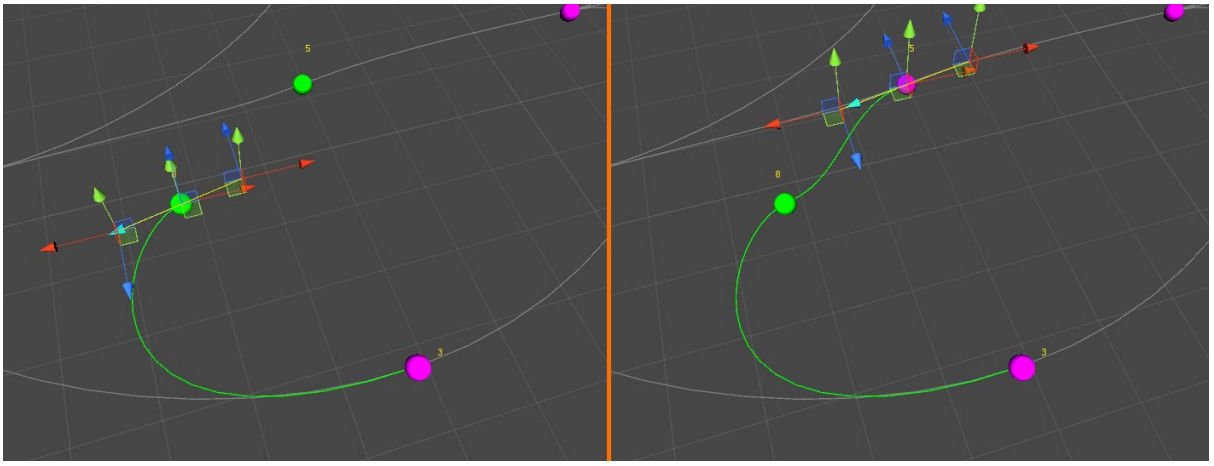
-Hold "Shift key" on the keyboard , you will get a yellow sphere that travels along the spline based on mouse position in your screen, once you are on the desirable position click and the node will be added,



Delete node :

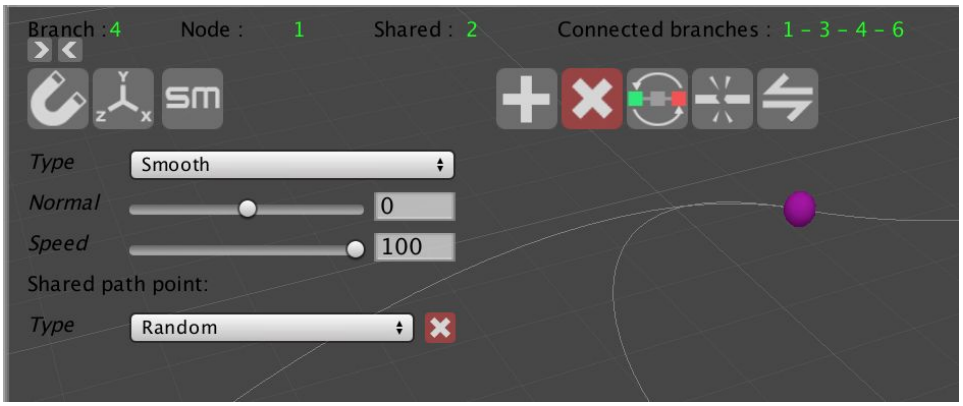
It’s like adding nodes in the middle of a branch ,but instead you hold ‘Shift key’, move your mouse to target the nodes that you want to delete , once you get closer to it, the yellow sphere snaps to the node and its color turns to red instead , if you click using your mouse then the node will be deleted ,

Weld branch :



select an unwelded branch and press "Shift key" on keyboard , now all you have to do is pick the node that you want your branch to form a bridge with, click on it and bridge will be established,

- Scene view menu



Debugging area:

Used to show the data you are currently selecting
it displays :
-The selected branch key (integer) in the branches dictionary
-The selected node index in the nodes list of the selected branch
-The selected shared node index in the shared nodes list
-The branch keys connected to the selected shared node
If data are unavailable then value shown is null

Branches selection buttons:

used to loop through the selection of the branches in the spline plus object, this can be very useful when a branch is unselectable in scene view (branch has only one node)

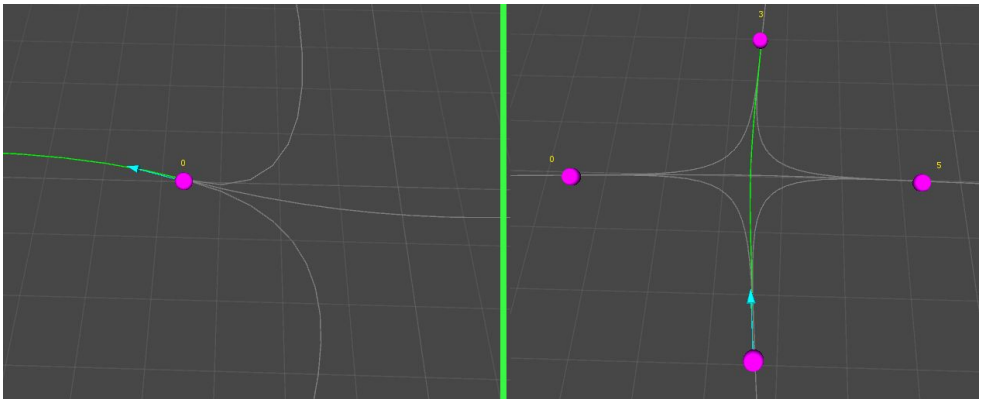
Spline editing buttons:

 Snap all nodes and their handles to Unity grid

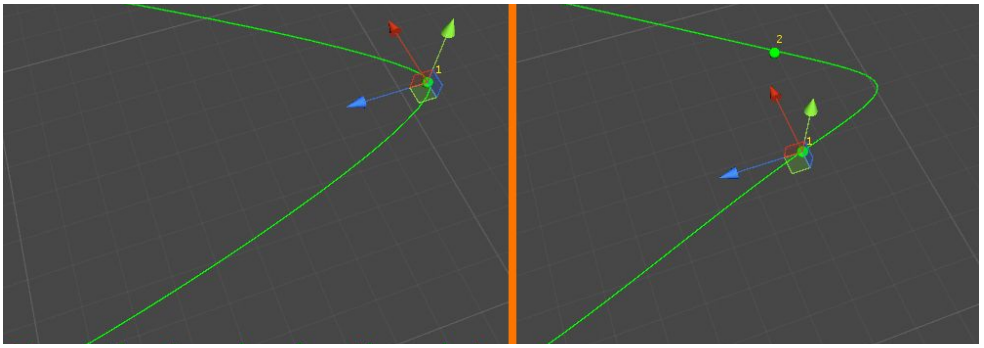
 Turn pivot editing mode On, once clicked the icon turns to green then you can move spline plus game object pivot freely without affecting the nodes transforms, once you're happy with your new pivot transform click again on the button to save changes and turn pivot editing mode to Off,

 Smooth regular and shared nodes, once this button is clicked you get a message box to control your smooth radius

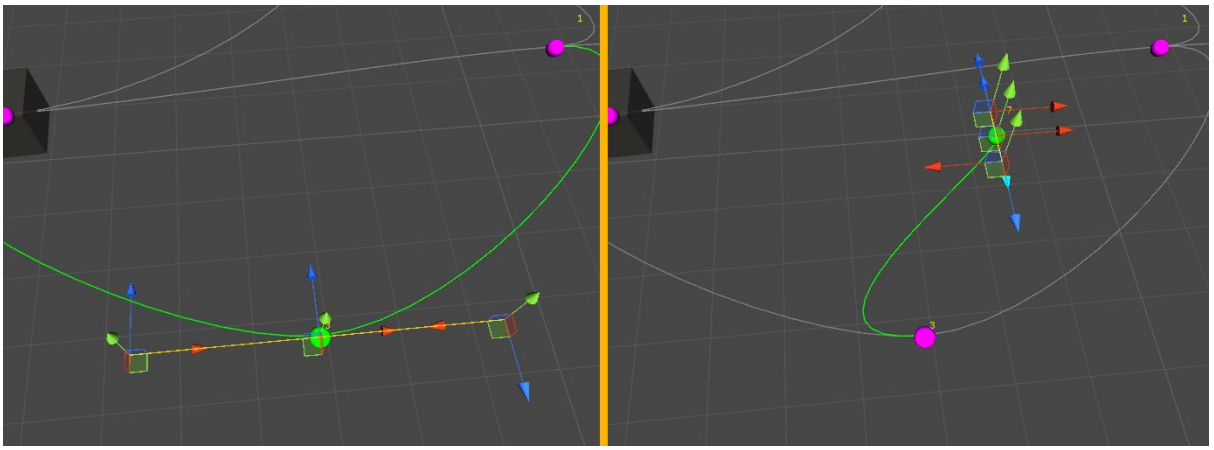
If shared node is selected



If standard node is selected

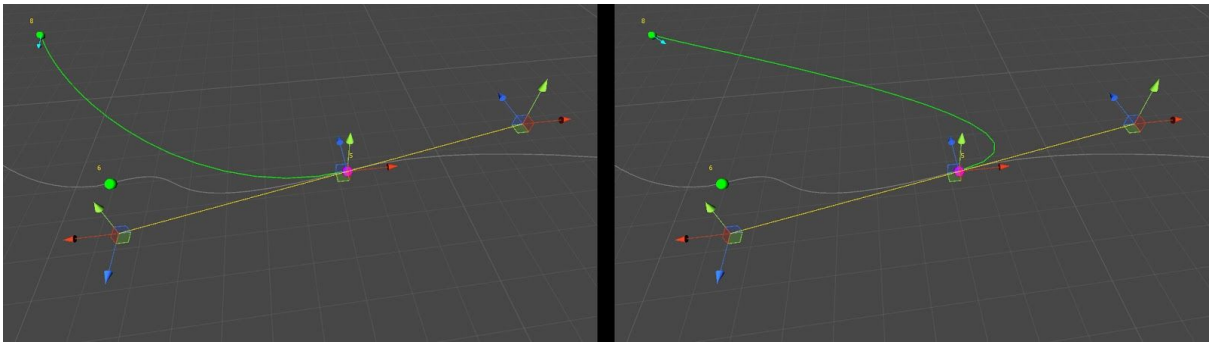


 Add a new branch, you need to have a node selected before clicking on the add branch button, the selected node will be considered as the origin of the newly created branch.

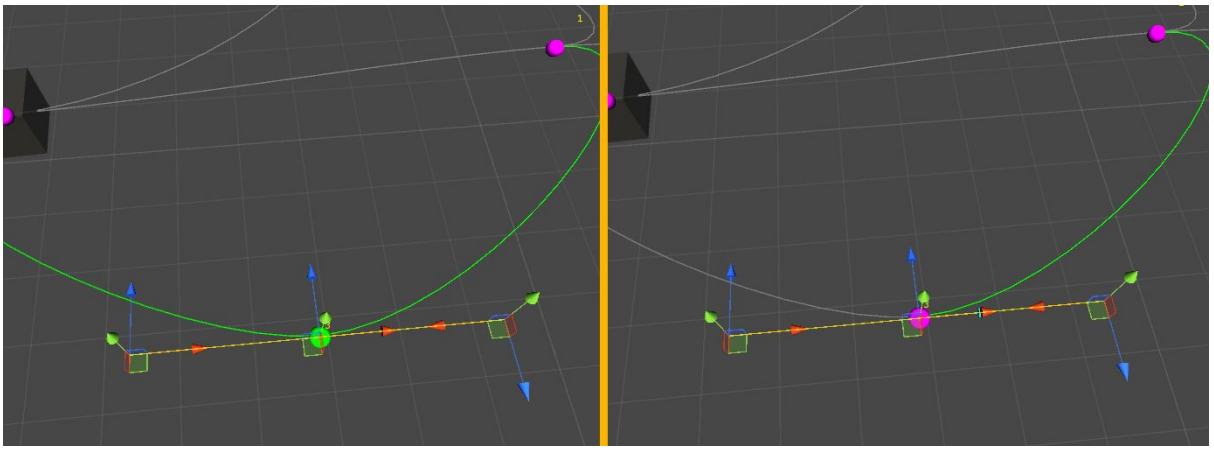


 Delete selected branch,

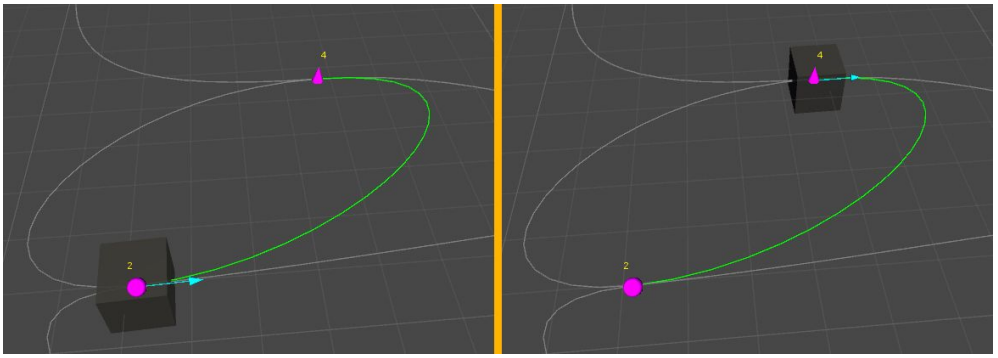
 Flip handles,
this flips the handles position of the selected node , this is very useful when drawing your spline ,it helps you get the desirable spline shape you want



this is used to break a branch at the selected node;



Reverse button is used to reverse the direction of the branch selected

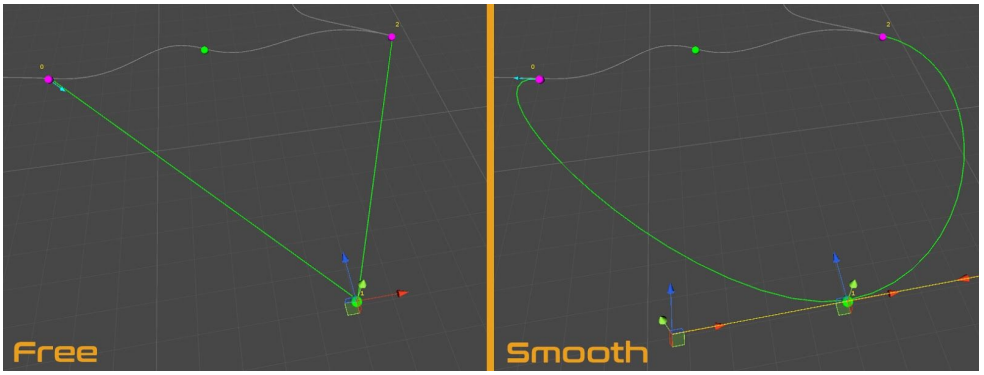


Node curvature type:

There are two supported node types in Spline plus,

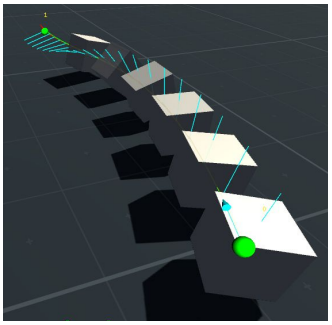
Free mode ,Smooth mode

To change the node type , first you have to be selecting the node then you go to the scene view menu => type, select the type you want from the list,



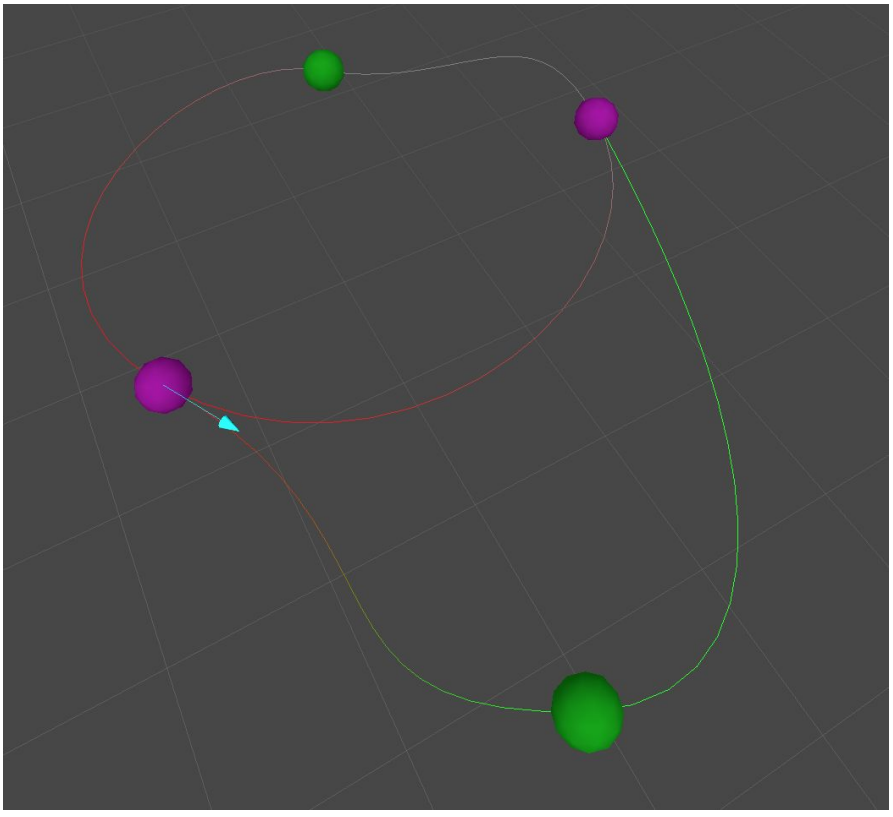
Normals:

In Spline plus you can control the normal value of the selected node from scene view by modifying the normal slider position, the slider is set to 0 by default and it varies from -180 to 180,
To visualize the normals of the spline plus object you have to enable “Helpers” which can be found under General settings window which can be found in Tools=>General settings ,



Speed:

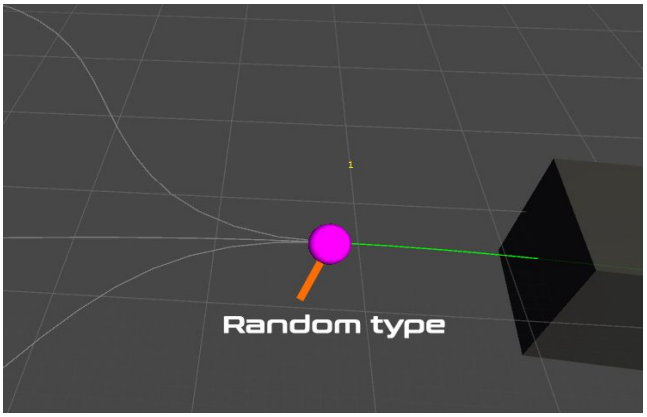
This will allow you to control speed value of the selected node
The speed variation [0,100] is represented by a spline color variation, red color means that the speed is minimum at that position, if color is green or gray then speed is maximum



Shared nodes types:

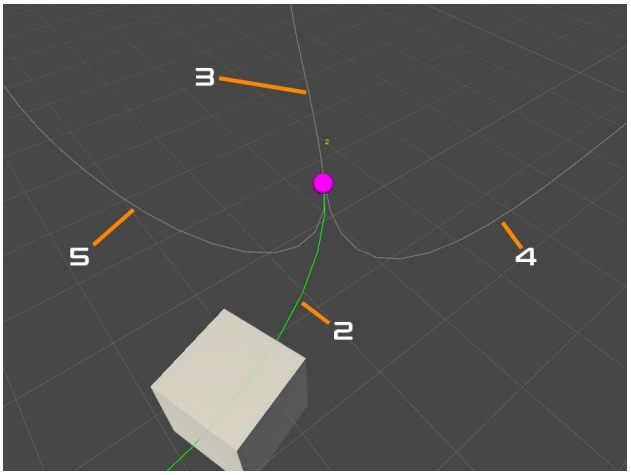
A shared node is node that is shared by more than one branch , there are 2 types of shared nodes in Spline plus,

Random:

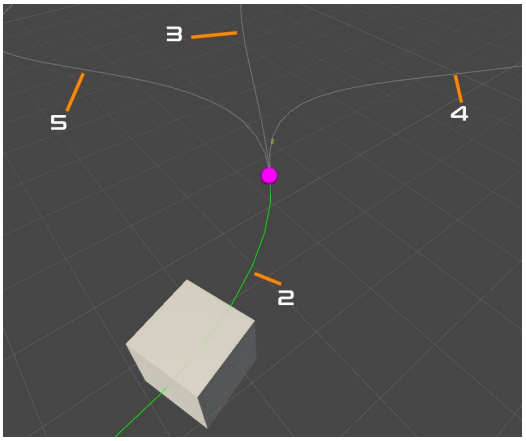


represented with a purple sphere, this is used to randomly pick a branch to follow when the follower is on that shared node,

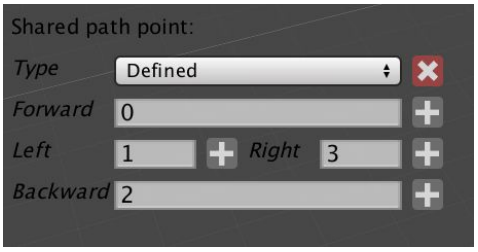
The random branch picking selection will be done between branches 4,3,5 for the example below, but branches 4 and 5 are going to be excluded because of the wrong curvature they have, so the only choice left is 3



In this new example below the random branches picking is going to be done between branches 5,3,4. All branches curvatures are normal in this new case, so all the options are going to be taken into consideration.



Defined:



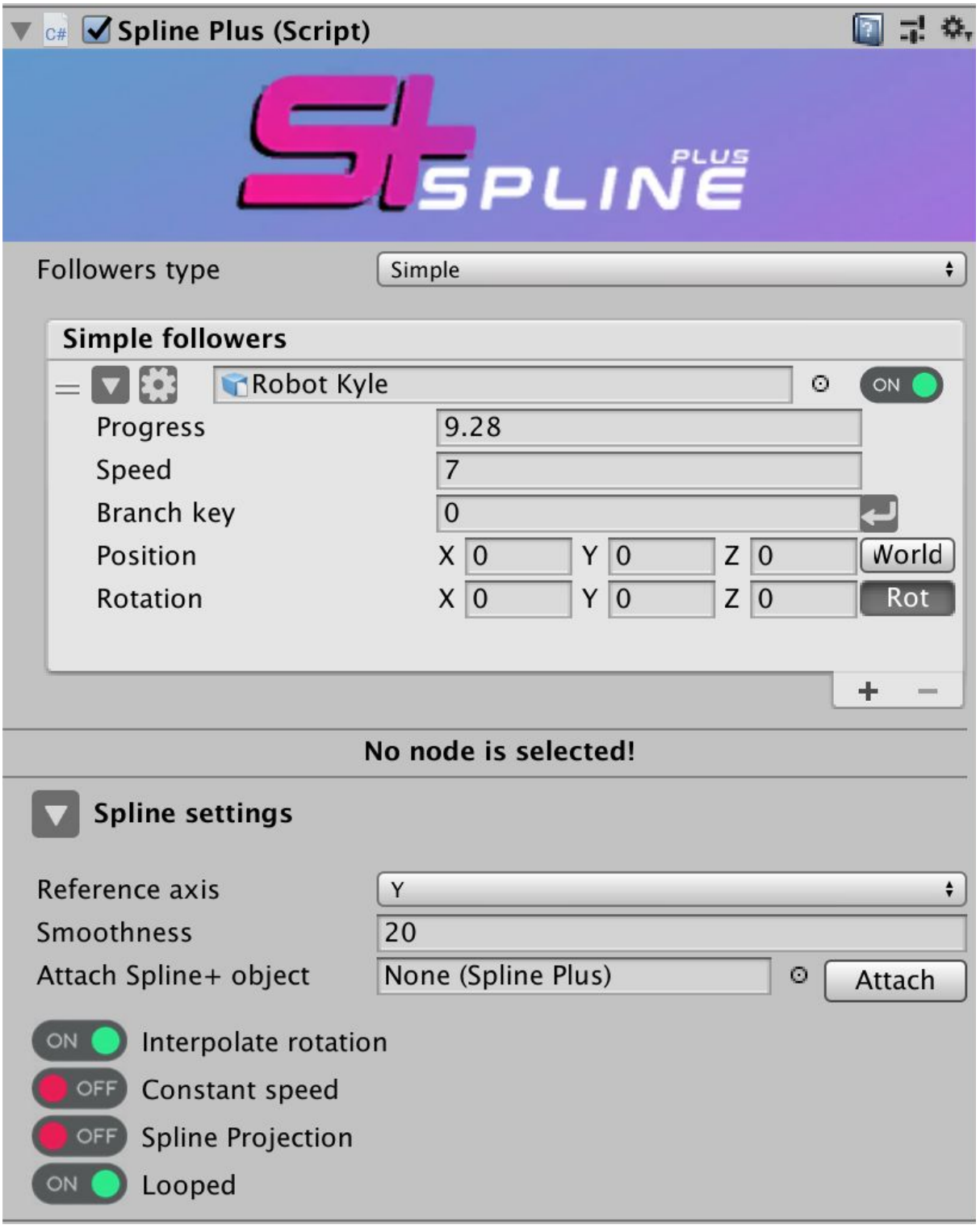
represented with a Blue sphere, this is used to predefine the branch you want your followers to take when it reaches the shared node, this works for both follower animation types ‘Auto animated & keyboard input’

You have 4 branches to set up, Left , Right, Forward and backward

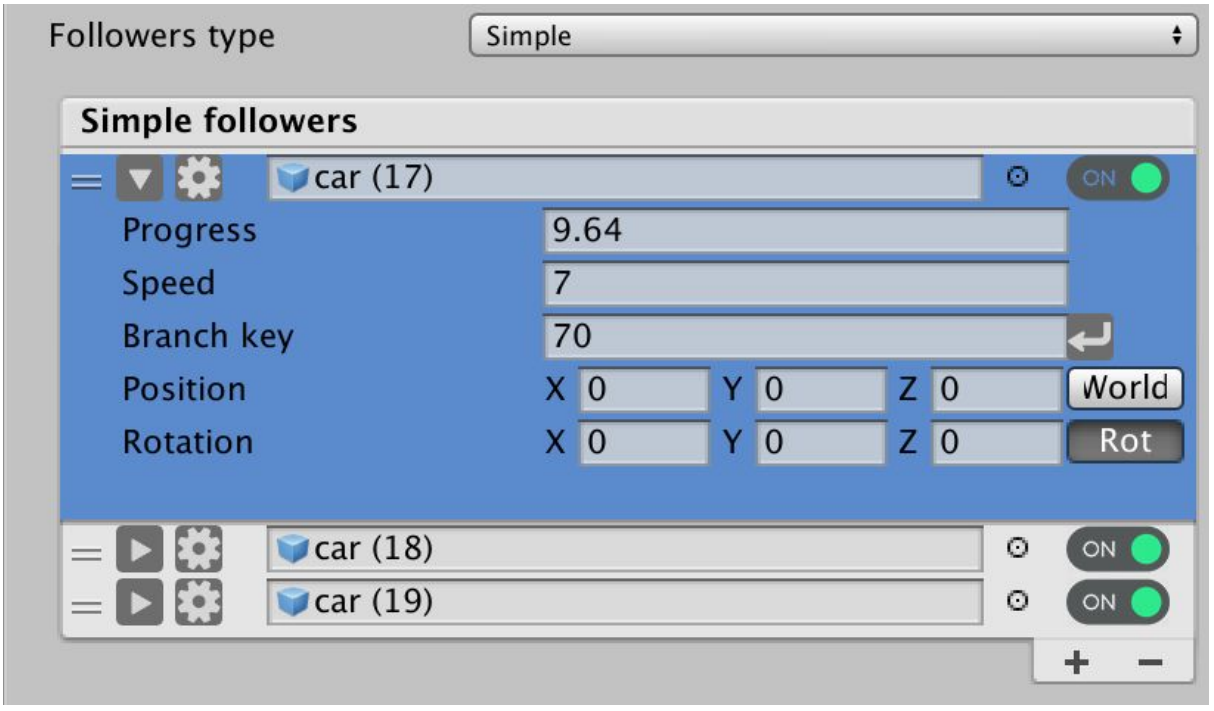
For ‘Auto animated’ only the forward and backward options are taken into consideration
For ‘Keyboard input’ all the options are taken into consideration, they are automatically mapped to your keyboard arrows

Ps: to add a branch index, you need to first select the branch from the scene view then click on the “+” button, the branch key will be inserted automatically into the text box,

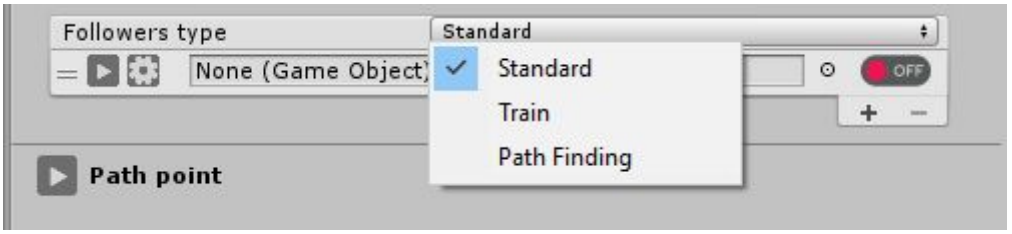
- Inspector


Spline Plus (Script)
SPLINE PLUS
Followers type
Simple
Simple followers
Robot Kyle
ON
Progress
9.28
Speed
7
Branch key
0
Position
X 0 Y 0 Z 0
World
Rotation
X 0 Y 0 Z 0
Rot
No node is selected!
Spline settings
Reference axis
Y
Smoothness
20
Attach Spline+ object
None (Spline Plus)
Attach
ON Interpolate rotation
OFF Constant speed
OFF Spline Projection
ON Looped

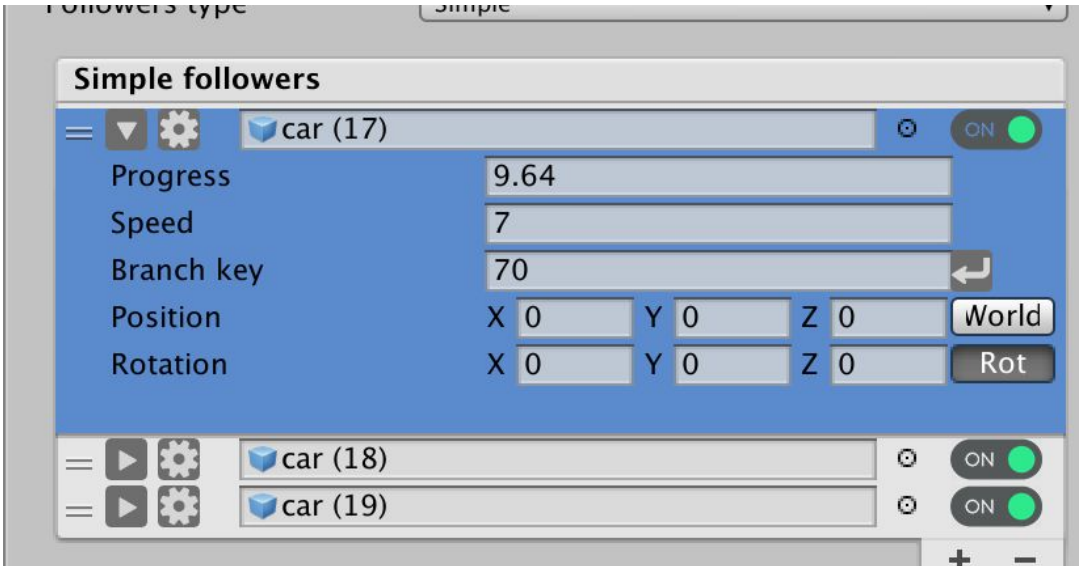
- Follower settings



+ Followers type: this is where you get to select which type of followers you want to add to your spline plus game object , currently there are 3 followers type supported



Standard: this is the basic followers list in spline plus



Follower Settings:

This opens the follower settings window ,You will find this explained in detail below,

Follower game object slot:
the game object that you want to use as follower, it could be a character, a particle system, camera, any kind of gameObjects

On/Off switch: used to enable disable follower animation

Progress:
progress is the current distance of the follower on the branch, the max is the length of the branch

Speed:
The speed of the follower

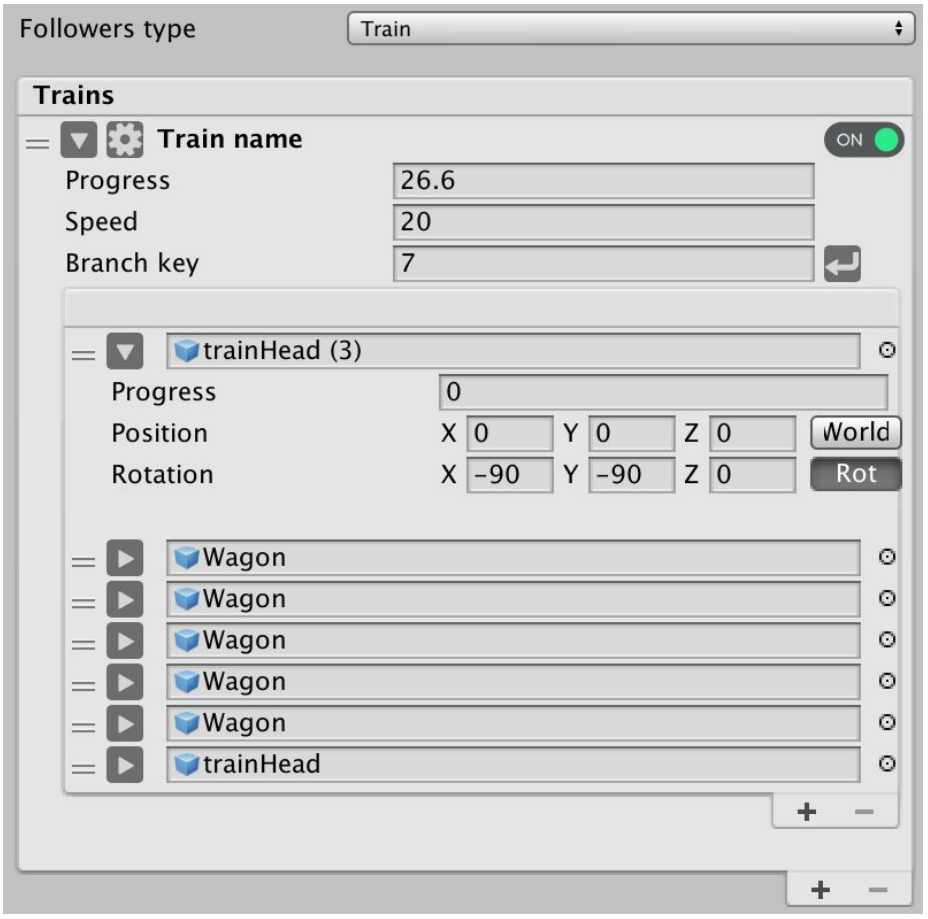
Branch key:
Used to change follower branch in the editor,

To add a branch key, select the branch from scene view then click on the ‘return’ button the key will be automatically added to the text field

Position:
Translation of the follower with a button to switch between World and local

Rotation:
Rotation of the follower, with a button to turn Rotation On/Off

Train: this will get you to followers list of type train, this is where you can add followers that have animation behaviour similar to trains.



Train Settings:

This is similar to follower settings, you will find this explained in detail below

Progress:

This is the current distance of the train head on the branch, the max is the length of the branch, changing this will affect the train wagons progress based on it's position on the train wagons list !

Speed:

The speed of the train

Branch key:

Used to change Train branch in the editor,

To add the branch key, select the branch from scene view then click on the 'return' button, the key will be added automatically to the field

Wagon Section:

Follower game object slot:
the game object that you want to use as follower, train wagon is this example

Progress:
progress is the current distance of the wagon on the branch, the max is the length of the branch

Position:
Translation of the wagon with a button to switch between World and local

Rotation:
Rotation of the wagon, with a button to turn Rotation On/Off

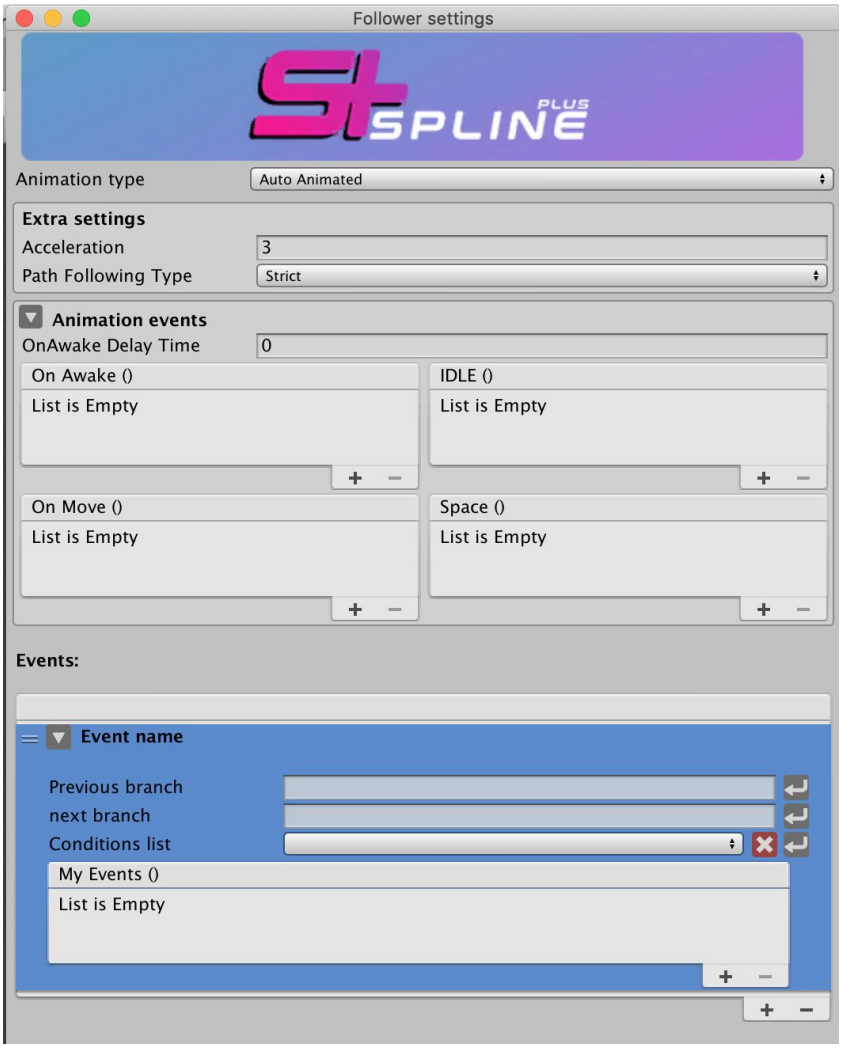
On/Off Rotation switch: used to enable disable wagon rotation

Path finding: **Only available if you have Spline Path Finding package in your project, you will find detailed documentation at the end of this document about Spline Path Finding**

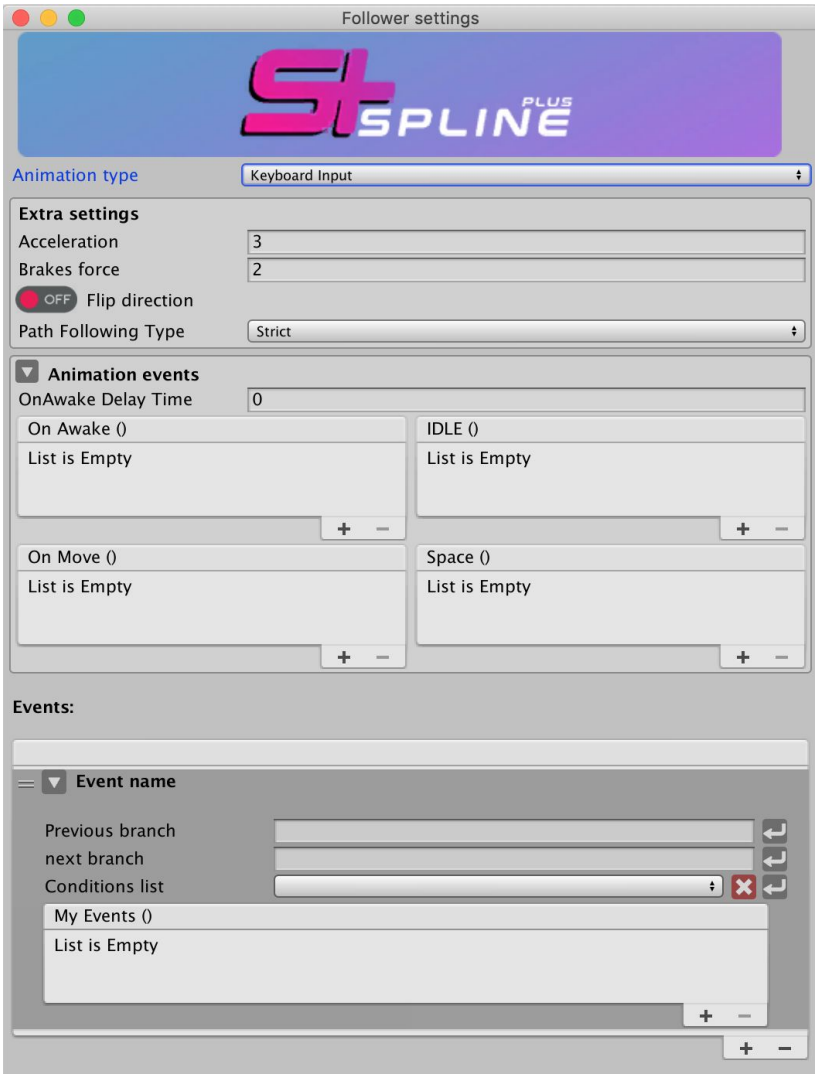
- **Follower Settings window:**

This window is opened when follower settings button is pressed  , it contains additional follower settings such as animation type and events

Auto Animated:

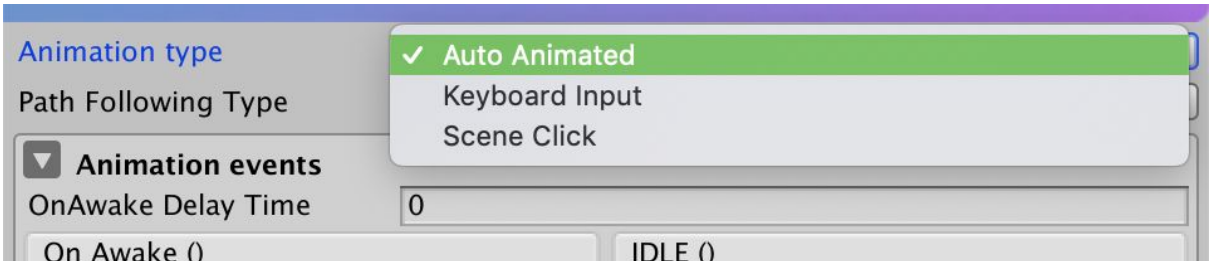


Keyboard input:



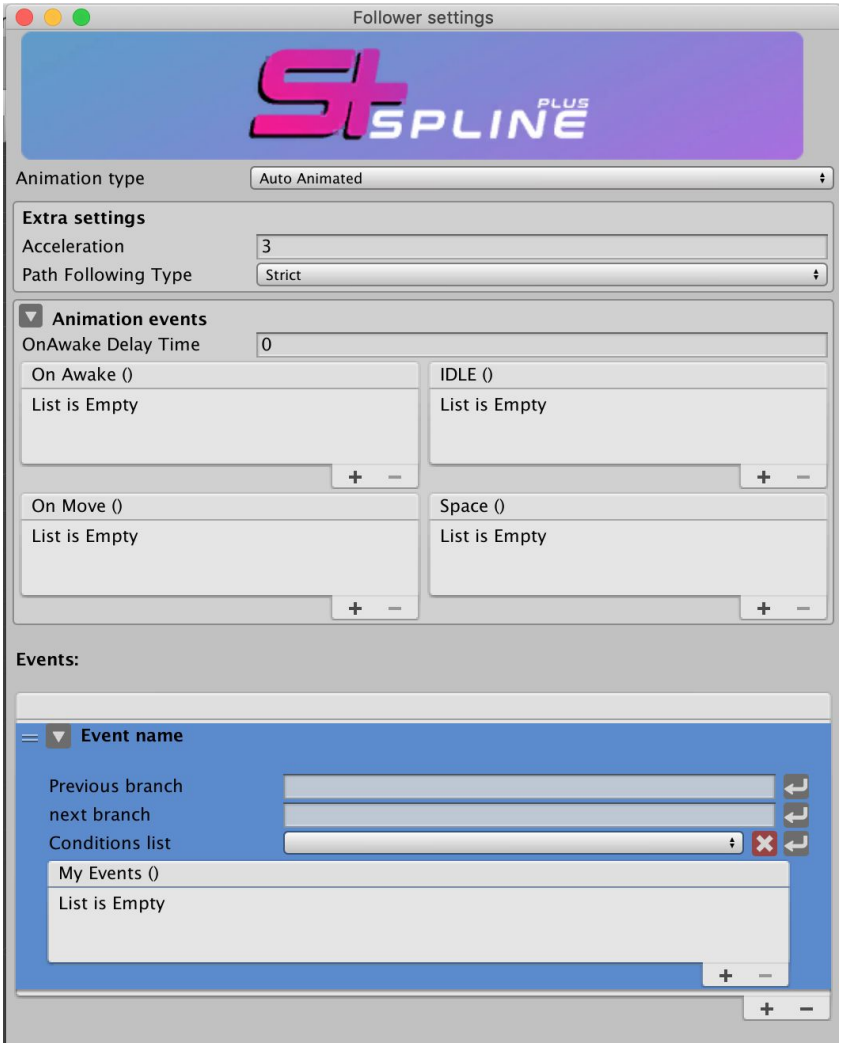
Scene click:

Follower animation type:



This is where you can control your follower animation behaviour along the spline, you have the following options:

"Auto animated" to move your follower with a defined speed along the spline.



when selected ,you get this event section where you can plan for events to be called once the game starts, this can be used to trigger an IDLE animation when the game starts for an example.

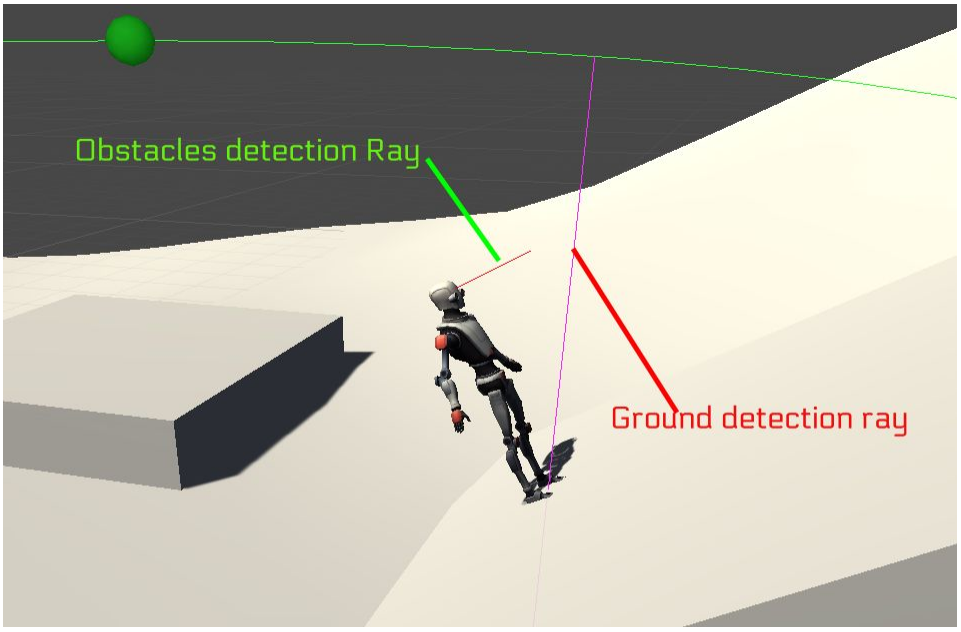
Acceleration: this is the time in seconds it takes for the follower to gain it's full speed or completely stop when game starts ,

Path Following Type:

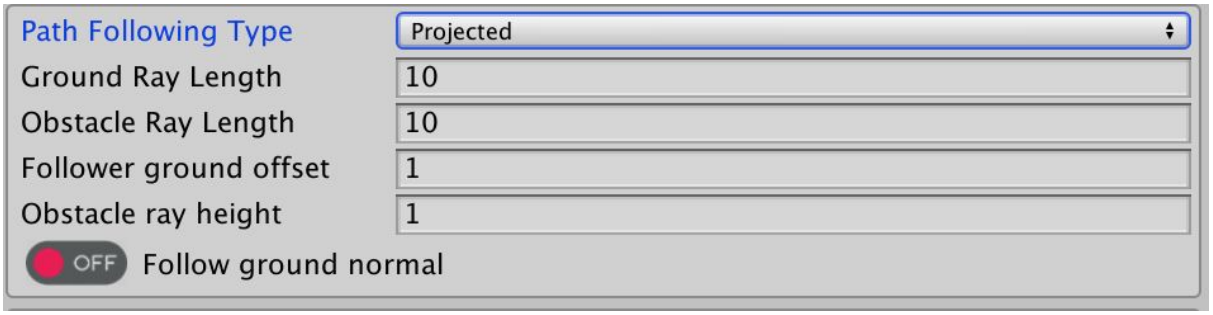
"Strict" path following is the old fashion way for followers to follow paths , it means that the follower will follow exactly the raw spline data provided,

"Projected" path following is using raycasting on followers to sense its surroundings, the path following data is being gathered from both sources , surrounding and raw spline data then it will be combined to form one final modified path following data to be used by the follower,

there are currently two ray sensors on each follower , one for the ground and one for the obstacles in front as you can see bellow



when "Projected" is selected, you get the following settings which will allow you to perform advanced customization



"Ground Ray Length": used to edit the ground ray length.

"Obstacle Ray Length": used to edit the Obstacle ray length.

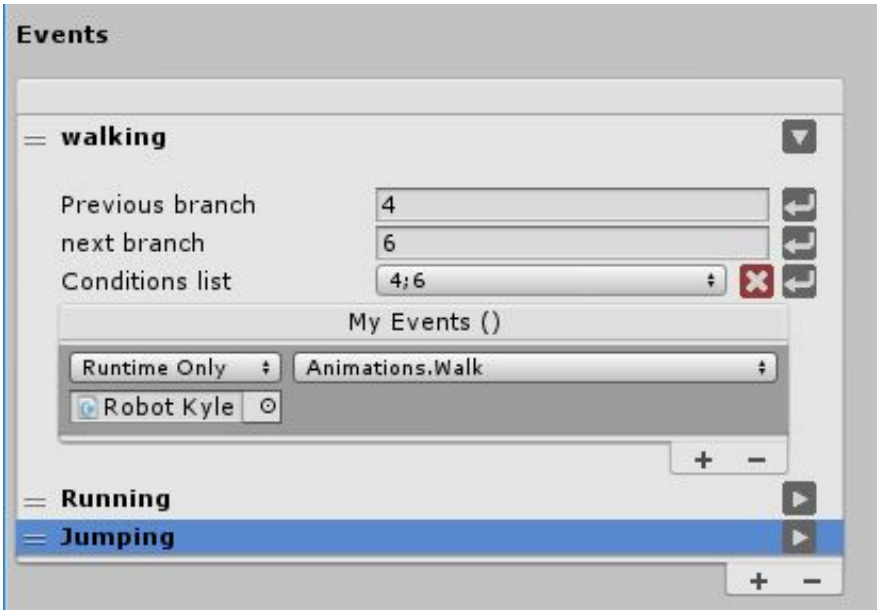
"Follower Ground Offset": offset the follower from the ground mesh.

"Obstacle Ray Height": edit the obstacle ray height.this can be used to define the obstacles the follower can go over, If obstacle ray detects an object in front then it will tell the follower to stop moving,

"Follow Ground Normal": the follower will lineup its Upward direction with the spline normal direction if set to true, if set to false then the follower upward direction will follow the spline raw normal data,

Animation Events:
You get 4 additional event sections that you can setup as you like
OnAwakeDelayTime field is used to delay the triggering of the “OnAwake” event when the game starts ,

“OnAwake “ triggered when the game starts,
“OnMove “ triggered when the follower moves
“IDLE” triggered when the follower stops,
“Space” triggered when Space key pressed,
Events



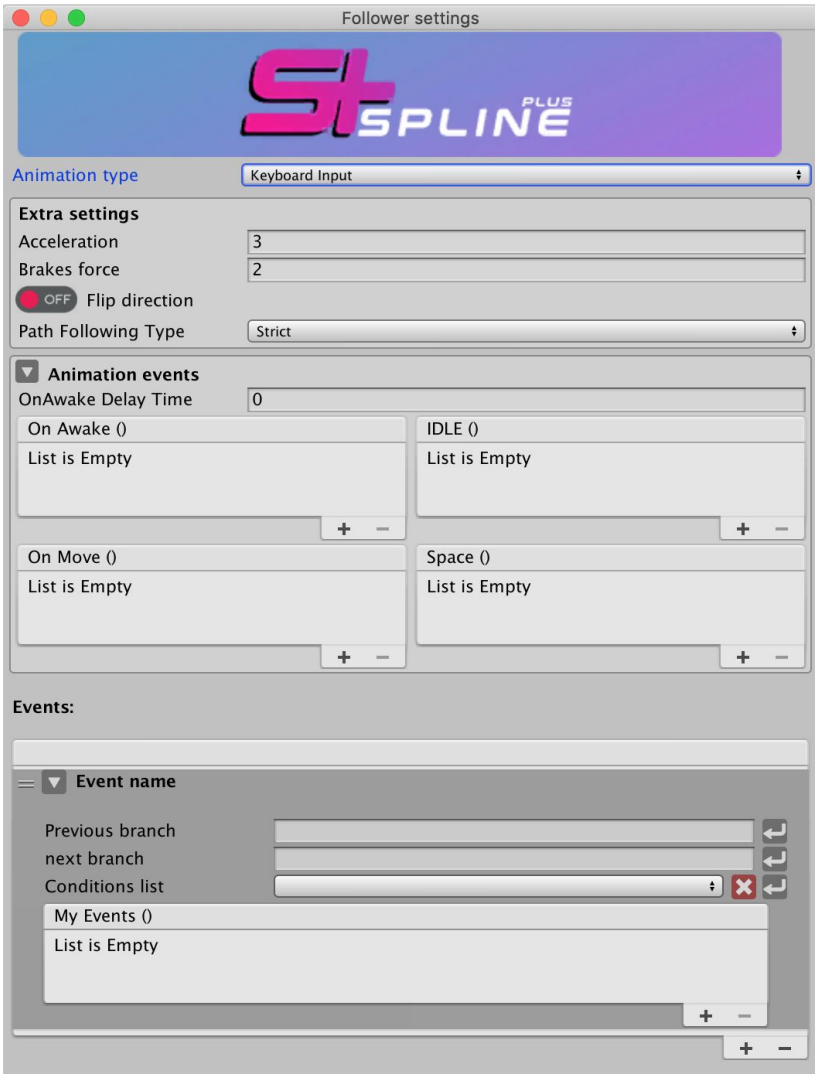
this consists of creating an advanced events system that fully covers all the possibilities,
To setup your event you need to provide two variants , previous branch key and next branch key , then the data provided is stored in Event conditions array , once one of the conditions in the array is met then the corresponding events will trigger .

To add previous branch or next branch just select the branch in the scene view, click on the “return” button and the branch key will be added automatically to the text box field,

after that you add the condition to the array by clicking on the "return" button, you can delete an unwanted condition by selecting it from the conditions list and clicking on "X" .

PS: You can rename events by editing the title text directly,

"Keyboard input" to move your follower using keyboard inputs,



Keyboard settings:

Acceleration: this is the time in seconds it takes for the follower to gain it's full speed or completely stop if you release Up/Down arrow keys,

Brake force: this represents the brakes force, the minimum value for this is 1"no impact on follower speed",

brakes force will impact the follower speed as its value goes up,

Flip direction: this will allow you to keep the follower forward direction when you switch "Up arrow key" with a "Down arrow key" or vice versa,

Animation Events:

You get 4 additional event sections that you can setup as you like

OnAwakeDelayTime field is used to delay the triggering of the "OnAwake" event when the game starts ,

"On Awake " triggered when the game starts ,

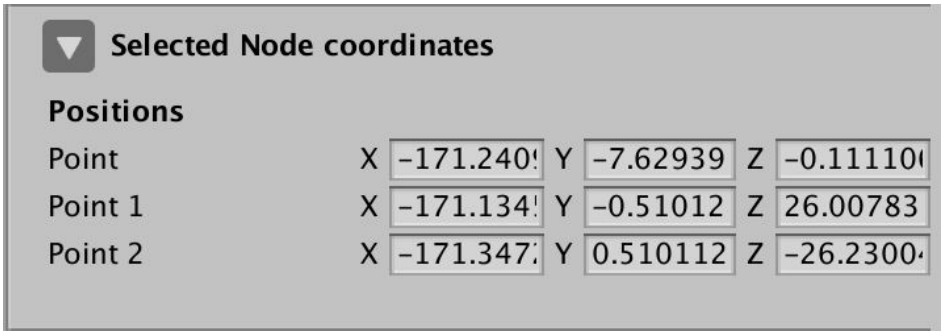
"OnMove " triggered when Up or Down key is pressed

"IDLE" triggered when Up or Down key is released,

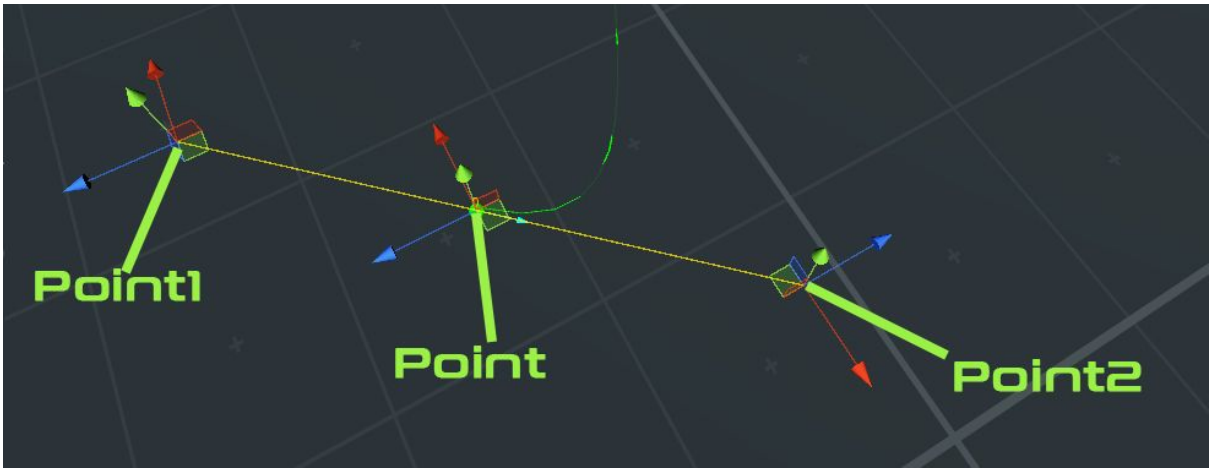
"Space" triggered when Space key pressed,

“Scene click” used to spawn your follower on the closest spline vertex to mouse click.

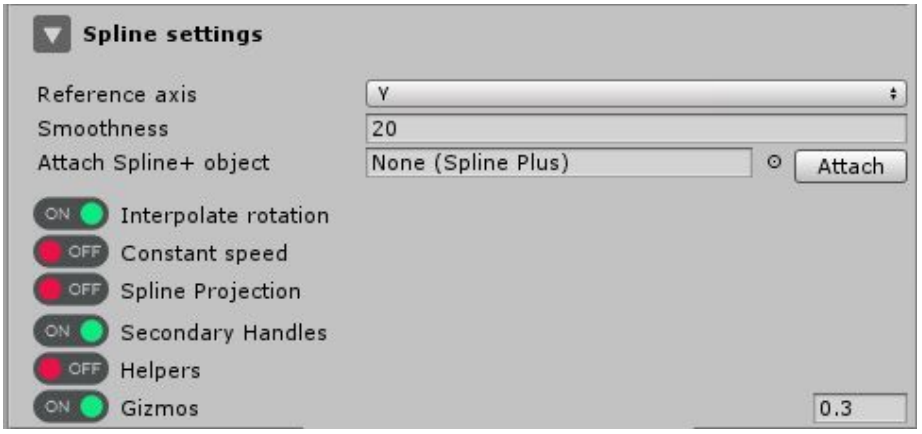
- **Selected node coordinates**



This section is used to control the node position and rotation manually from the editor, this can be useful in case you’re seeking precision in positioning your nodes,



- Spline settings



Reference axis:
this is the spline normals default direction, this is very useful when changing the scene view mode, in spline plus Reference axis changes its value accordingly when switching between 2D and 3D mode

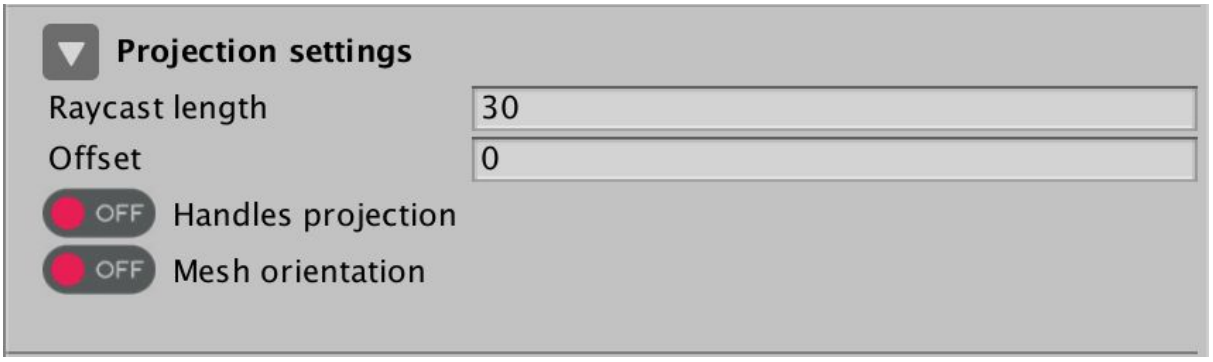
Smoothness :
this changes the number of vertices between two nodes, it controls the smoothness of your curve

Attach:
this will attach a copy of another Spline plus Object, this can be used to speed paths drawing when having similar path patterns.

Interpolate rotation:
Set this to true if you want very smooth animation for your follower along the spline,

Constant speed:
This is used to enable/disable speed variation on nodes

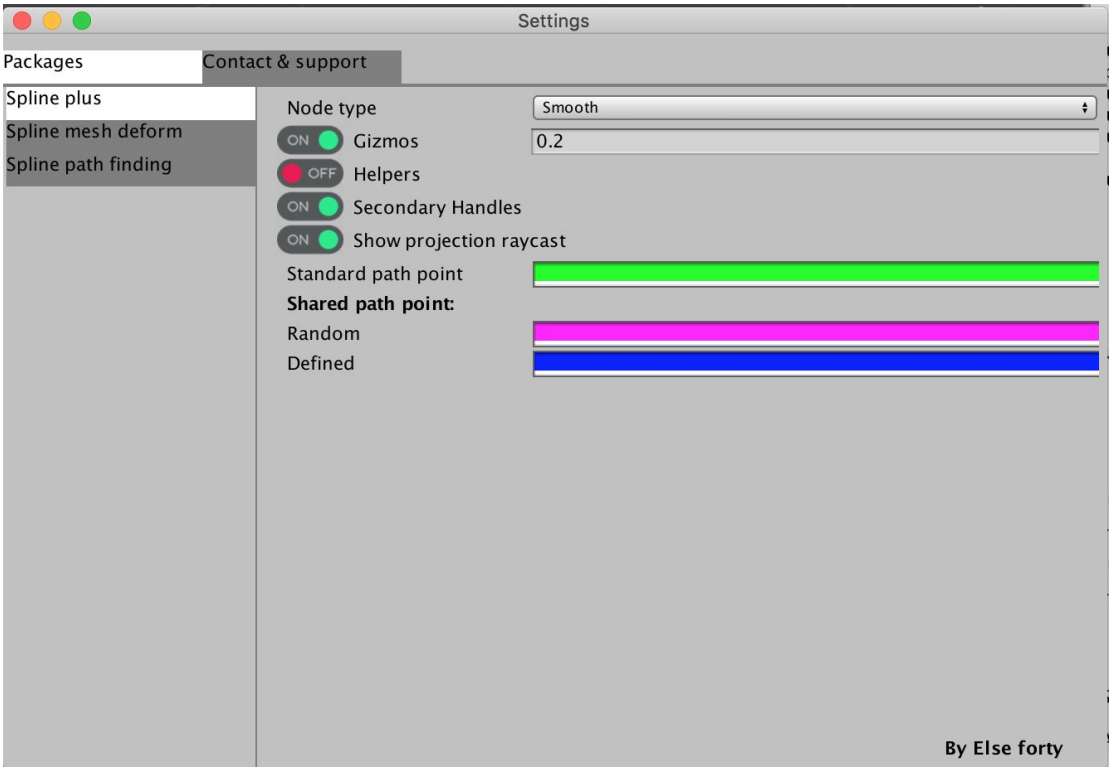
Spline projection:

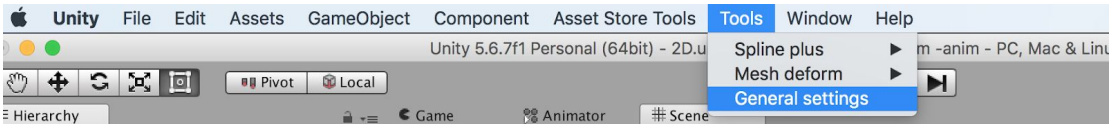


You will get extra settings in your spline plus inspector when projection is enabled,
for this to work, the meshes where the spline plus object is being projected into needs to have a 3D collider on.

Raycast length:
this is the length of the raycast used to do the projection
Offset:
this is a local translation offset applied to the spline on the Y axis,
Handles projection:
this enables the handles projection of all nodes as well, this increases projection precision
Mesh orientation:
this is used to ignore the spline default normals and use the projection mesh normals instead

- **General settings:**





Node type:
the default node type you want to use when adding new nodes,
Gizmos:
this hides and unhides the gizmos in your scene view

Gizmos size:
This appears only if gizmos is set to On, This allows you to control the size of the gizmos in you scene view

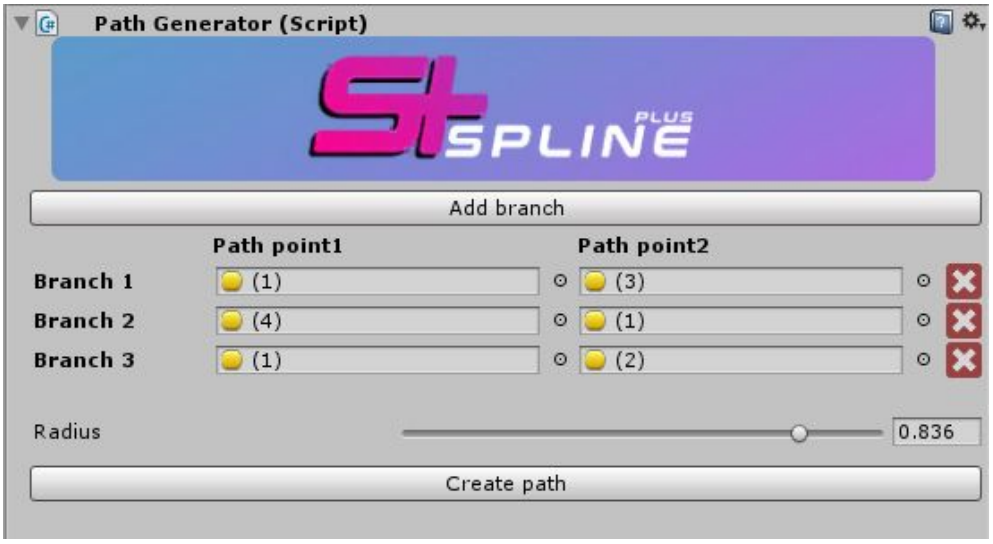
Helpers:
this hides and unhides the normals & tangents representation in the scene view

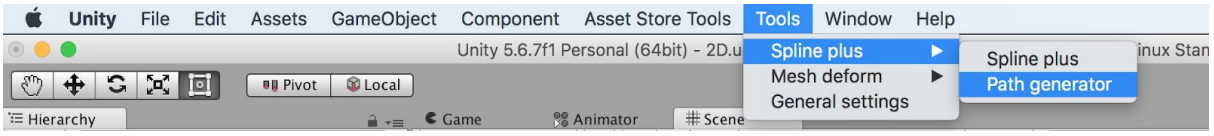
Helpers size:
this appears only if helpers is set to "On", this controls the helpers size

Secondary handles:
this hides and unhides the secondary handles of nodes type smooth.
Show raycast:
this hides and unhides the projection raycast gizmos from scene
Colors:
All nodes gizmos colors can be changed from here,

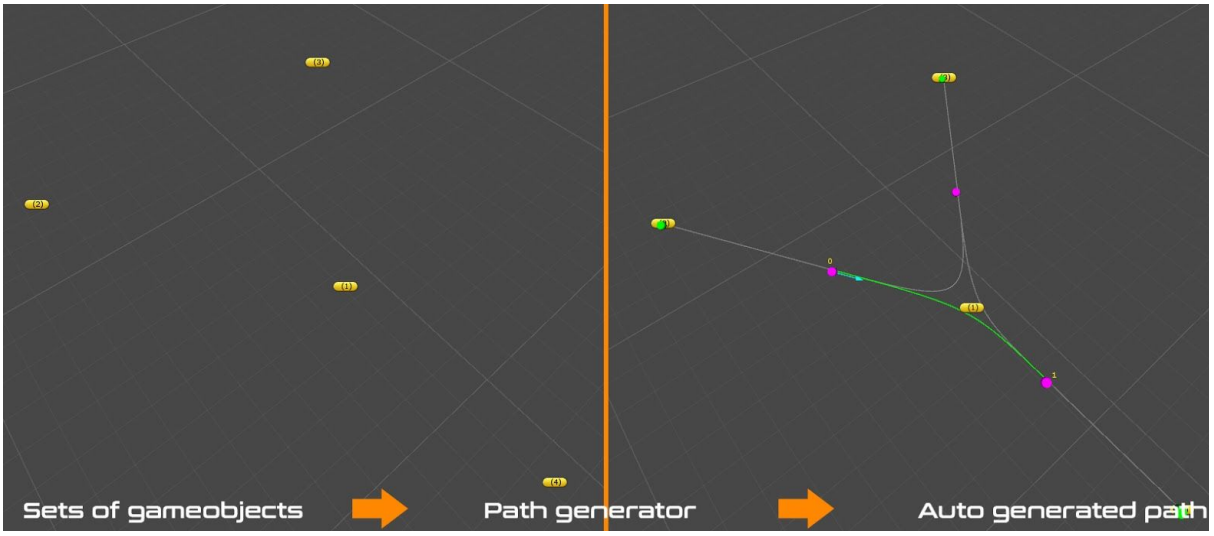
- Path generator

this is a straight forward tool to auto generate spline plus paths in no time, all you have to do is to provide the game objects to the Path generator and click create and your path will be served in no time



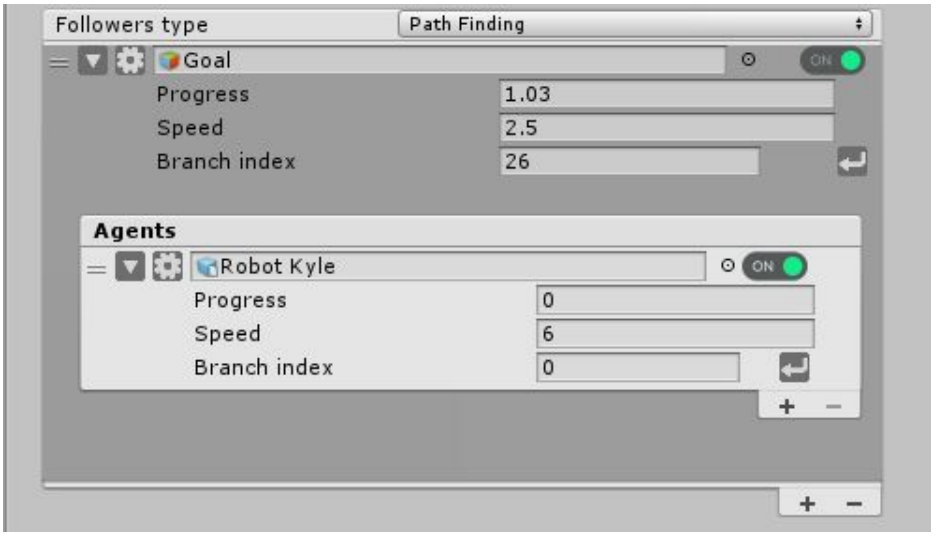


Add branch:
this will add a new branch "two game Objects slots", game objects will be converted to nodes internally,
X Button:
this Deletes the branch from the list,
Radius:
This is where you can control how smooth are your shared nodes
Create path:
this creates the final path , it creates a gameObject in your hierarchy with a spline plus component holding all the data,
Here is an example of the generation of a path, based on game object placed in scene view



- Spline Path finding

Path finding: **Only available if you have Spline Path Finding package in your project,**



Goal:

Goal Settings:

This opens the goal settings window, it's similar to follower settings explained in detail above,

Goal game object slot:
the game object that you want to use as a goal for your agent game objects to find,

On/Off switch: used to enable disable follower animation

Progress:
progress is the current distance of the goal on the branch, the max is the length of the branch

Speed:
The speed of the goal

Branch key:
Used to change Goal branch in the editor,
To add the branch key select the branch from scene view then click on the ‘return’ button, the key will be added automatically to the field

Agent:

 **Agent settings:**

Click on this button to open the agent settings window, it’s a bit different than the other follower settings windows, you will find detailed explanation about this window bellow

Agent game object slot:
the game object that you want to use as an agent for your goal game objects to follow,

On/Off switch: used to enable disable agent animation
Progress:
progress is the current distance of the agent on the branch, the max is the length of the branch

Speed:
The speed of the agent

Branch key:
Agent start branch key , this is the branch key the agent will start path following on ,
To add the branch key select the branch from scene view then click on the ‘Return’ button the key will be added automatically to the field

Agent:

 **Agent settings:**

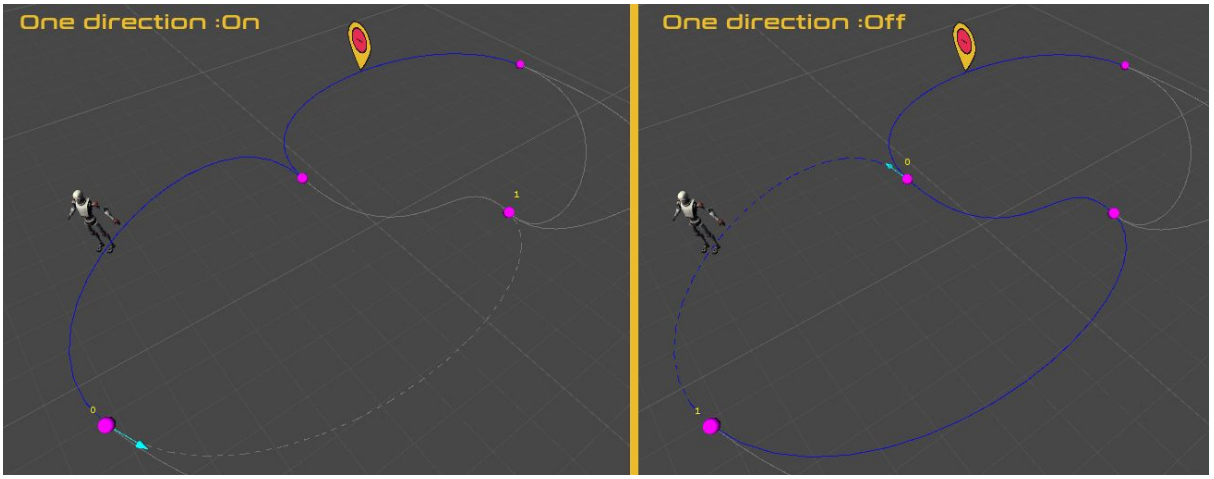
Click on this button to open the agent settings window, it’s a bit different than the other follower settings windows,
here is how it looks

Acceleration: this is the time in seconds it takes for the agent to gain it's full speed or completely stop ,this is used to smoothly start or stop the agent animation on the shortest path found to goal,

Brake force: this represents the brakes force, the minimum value for this is 1"no impact on agent speed", brakes force will impact the agent speed as its value goes up, this will help controlling how quick you want your agent to stop when for example no shortest path to goal is found

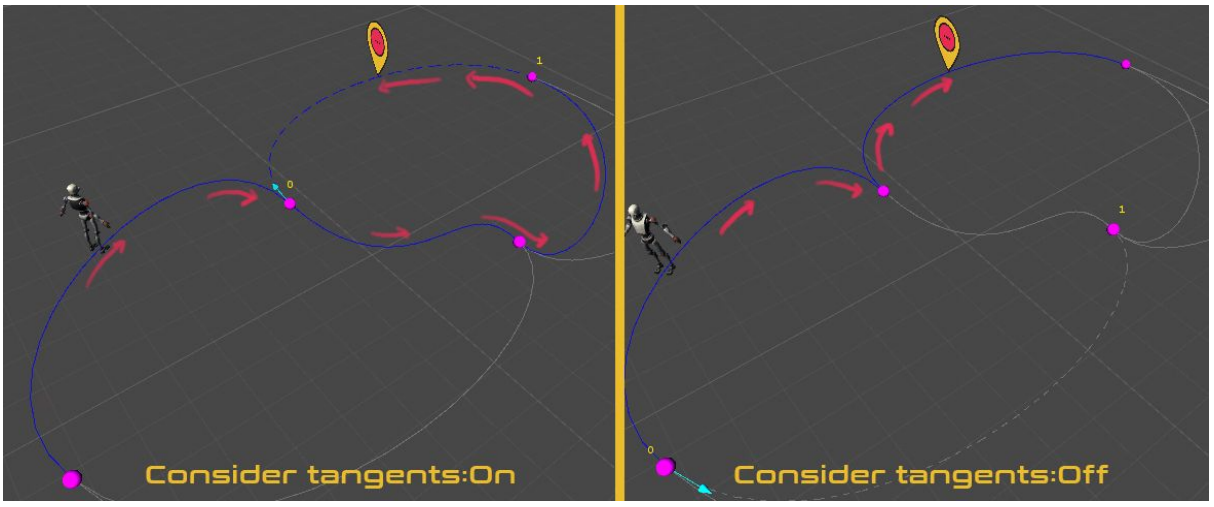
Update Type: there are two options to pick from
"None" no shortest path found calculation is triggered
"Shared nodes" this checks for shortest path found between goal and agent whenever agent or goal is on a shared node

Flip direction:



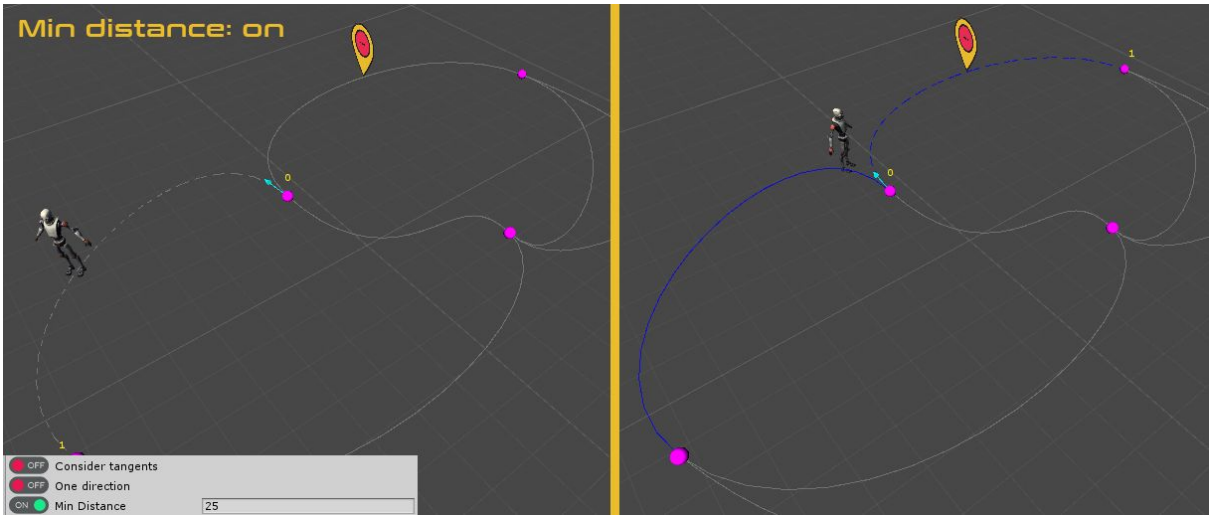
“One Direction” is set to false by default, this means that calculations to find shortest path is conducted from both directions of the agent “backward, forward”,
If set to false then calculation will be done only in the forward direction of the agent,
Ps: In the example above “Consider tangent” was set to false,

Consider tangents:



set this to true in case you want to take spline tangents into consideration when finding a shortest path to a goal game object
Set it to false in case you want to ignore tangents during calculations

Min distance:



This can be used in case you want to set a min distance condition when doing calculation to find the shortest path, if the distance of the path found is less than the distance defined in the agent setting window then shortest path will be approved and returned , if not then it will be ignored,

Events:

“On Awake” event is called when game starts

“On move” when agent has found a shortest path and it’s heading toward the goal

“IDLE” if the shortest path to the goal state has changed from found to unfound then IDLE event is triggered

“Space” is triggered when the space key is pressed