

Help and support

For help or questions:

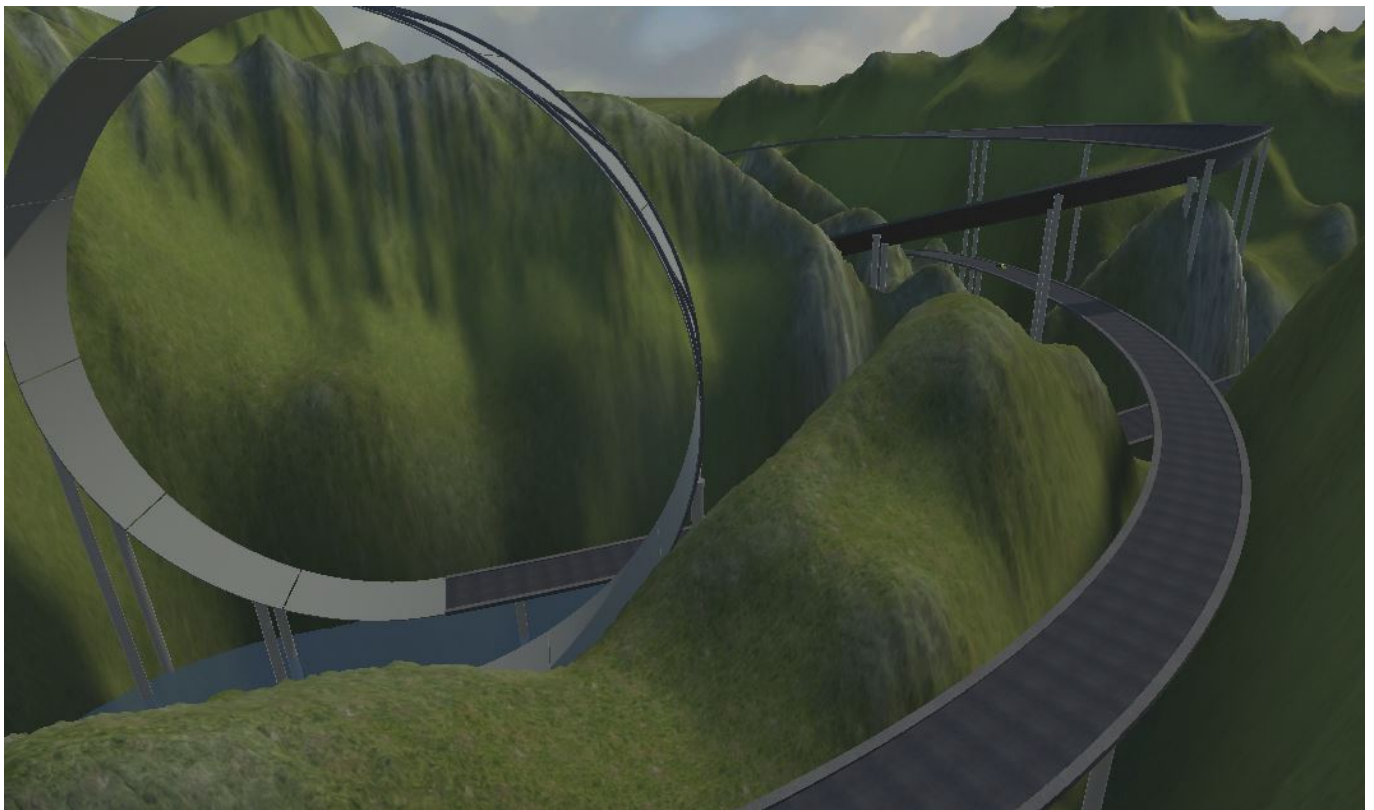
- email: tmulgrew@slingshot.co.nz
- or post to this Unity discussion forum thread: <https://forum.unity.com/threads/released-racetrack-builder.644332/>

Also see the Unity asset store page for tutorial videos:

<https://assetstore.unity.com/packages/tools/modeling/racetrack-builder-138353>

Overview

This racetrack building system allows you to build racetracks by warping meshes around a series of curves. It is particularly suited to building elevated, rollercoaster-like tracks. It features the ability to create jumps, banked corners and even loops.

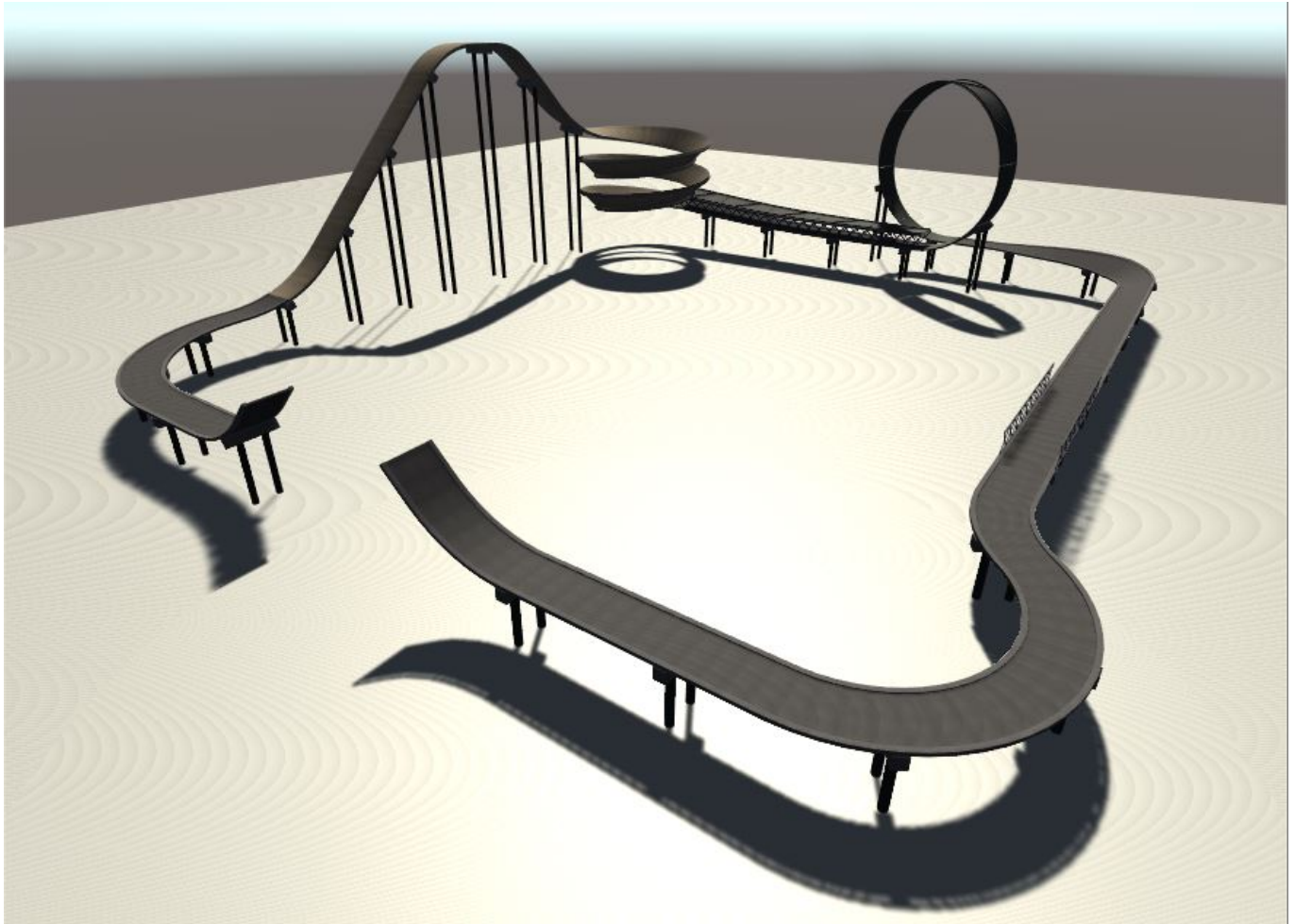


The resulting mesh is fully drivable, for example using the Unity Standard Assets car, and contains runtime information for tracking a vehicle's progress.

The package contains a "progress tracker" component that can be attached to a car to track its progress around the race track, detect when it has fallen off and automatically place it back on track after a short delay.

Example scene

See the Assets/Racetrack Builder/Example.unity scene for a simple example racetrack.



Driving on the track

You can drive on the track using the Unity Standard Assets car.

Search the Asset Store for the "standard assets" package. Import everything in the "Standard Assets/Vehicles/Car" and "Standard Assets/CrossPlatformInput" subfolders of the package. It is not necessary to import the rest of the package.

To setup the car:

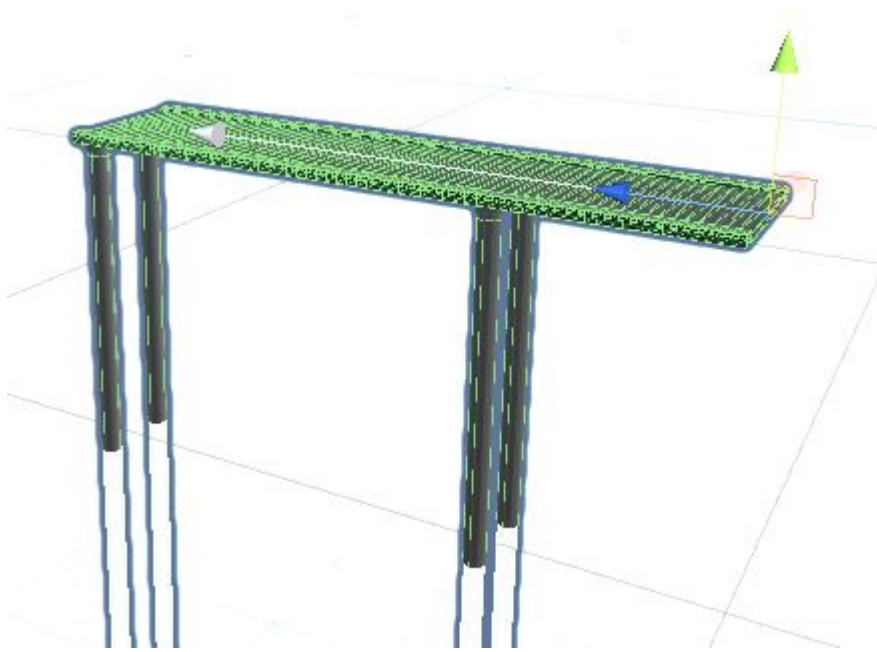
1. Drag the "Car" prefab from "Assets/Standard Assets/Vehicles/Car/Prefabs" into the scene.
2. Drag the "Main Camera" in the scene tree and make it a child object of the Car.
3. Select the "Main Camera". Reset its transform in the Inspector window.
4. Move the camera behind and above the car a little (e.g. Y=2.3, Z=-6)
5. Drag the "RacetrackProgressTracker" script from "Assets/Racetrack builder/Scripts/Runtime" onto the car.
6. Select the car and find the "Racetrack Progress Tracker (Script)" component in the Inspector window, and click "Reset car".
7. Run the scene and drive with the arrow keys. If you fall off the track, wait 10 seconds and you will respawn back onto it.

Quick start - Creating a track

It only takes a few minutes to get started building a race track:

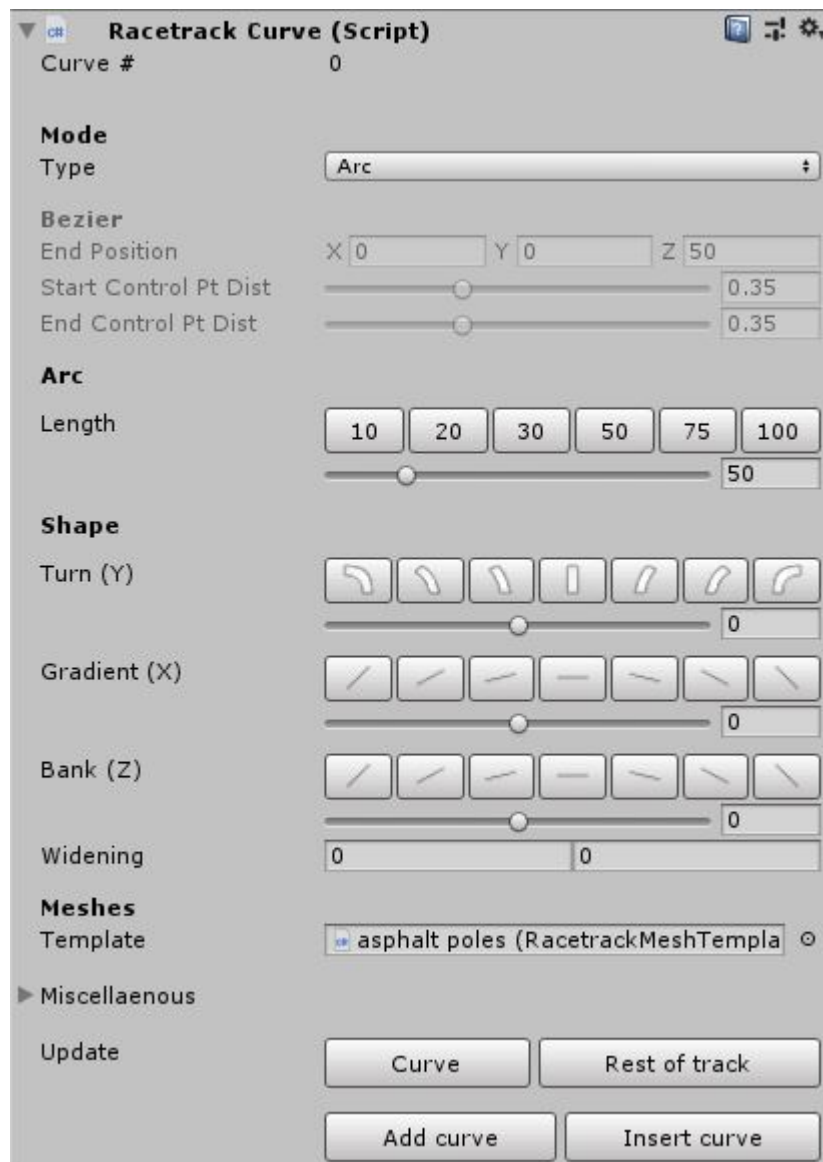
First create or open a scene (File > New Scene), and make sure it has some ground (e.g. a plane).

Now create the racetrack object by creating "GameObject > 3D Object > Racetrack" from the menu.



Racetrack Builder has created a racetrack with a single curve object. The white arrow shows the path of the curve, and the mesh has been fitted around it. The curve is initially a straight line, so the road mesh is accordingly straight.

The curve is automatically selected, and the Inspector window shows the UI for editing it:



Try clicking the buttons in the **Shape** section to see how the track adapts to the updated curve.

For finer control you can set the values via the slider or key them in. You will need to explicitly rebuild the mesh model by clicking the "Curve" update button in this case.

Once you're happy with the initial curve, click the "Add curve" button to create a new curve and add it onto the end of the racetrack.

This is the basic workflow for Racetrack Builder.

Note: If you need to reposition your racetrack, be sure to update the transform on the main "Racetrack" object, rather than the curves. Racetrack Builder automatically manages the transformations for the curve objects. If you get into a mess, select the main racetrack object and click "Update whole track" to reposition all the curves and rebuild the all the meshes.

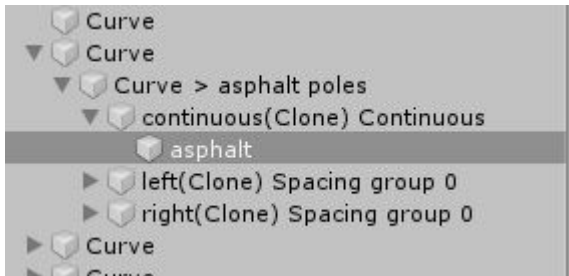
More about track building

Selecting corners

If you need to go back and change a previous corner, there are a couple of ways to do this.

You can expand the "Racetrack" object in the scene tree and click on the corresponding "Curve" child object.

Alternatively, you can click on the track in the editor view. This selects the mesh that was generated from the curve, which is placed underneath the curve in the scene tree.



Look back up the scene tree to find the corresponding Curve and select it.

Changing a previous curve has a flow on affect that affects where the rest of the curves in the track are positioned.

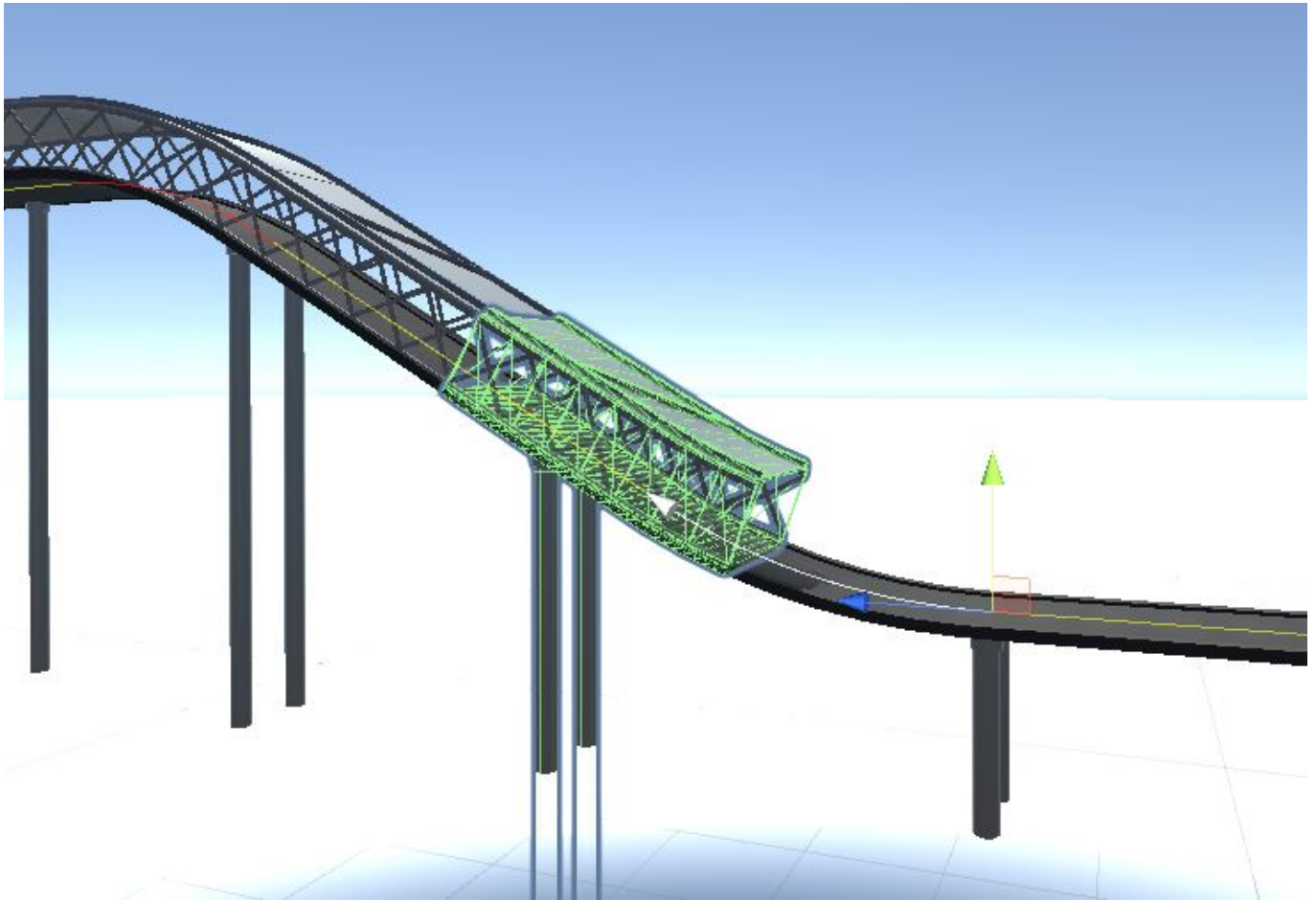
Be aware that changing a curve's length can also be quite slow, as all the meshes for the remaining curves in the track must be regenerated so that the meshes line up correctly.

Changing a curve's angles is faster, because only the curve and its immediate neighbours need to be rebuilt. (The remaining curves are simply repositioned, which is faster.)

Changing the track type

You can change the type of track by dragging a different prefab from the "Assets/Racetrack builder/Prefabs/Track Templates" project folder and dropping it on the "Template" field in the properties of the corresponding curve.

Then click "Rest of track" in the curve properties, to update the remainder of the track.



This will set the track type from this curve onward, or until it is changed again in a later curve.

Changing the road width

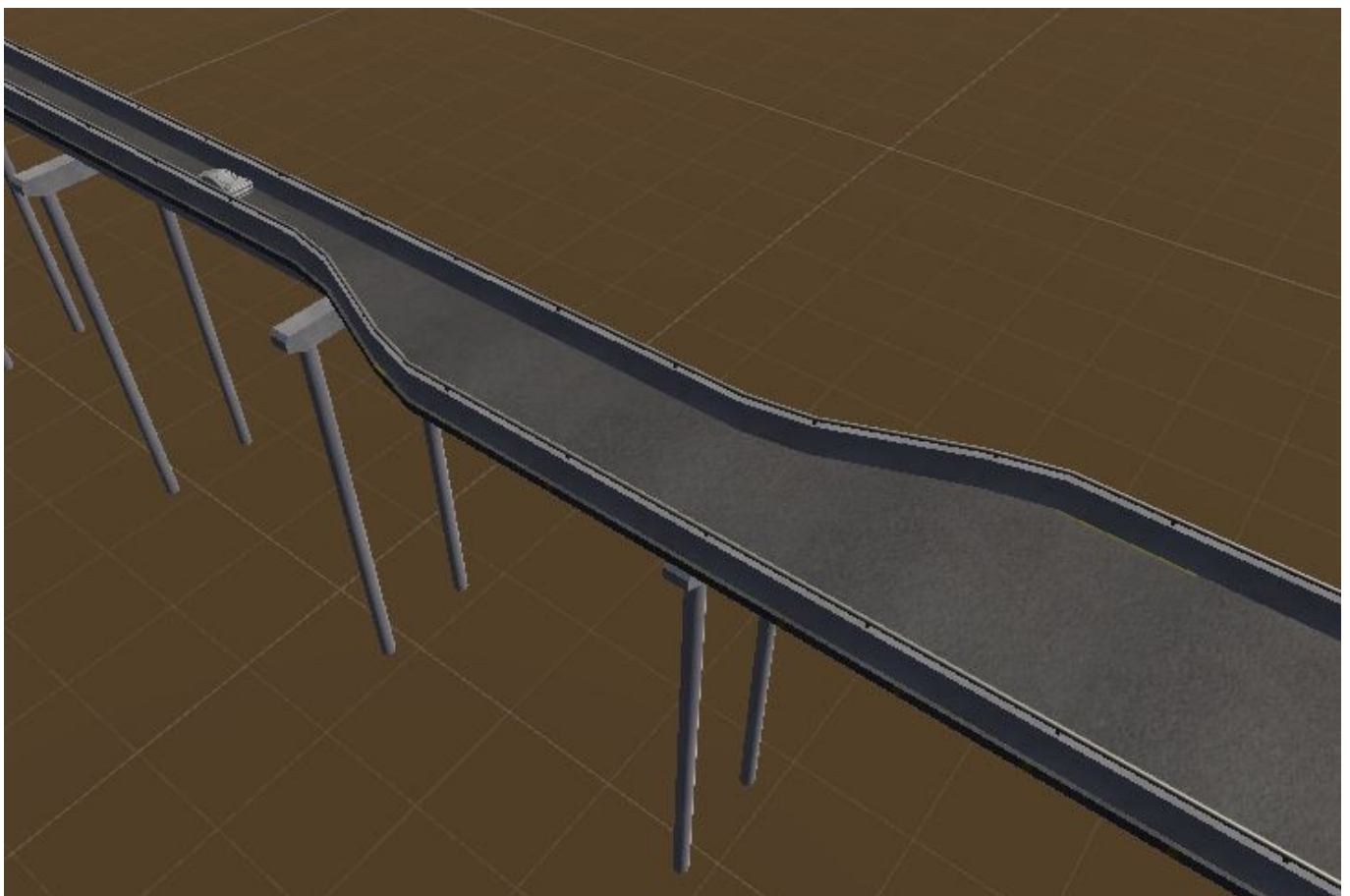
To make the racetrack wider (or narrower) adjust the "Widening" values.

There are two values - left and right - which extend the left and right hand side of the racetrack by the specified number of units respectively.



Note that these values are *added* to the original width.

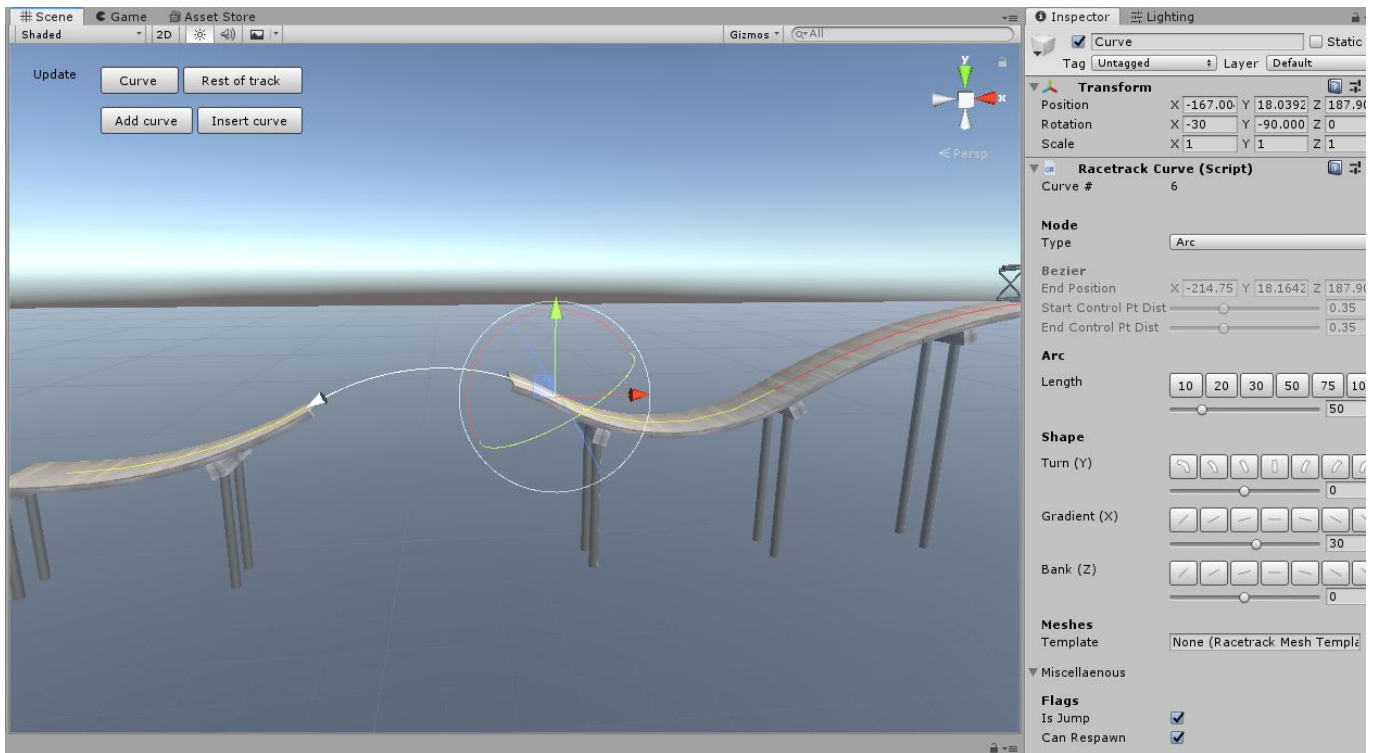
If the track type supports it, you can also narrow the track, by specifying negative values. Be aware that track types typically will enforce a minimum width beyond which they will not go any narrower.



Creating jumps

To create a jump, select a curve, then in the inspector expand the "Miscellaneous" section and tick "Is Jump" property.

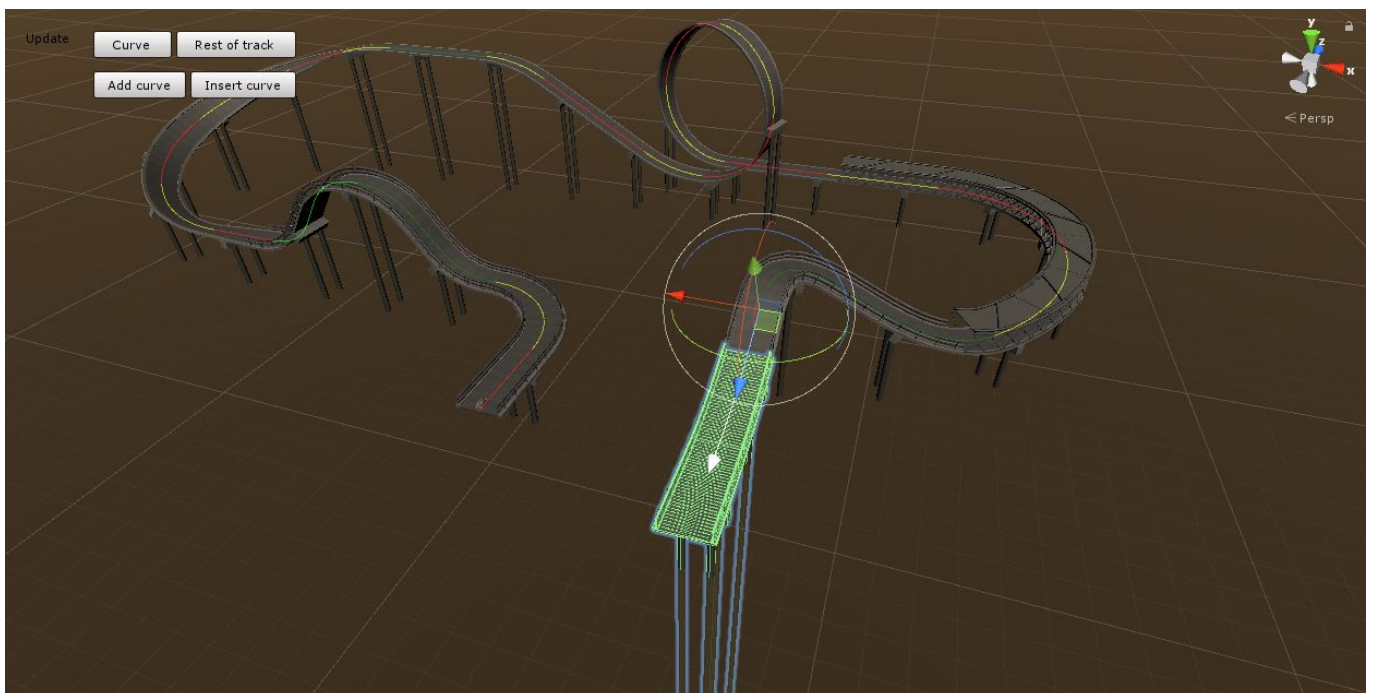
No meshes will be generated for the curve, resulting in a gap which the player must jump over.



Creating a closed circuit

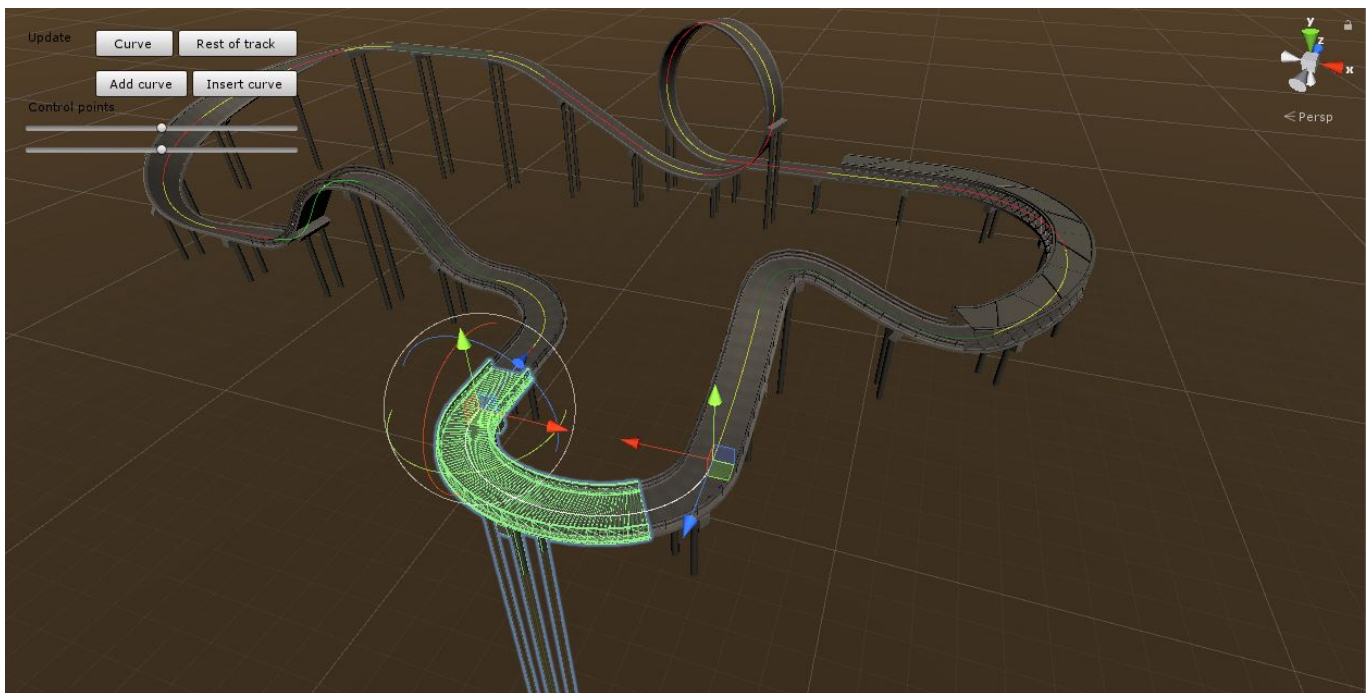
Racetrack Builder can create a seamless looped racetrack by adding a closing curve to the end of your racetrack.

For best results, start with an almost complete track, where a single curve would complete the loop. Because there is usually some overlap between the start and end meshes it can also be a good idea to set the last curve to the same track type.



Select the Racetrack object in the scene hierarchy then click "Create closed circuit" in the inspector.

Racetrack Builder will create a single Bezier curve to close the loop.

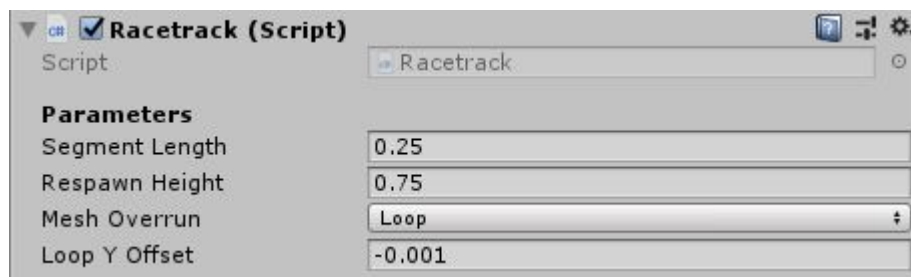


(Bezier curves are described later in this document.)

You will likely notice that the last mesh of the Racetrack overlaps the first one. This happens when the meshes when laid end-to-end don't exactly match the length of the racetrack curves leaving a bit of overrun.

Racetrack Builder attempts to hide the overrun by lining it up *almost* exactly with the start curve.

To avoid Z fighting Racetrack Builder offsets the looped meshes Y coordinates very slightly. This is controlled by the "Loop Y Offset" property on the Racetrack object.

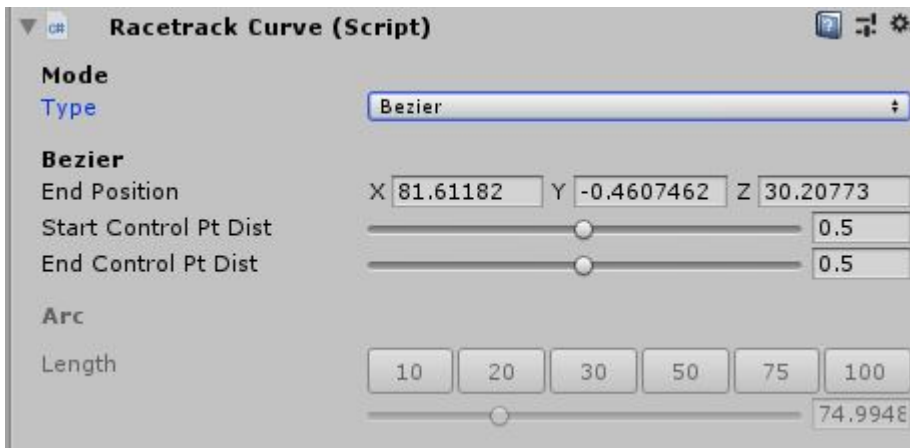


The looping behaviour is controlled by the "Loop Overrun" property. The "Create closed circuit" function automatically sets this to "Loop" which enables the above behaviour. The other option is "Extrapolate" where the overrun part of the mesh simply carries on in a straight line in the direction the curve is facing.

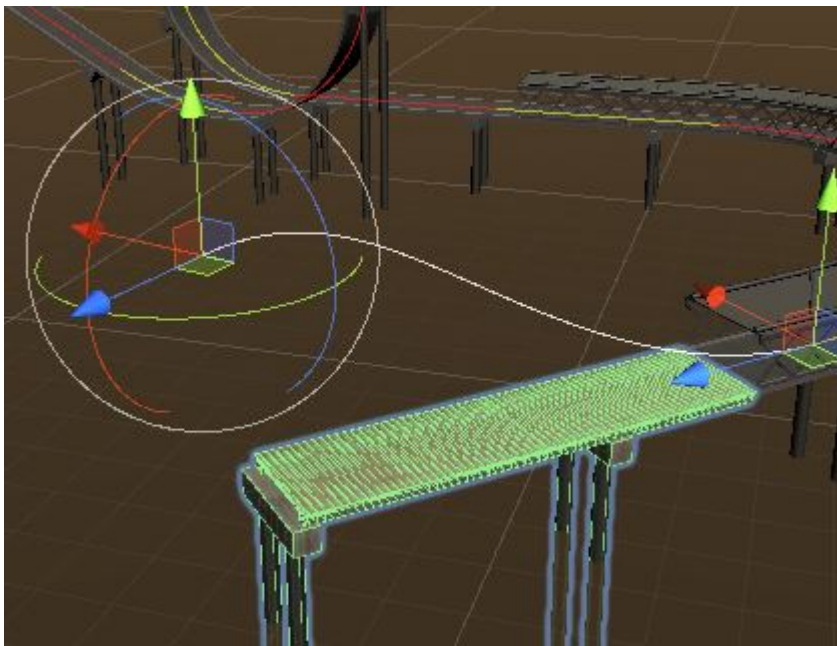
Also when "Loop Overrun" is set to "Loop", clicking the "Create closed circuit" button will update the last curve of the racetrack, rather than creating a new one.

Bezier curves

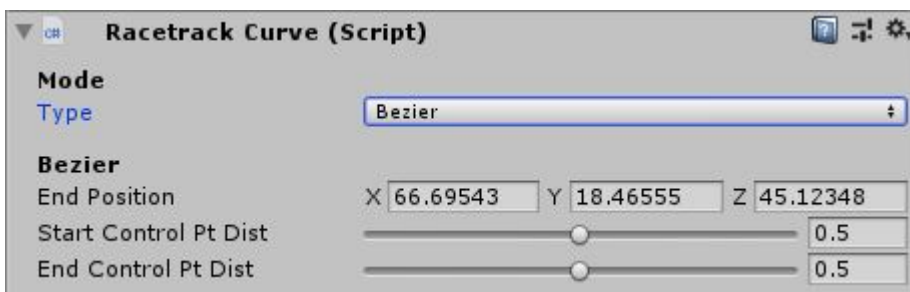
As well as the standard circle "arc" curves, you can also use Bezier curves. Select a curve and change its "Type" to "Bezier" in the drop down:



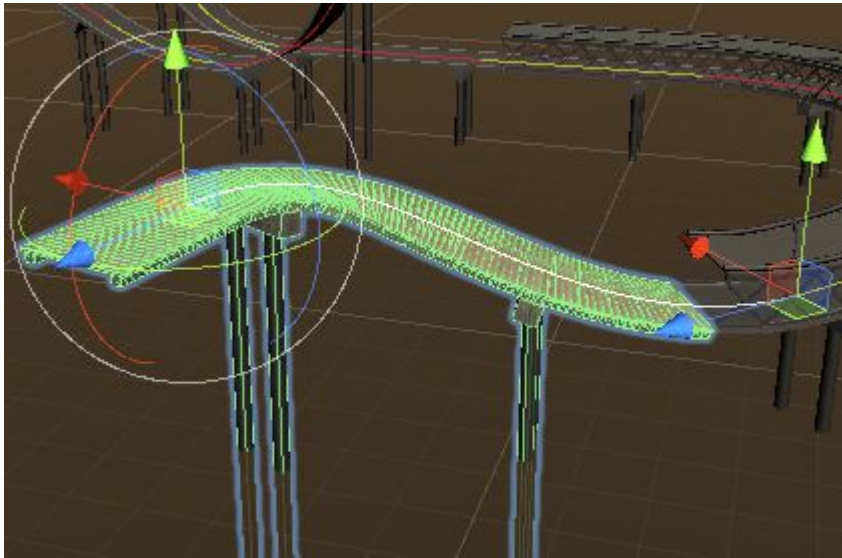
Drag and rotate handles will appear in the editor view to allow you to specify the position and direction of the end of the curve in world space. The curve will automatically update in response to your changes.



You can also control the curve shape by changing the "Start Control Pt Dist" and "End Control Pt Dist" in the curve properties. (Control point distances are proportional to straight-line distance between the curve start and end points.)



Click the "Update Curve" button to recreate the road meshes around the updated curve.



Bezier curves are useful when you need to control the exact position of the racetrack, e.g. when fitting around terrain or other game objects. They also have the useful property that the end point is fixed in world space regardless of where the start point is. You can use this to "lock down" parts of your racetrack by switching the curve immediately in front to a Bezier. They will then remain in the same place regardless of any changes to earlier curves in the racetrack.

Note: Bezier curves are based on the "cubic Bezier" equation, common in drawing and animation programs. The curve is defined by 4 points: 2 define the start and end of the curve - which in Racetrack Builder means the racetrack curve position and the end position that you specify. The other 2 points control the shape of the curve - in Racetrack Builder these lie on the tangent vectors of the start and end points, at the distance you specify.

Respawning

The RacetrackProgressTracker component can be added to the player car to automatically respawn them back on the track after they fall off. By default the player is respawned on the last curve that they drove on.

Sometimes a curve is not suitable as a respawn point, e.g. if the player cannot get enough speed to complete the next jump, and therefore cannot progress.

To avoid this, untick the "Can Respawn" property of the curve. The respawn logic will search backwards from the last curve the player drove on until it finds a curve where "Can Respawn" is ticked.

Creating mesh templates

A "mesh template" provides the meshes that are generated and fitted to the path of the curves, in order to create the racetrack.

They are a little bit like Unity prefabs, and are often stored as one. But they are instantiated a little differently, mainly due to the need to warp the meshes along the curves and clone the repeating parts (like support poles).

This package contains a set of mesh templates to get you started, but you can easily build your own to create your own road types.

Then select the racetrack object and click the "Create closed circuit" button.

Supplied templates

The sample mesh templates are in: Assets/Racetrack builder/Prefabs/Track Templates

There are also prefabs that can be composed together to create mesh templates in: Assets/Racetrack builder/Prefabs/Template parts

These are grouped into folders:

- Driving surface - The main part the player drives on
- Sides - Barriers etc that attach to the side of the track
- Supports - Support poles that hold up the track

Example walkthrough

As an example, we can create a mesh template consisting of wooden planks, support poles and side barriers.

First navigate to the "Assets/Racetrack builder/Prefabs/Track Templates" project folder and drag the "template base" prefab into your scene. This creates the basic skeleton structure for a mesh template. You can examine the object in the scene tree:

- The main object ("template base") contains a **Racetrack Mesh Template** script component. This marks it as a mesh template and is mandatory.
- Underneath we have a "continuous" object with a **Racetrack Continuous** script. This denotes the meshes underneath it as "continuous", meaning they will be warped along the racetrack curves. In this prefab the driving surface and barrier meshes will be "continuous", so that they follow the racetrack curves.
- We also have a "spaced" object, which is an empty placeholder for now. This will be used for objects that will be placed along the track at regular intervals, like the supporting poles.

Create the road surface as follows:

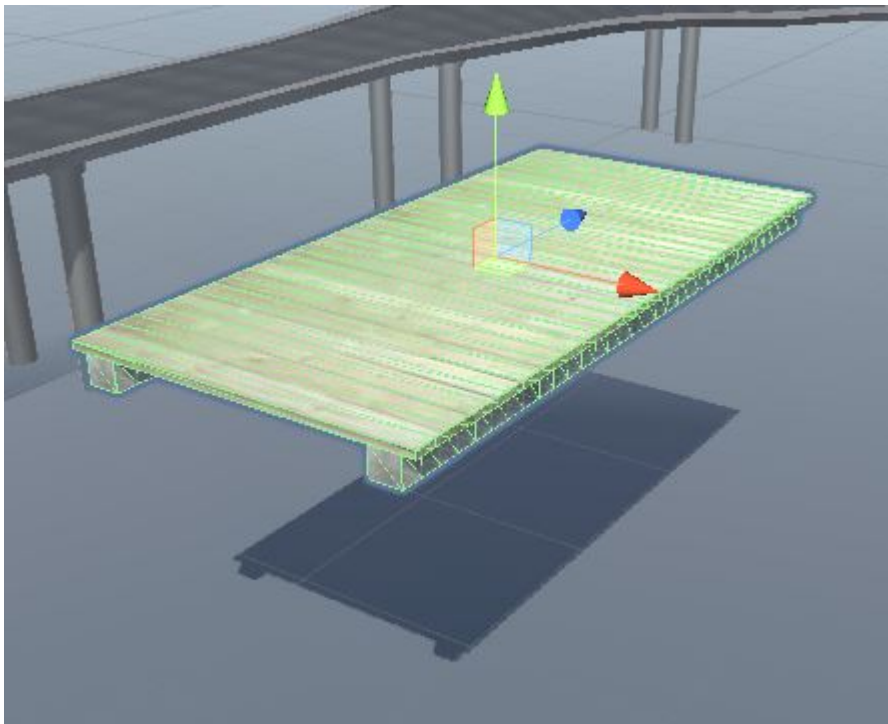
1. Make sure the "template base" object is expanded in the scene tree, and the "continuous" child object is visible.

2. Open the "Assets/Racetrack builder/Prefabs/Template parts/Driving surface" project folder.
3. Drag the "woodplanks" prefab into the *scene tree* and drop it onto the "continuous" child object.
4. Reset the "Position" of the new object to (0,0,0) in the Inspector window.

Placing the woodplanks mesh underneath the "continuous" object means it will be warped along the racetrack curves. The first continuous mesh is also special, as it will be treated as the main driving surface. This has certain implications:

- It defines the length of the mesh template.
- It means a "Racetrack Surface" script component will be attached to the mesh after it has been copied and warped. This is used by the RacetrackProgressTracker component to detect when the player is above the road. It also links back to the curve that generated it, so that the player's progress along the track can be calculated.

If you view the template object in the scene, you'll see it now has a woodplanks surface. This is now a fully functional mesh template, which you can drag from the scene tree and drop onto the "Template" property of a racetrack curve. But we are not finished yet.



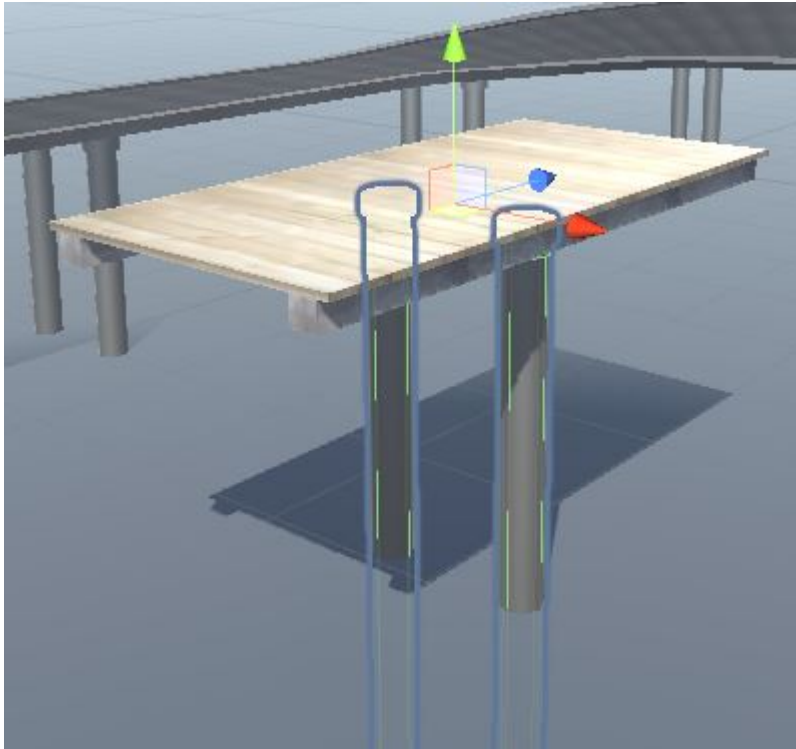
You may notice the template looks a little small. This is because the default mesh templates are all scaled by a factor of 3. Correct this as follows:

1. Click on the "template base" object in the scene tree.
2. Set the X, Y and Z components of the "Scale" to 3 in the Inspector window.

Now add some poles to hold up the track:

1. Make sure "template base" is still expanded in the scene tree, and that "spaced" is visible.
2. Open the "Assets/Racetrack builder/Prefabs/Template parts/Supports" project folder.
3. Drag the "Metal poles" prefab into the *scene tree* and drop it on the "spaced" child object.
4. Set the Y position to -0.33 in the Inspector window.

The mesh template now has two poles underneath the track. Once again it is fully functional. If you assign it to a curve and regenerate the track, the poles will be spaced along it at regular intervals.



Expand the new "Metal poles" object in the scene tree and examine it.

The "Metal poles" object has a **Racetrack Spacing Group** script component. This indicates that the content underneath will be spaced evenly along the track, and specifies the spacing.

The "Index" property is important to get correct spacing. Objects spaced at *different* intervals should be assigned to spacing groups with *different* indices, in order to get correct results. You should organise your spaced objects into distinct groups, each with a unique index between 0 and 15. The supplied mesh templates use index 0 for road support poles and index 1 for poles that hold up the side barriers.

The other properties are:

- Spacing Before - Amount of space to add before an object
- Spacing After - Amount of space to add after an object

In this case we have 10 units before and after each, meaning the poles will be spaced 20 units apart.

Underneath the "Metal poles" object we have two child objects, "left" and "right". Each has a **Racetrack Spaced** script component, indicating it has content to be repeated, with properties describing how:

- Is Vertical - This forces the object to be aligned vertically in world space. If unticked the object will be aligned with surface of the curves.
- Max Z angle - Maximum bank angle (positive or negative). If the curve exceeds this angle, the spaced content will not be created.
- Max X angle - Maximum pitch angle (positive or negative). Same as above.
- Apply Widening - This causes the object to be moved horizontally when the road is widened (or narrowed). If unticked, the object position is not affected by widening.

Important: "Max Z angle" and "Max X angle" only apply when "Is Vertical" is ticked.

In this case "Is Vertical" is ticked, so that the poles remain vertical regardless of how the road surface pitches or banks. The max X and Z angles ensure poles are not created if the track is upside down. (See the loop in the example scene for an example of upside-down track).

Underneath the "left" and "right" objects is the content to be generated. In this case we have a standard Unity mesh to represent the pole visually, and a capsule collider.

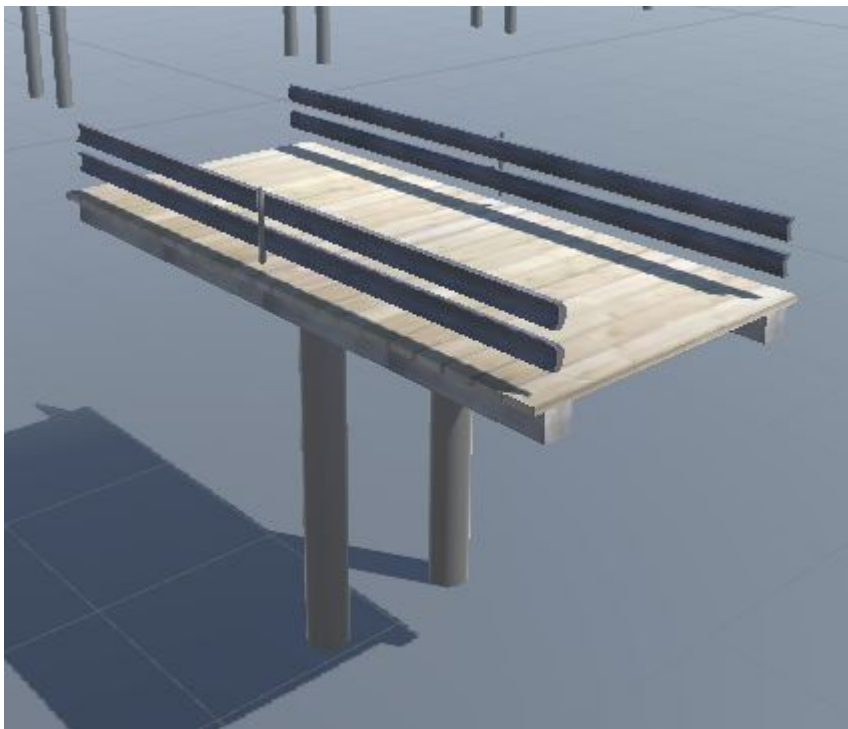
To complete the mesh template, add the side barriers as follows:

1. Open the "Assets/Racetrack builder/Prefabs/Template parts/Sides" project folder.
2. Drag the "rail barrier" prefab and drop it on the "template base" object in the scene tree. **Do not** drop it on the "continuous" or "spaced" child objects.

The prefab should not be a child of the "spaced" or "continuous" objects, because it contains both spaced and continuous content. If you expand the "rail barrier" object, you'll see it has its own "continuous" and "spaced" sub objects with the appropriate components attached to each. The "continuous" child object contains two railing meshes, which will be warped along the curve path. The "spaced" child object contains a small pole configured to be spaced every 6 units along the track.

The barrier runs along one side of the mesh template. To create the barrier on the other side:

1. Right click the "rail barrier" object in the scene tree and select "Duplicate"
2. In the Inspector window, set the rotation Y component to 180.

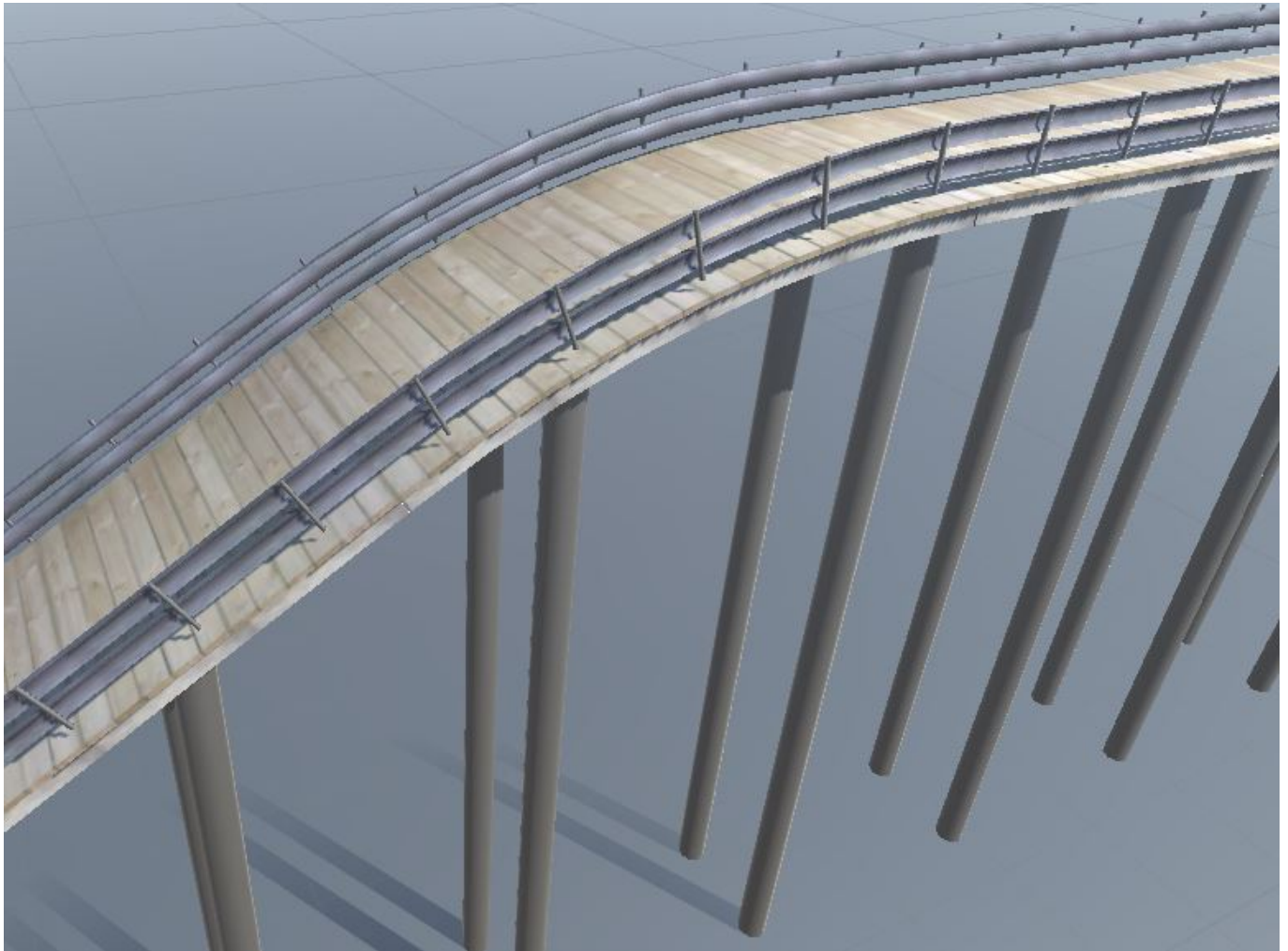


The mesh template is ready to use. The last step is to convert it into a prefab, so that it can be reused easily:

1. Click on the "template base" object in the scene tree.
2. Key in a new name in the Inspector window. E.g. "woodplank barriers"
3. Navigate to the "Assets/Racetrack builder/Prefabs/Track Templates" project folder.
4. Drag the new object from the scene tree into the project window to create a new template.
5. When prompted click "Prefab Variant" (although it doesn't make much difference in this case).

Once the prefab has been created, you can delete the object from your scene.

The template is now complete. Drag it from the project folder onto the "Template" field of a racetrack curve and click "Rest of track" to apply it to your track.



Creating meshes

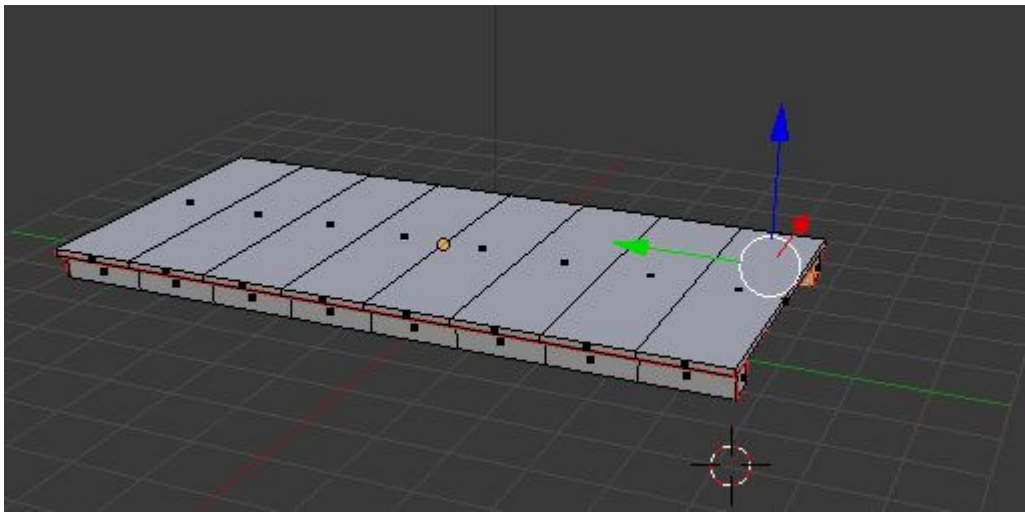
You can of course use your own meshes to create track templates and build your own custom tracks.

The standard Unity workflow applies. I.e. create them in a 3rd party modeller, import them, and use them to build your mesh template prefabs.

For continuous meshes, like the road surface, there are some guidelines to ensure they will warp around the racetrack curves correctly, and provide a smooth driving experience.

Split along the Z axis

Meshes are warped to fit a curve by transforming their existing vertices. The process does not split existing polygons or introduce new vertices, so you must provide sufficient vertices to make the result look smooth.



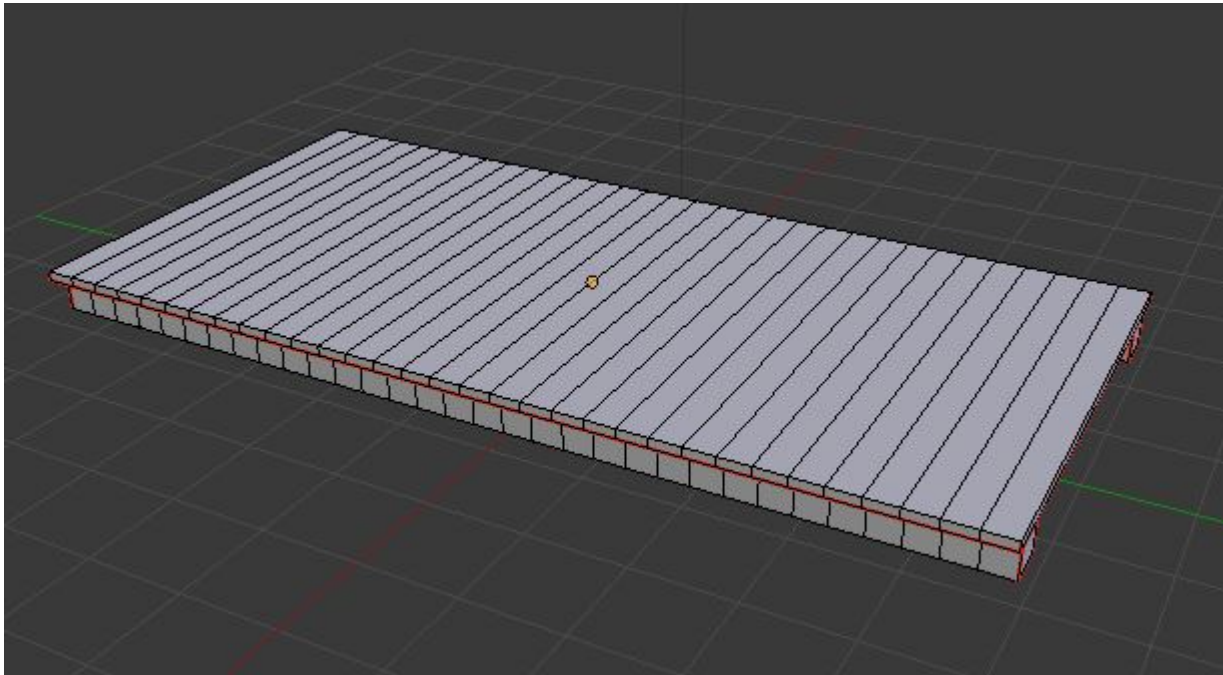
Here the road surface mesh has been sliced into 8 pieces, at regular intervals along the Z axis. (In this case the Blender3D "Loop cut" tool was used. Other 3D modelers should have a similar function.)

This is the visual mesh used for the "woodplank" road surface.

Separate high poly mesh for collisions

The visual mesh *looks* decent when warped around the racetrack curves, but does not have adequate detail to be used as the collision model. It will feel juddery to drive over when the road pitches or banks.

To fix this, create a second mesh, identical to the first, but with more polygons and vertices, so that it can be warped into a smoother surface.



Assign this mesh explicitly to the "Mesh Collider" component of your mesh object or prefab.

Unlike the rendered mesh, having a high resolution collision mesh has little performance penalty. Although it is worth keeping in mind the storage requirements of the mesh, especially as it will be duplicated many times along the different curves of the racetrack.

In this example the mesh has been sliced into 32 pieces, which gives a decent driving feel without being too excessive.

*Note: For continuous meshes that the player will **not** be driving on, like barriers or walls, it is not necessary to have a separate high poly mesh*

Use a mesh collider

For continuous meshes the collision mesh must be warped along the racetrack curves along with the visible mesh. Although other colliders, like the box collider, may fit neatly around the mesh template, they cannot be warped, which will result in an incorrect collision model on your racetrack.

Therefore always use a mesh collider with continuous meshes.

Align the top of drivable surfaces with the Y=0 plane

This is more of a suggestion than a rule, however it makes life a lot easier.

It means a continuous surface when the track switches from one mesh template to another. Also, applying a different scale factor to a mesh template will not alter the height of the surface, in case you want to vary the size of the track.

Spaced objects

Spaced objects are much simpler than continuous meshes. There is no mesh warping. They are simply instantiated (using standard Unity object instantiation) and positioned at regular intervals along the track.

This means:

- You do not need to add extra vertices.
- You do not restricted to a mesh collider. For example, you can use a box or capsule collider if suitable.

Appendix - Component reference

Track building components

Location: *Assets/Racetrack Builder/Scripts/Track*

Use these components to define the racetrack curves.

Racetrack

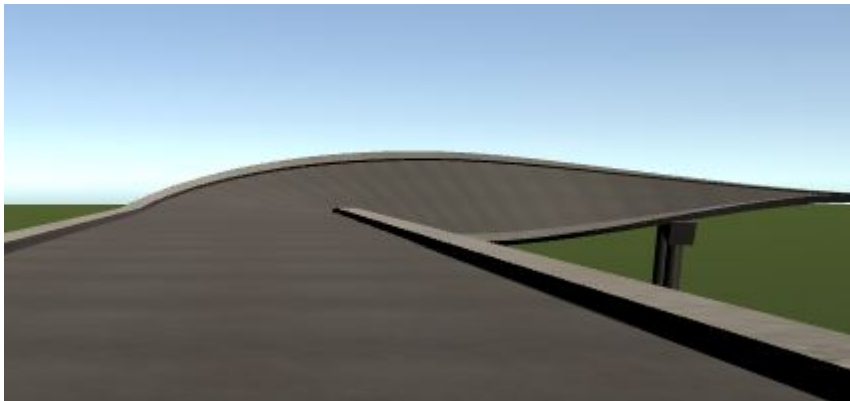
Represents the racetrack as a whole. Acts as the parent object for the Racetrack Curve objects that define the curves of the track.

Use "GameObject > 3D Object > Racetrack" to create a Racetrack object.

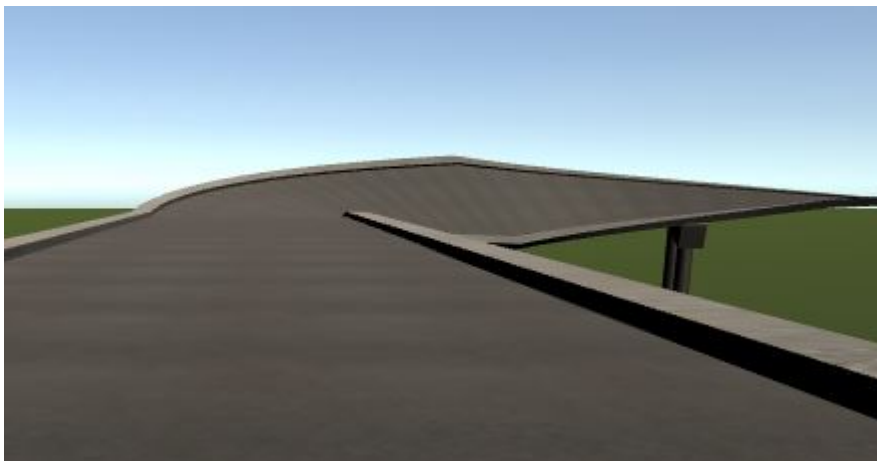
Properties - Parameters

- Segment Length - Length of line segment generated from curves. Each curve is converted into a sequence of small line segments. Generally you should not need to change this setting.
- Bank Angle Interpolation - Controls how bank (Z) angles are interpolated along a curve.

The default value is "Bezier" which applies a smooth Bezier curve interpolation. This avoids sharp angles at the end of curves, and generally gives a smoother driving surface.

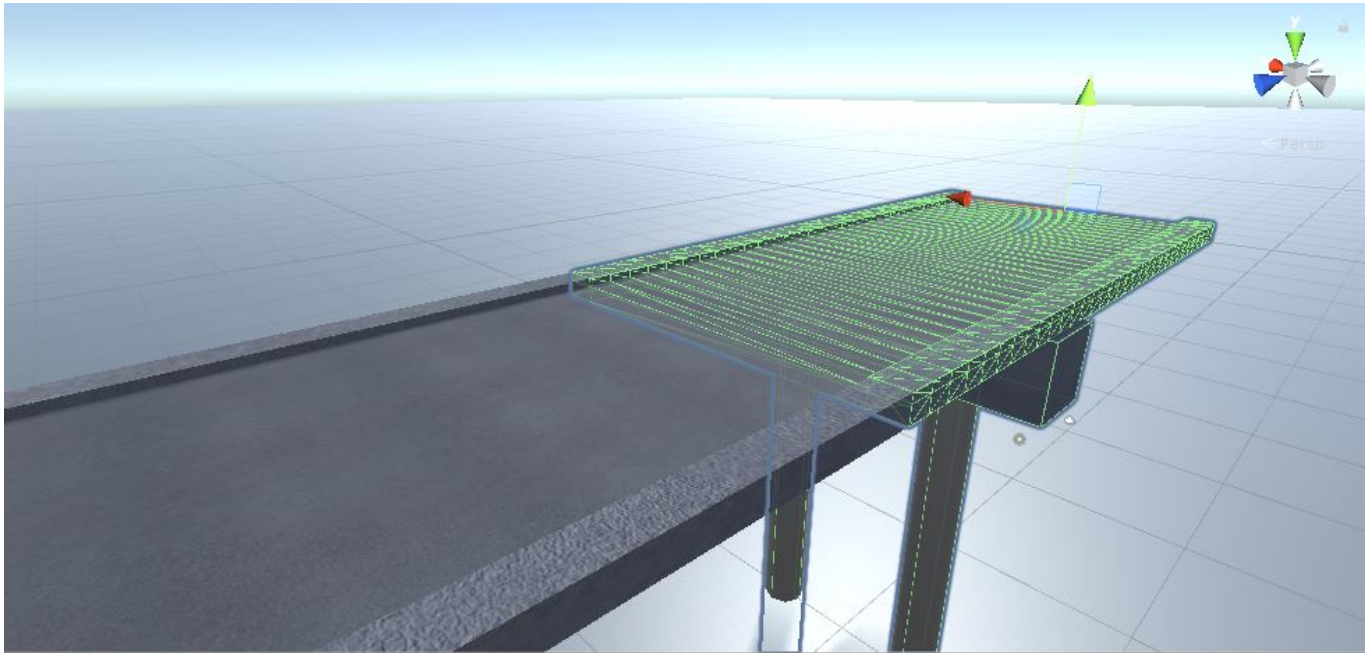


"Linear" applies a simple linear interpolation.

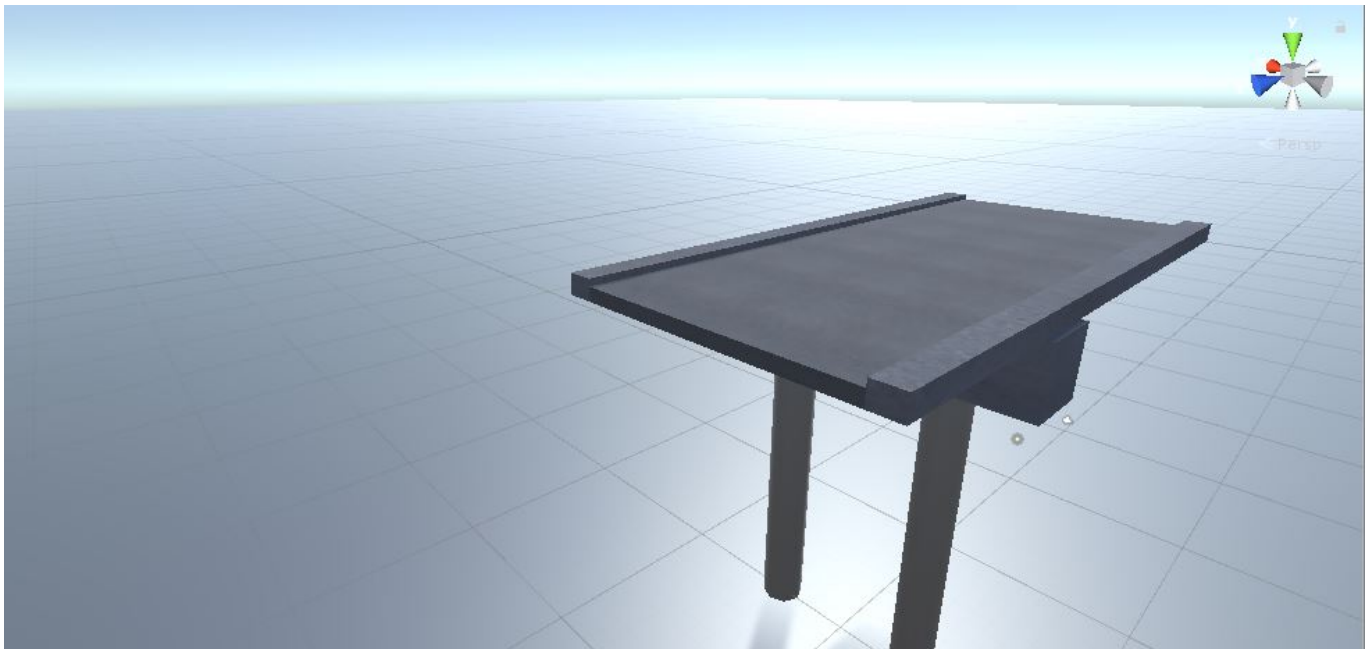


- Remove Internal Faces - Whether to remove internal faces that are hidden due to consecutive meshes being adjacent to each other.

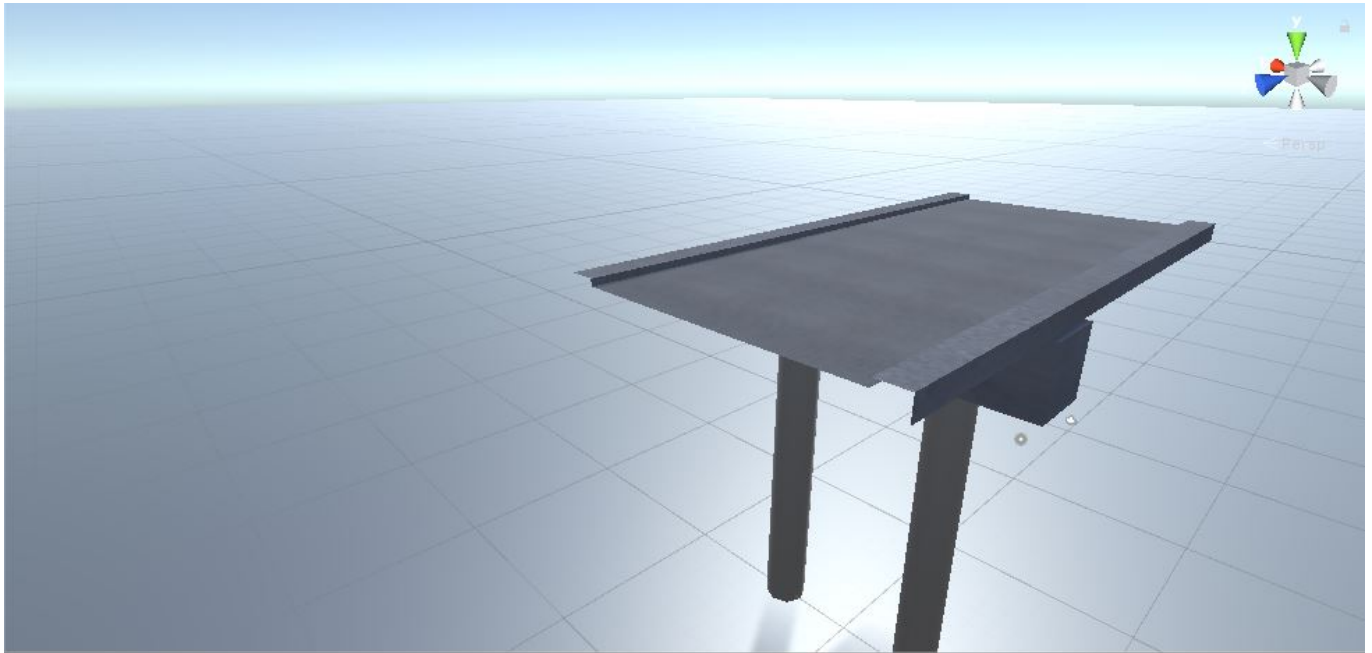
For example, consider these two consecutive asphalt meshes:



If we hide the second mesh instance and examine the first mesh with "Remove Internal Faces" **un-ticked**, we can see that it has polygons at the cross section between the two instances. These will never be seen in practice, but can sometimes poke through due to Z fighting causing visual artifacts.



Here's the same mesh instance generated with "Remove Internal Faces" **ticked**. The cross sectional faces are automatically removed.



By default Racetrack Builder will only remove faces between two continuous meshes in consecutive mesh template instances generated from the same RacetrackMeshTemplate. It will not remove faces that might be visible, such as at the start or end of the track, or around jumps.

You can override this for a specific RacetrackCurve by setting the "Remove Start Internal Faces" and/or "Remove End Internal Faces" properties of the curve.

- Respawn Height - Height of the respawn points above the racetrack surface.
- Respawn Z Offset - How far along each curve to place its respawn point. *Note: Racetrack Builder will never place a respawn point further than halfway down a curve, regardless of this value.*
- Mesh Overrun - What to do with the part of the last mesh that overruns the end of the curves. For more information see the **Creating a closed circuit** section earlier in this document.
- Loop Y offset - Offset to apply to mesh Y position when Mesh Overrun mode is "Loop". Also see the **Creating a closed circuit** section.

Properties - UI settings

- Show Manipulation Handles - Whether to show drag and rotate handles when a RacetrackCurve is selected (in addition to the regular Unity handles), allowing the curve to be manipulated directly on screen.
- Show On Screen Buttons - Whether to display the curve manipulation buttons on screen when a RacetrackCurve is selected.

Buttons

- Update whole track - Delete and recreate all generated meshes for all curves. This can take several seconds for larger racetracks.
- Add curve - Add a new curve to the end of the track and select it.
- Create closed circuit - Creates a closed circuit racetrack by adding a Bezier curve. Refer to the **Creating a closed circuit** section earlier in this document.

Buttons - Miscellaneous

- Delete meshes - Delete all generated meshes.
- Clear templates - Clear the track templates from all curves (sets them to null).

Racetrack Curve

Represents a single curve in the racetrack. Stores the shape of the curve.

Properties

- Type - Selects the type of curve. "Arc" is the traditional curve type where the curve is defined by its angles and length. "Bezier" is a cubic Bezier curve defined by angles and an explicit end position.
- End Position - The end position of the curve in world space. This is readonly for "Arc" curves.
- Start Control Pt Dist - The distance of the start Bezier control point from the curve start point. As a fraction of the straight line distance between the curve start and end points. Applies to "Bezier" curves only.
- End Control Pt Dist - The distance of the end Bezier control point from the curve end point. As a fraction of the straight line distance between the curve start and end points. Applies to "Bezier" curves only.
- Length - The curve length. This is readonly for "Bezier" curves.
- Turn (Y) - How far the curve turns around the Y axis. Positive values create right hand corners.
- Gradient (X) - The X axis angle at the *end* of the curve. The curve curves from the previous gradient to the new one.
- Bank (Z) - The Z axis angle at the *end* of the curve. The curve curves from the previous bank angle to the new one.
- Widening - The number of units to widen the left and right hand side of the racetrack by. Negative values will narrow the racetrack, if and to the degree that the track type supports it. Applies to the *end* of the curve. The curve interpolates from the previous widening values to the new ones.
- Template - The Racetrack Mesh Template that defines the meshes that will be warped along the Racetrack Curve objects to create the final model. Can be left to null to use the previous curve's template.

Properties - Miscellaneous

- Is Jump - If true, no meshes will be created for the curve, leaving a gap in the racetrack.
- Can Respawn - If true, the Racetrack Progress Tracker component will respawn the car above this curve. Otherwise it will skip it and search backwards along the racetrack for a curve with "Can Respawn" set to true. Useful to ensure there is enough run-up before jumps etc.
- Remove Start Internal Faces - Whether to remove internal faces at the start of each mesh instance. One of the following:
 - Auto - The behaviour is controlled by the RacetrackBuilder "Remove Internal Faces" property (see above).
 - Yes - Remove the internal faces from the start of all mesh instances generated for this curve.
 - No - Do not remove internal faces from the start of any mesh instances generated for this curve.
- Remove End Internal Faces - Whether to remove internal faces at the end of each mesh instance. Has the same options as "Remove Start Internal Faces".

Buttons

- Length (buttons) - Set the curve to a specific length. Also causes the meshes for the remainder of the track to be rebuilt, as if "Update Rest of track" was clicked.
- Turn (Y), Gradient (X) and Bank (Z) (buttons) - Set the curve angles to specific values. Causes the meshes for the curve to be rebuilt, as if "Update Curve" was clicked.
- Update Curve - Delete and recreate the meshes for this curve. Use this after changing the curve angle via the sliders (or keying in values). Note: The previous and next curve will be rebuilt as well, as their meshes can be affected by the curve's angles.
- Update Rest of track - Delete and recreate the meshes for this curve and all curves after it. Use this after changing the mesh template or "Is Jump" flag, or after changing the length via the slider (or keying in values), as all these actions can affect the meshes for the remaining curves of the track.
- Add curve - Add a new curve to the end of the track.
- Insert curve - Insert a new curve in the track immediately after this one.

Mesh building components

Location: *Assets/Racetrack Builder/Scripts/Template*

Use these components to build the mesh templates that are used to create the 3D model of the racetrack.

Racetrack Mesh Template

Marks an object as a mesh template. This component is required in order to be assigned to a Racetrack Curve object's "Template" field.

No properties.

Racetrack Continuous

Indicates that all the meshes in the subtree are "continuous". The track building algorithm will copy the subtree, find all its meshes, and warp them around the racetrack curves.

Used for the road and other surfaces that follow the racetrack curvature, like barriers, tunnel walls etc.

IMPORTANT: The first "continuous" object containing a mesh defines the racetrack "surface". This is the mesh above which the car must be to be considered on the racetrack, and affects how the Racetrack Progress Tracker detects the car's progress along the racetrack and whether they have fallen off. ("First" in this case is the first applicable object based on a depth first search of the mesh template.)

A mesh template typically will have at least one of these.

No properties.

Racetrack Spacing Group

Assigns all Racetrack Spaced objects in the subtree to a spacing group, and specifies their spacing.

Used to space out repeating objects like support poles at regular intervals. Spaced objects are positioned along the racetrack curves, but their meshes are not warped to the curve.

Properties

- Index - The spacing group index. The mesh building algorithm maintains 16 "spacing groups", indices 0 to 15, which step down the racetrack spacing out objects. If a mesh template has different objects with different spacing, they should each be assigned to a spacing group with a different index.
- Spacing Before - Space to apply before an object
- Spacing After - Space to apply after an object

Racetrack Spaced

Indicates the subtree is a "spaced" object that will be copied and placed along the racetrack at regular intervals.

The actual spacing must be specified in a Racetrack Spacing Group object higher up in the object hierarchy.

Properties

- Is Vertical - True to align the object's Y axis with the world Y axis. False to align it to the curve's local Y axis.
- Max Z Angle - **Applies only when Is Vertical=true**. Specifies the maximum positive or negative Z axis angle (or "bank" angle) of the curves where an object will be placed. If the curve exceeds this angle, no spaced object will be created.
- Max X Angle - **Applies only when Is Vertical=true**. Specifies the maximum positive or negative X axis angle (or "pitch" angle) of the curves where an object will be placed. If the curve exceeds this angle, no spaced object will be created.

Note: Max Z and X Angles are useful to prevent road support poles from being created for upside down portions of the racetrack, or when the track is very steep.

Racetrack Widen Ranges

Describes how to widen or narrow the the mesh template, or part of it.

The widen range affects the object it is attached to and its subtree, and controls how continuous meshes are warped, and spaced objects moved horizontally (if "Apply Widening" is ticked).

The component has a "Left" and "Right" ranges, each defining a horizontal region that is stretched or squeezed in order to widen or narrow the road.

Properties

- Left - The left range
 - X0 - X coordinate of the start (left) of the range
 - X1 - X coordinate of the end (right) of the range
 - Min Width - Minimum width when road is narrowed. The range will not squeeze narrower than this value.
- Right - The right range. Has the same properties as the left range.
- Y - Y coordinates of the guide lines when displayed in the editor. This has no effect at all on the racetrack generation.

Buttons

- << Mirror to left - Sets the left range to a mirror copy of the right range.

- Mirror to right >> - Sets the right range to a mirror copy of the left range.

If no RacetrackWidenRange component is found the mesh template defaults to two 0 width ranges in the center of the mesh template, meaning that widening simply moves all content to the left or right depending on which side of the center line it is, and narrowing is not supported.

Racetrack UV generator

Can be used to generate UV coordinates for the racetrack surface texture.

This can be particularly useful when road widening is used, as otherwise the vertices will be moved while the texture coordinates remain the same, resulting in stretched textures which often is not desired.



The UV generation takes the widening into account, generating UV coordinates based on the vertices X and Z coordinates *after* widening, but *before* warping the mesh along the curve path.



It can also be used to seamlessly apply a repeating texture along the racetrack that doesn't exactly match the length of the mesh template.

The Racetrack UV Generator must be added to the mesh object, specifically the object that contains the MeshRenderer. UV coordinates will then be generated when the racetrack is generated from the RacetrackCurve objects. Please note that this component does not change the UV coordinates on the mesh template itself. You must generate/update the racetrack to see its effects.

Properties

- Materials - Specify the materials for which UV coordinates will be generated
- Side - Which side(s) of the mesh to generate UV coordinates for. Values are self explanatory:
 - Top
 - Bottom
 - Top And Bottom
- Max Angle - The maximum angle between the polygon and the up vector, if generating UVs for "top" facing polygons, or down vector for "bottom" facing polygons. UVs will
- Scale - X and Y scale factors. Note that the UV coordinates are actually *divided* by these factors, so larger numbers make the texture appear larger.
- Offset - 2D offset added to the UV.
- Rotation - An optional rotation amount (in degrees) to apply to the UV coordinates.

Runtime components

Location: *Assets/Racetrack Builder/Scripts/Runtime*

Racetrack Progress Tracker

This component tracks a vehicle's progress along the racetrack, detects when it has come off the track and places it back on.

It must be added to an object with a "Rigid Body" component (typically a "Car" game object).

Properties

- Curve Search Ahead - How many curves to check to determine whether the car is on the track and whether it has progressed to the next curve. Must be at least 2 - one to check if the car is still on the current curve, and one to check if it has reached the next curve. May need to be higher if your racetrack has short curves, as they sometimes do not generate any meshes, so the tracker cannot detect the car driving over them. This value determines the number of ray casts per physics update.
- Off Road Timeout - The number of seconds of the car being off the racetrack before it will be automatically reset onto the track. The car is considered "on" the racetrack if it is above the racetrack surface mesh. This includes when the car is airborne - it does not have to actually be touching the road surface. Also "above" means above in the racetrack curve's local space (which can even be *below* in world space, if the track is upside down). **IMPORTANT: If a car is jumping over an "Is Jump" curve, they will not register as being on the racetrack. If you have large jumps with a lot of airtime, make sure to set the Off Road Timeout long enough that the car can complete the jump!**
- Auto Reset - Enables the automatic reset logic.
- Current Curve - The index of the curve the car has progressed to.
- Lap Count - Increased after each lap for circuit racetracks.
- Off Road Timer - The amount of time the car has been off the racetrack. Once this value reaches the *Off Road Timeout* the car will be reset on the track. **Valid if AutoReset=true.** Otherwise will always be 0.
- Last Lap Time - The last lap time in seconds.
- Best Lap Time - The best (i.e. quickest) lap time in seconds.
- Current Lap Time - The current lap time in seconds.

Buttons

- Reset car - Place the car back on the racetrack, on the *Current Curve* (or before, if *Can Respawn*=false for that curve.)

Generated components

These components are automatically attached to the objects that are created when building the racetrack meshes.

Note: These objects should be considered to be automatically "generated". You should not modify them directly, as they are often destroyed and regenerated, meaning your changes will be lost.

Racetrack Template Copy

Indicates that the object was created by copying (and modifying) a Racetrack Mesh Template.

These objects are created when the racetrack is built, and placed underneath their corresponding Racetrack Curve objects in the scene hierarchy.

Properties

- Template - Points back to the Racetrack Mesh Template object from which this object was created.

Racetrack Surface

Attached to the copy of the first continuous mesh in the Racetrack Mesh Template to indicate that this is the main driving surface.

The Racetrack Progress Tracker looks for this component to determine if the car is above the racetrack and which curve.

Properties

- Start Curve Index - The index of the first curve the surface belongs to.
- End Curve Index - The index of the last curve the surface belongs to. Meshes can span two curves if their lengths don't line up with the curve lengths (or even more if there are curves that are shorter than the meshes).