









# Welcome to TerrainComposer

TerrainComposer is an Unity Extension Tool to make professional Terrain. It has an user friendly GUI interface and its unlimited multi-threading editor and runtime generation features make it a very powerful tool. It is designed to create amazing results in a minimum amount of time.

It uses a system of layers, filters and masks (masks). The layers have different outputs heightmap, colormap, splatmap, tree, grass and objects and the filters and masks are for creating the rules for output. With the filter and mask system you can use curves to quickly manipulate the output. This one system applies to all layer outputs. Once you understand the system it becomes very easy to transform one output to the other, because the system allows duplication/swapping of any component.

TerrainComposer is very flexible and can be used for all kinds of terrains and environments. For example flight simulator perspective as well as first person perspective. You can create low detail high performance terrain for the mobile platform, as well as high detail AAA terrain for high end graphic machines. It supports all high and low terrain, which can be changed any time during the terrain making, as well as the support for multi-terrain. For multi-terrain there are quick buttons that apply settings from one terrain to all terrains. These buttons are in more components like the tree and the object layer, which apply settings for example one tree to all the trees in a layer. The multi applying will save you much time.

The auto generation (shift click 'Generate' button) option makes it very easy to see changes you make directly in the Scene view. This allows for much faster work flow as well as easier learning curve. The unlimited multi-level placement makes it possible to create endless detailed Scenes, where you for example create a whole city where the outside of the building has a garden with wall and fences and the inside of the building is furnished, and with objects on and around the furniture, etc.

The automatic update feature allows you to use the latest TerrainComposer version with its added features, fixes and updated documentation.

To make it more practical 'TerrainComposer' will sometimes be abbreviated with 'TC'.

I wish you good luck with TerrainComposer and that it will help boost developing your game leading to a bigger end result while saving you tons of time.

My personal opinion about games is that I don't like violence in it. So I hope you use TerrainComposer and WorldComposer to make normal games without shooting that are fun, exciting and educational to play and have a good message in it.

If you have any questions or run into any issues contact me at [Nathaniel\\_Doldersum@Hotmail.com](mailto:Nathaniel_Doldersum@Hotmail.com)

# Getting Started

To learn TerrainComposer I recommend watching the tutorial videos on my site

click here to go to the [Tutorial Videos](#).

## Importing TerrainComposer.

1. Open your Unity Project. In the Unity menu select Assets -> Import Package -> Custom Package. Now select the Terrain Composer package from where you have stored it.
2. A new Import Window will appear, click on the 'Import' button.
3. All Terrain Composer files will be imported and compiled, a new menu item "Terrain Composer" should appear under at Unity Menu -> Window -> TerrainComposer. A map named 'TerrainComposer' will be added to your project folder.

## Starting TerrainComposer.

1. Select from Unity Menu -> Window -> "TerrainComposer". The Terrain Composer window should appear. The window behaves like any other Unity window. You can dock it or leave it floating on top.
2. A GameObject is created in the Scene called 'TerrainComposer'. This GameObject contains all the data you create inside the Terrain Composer window, and it is stored with your Scene. If you delete the TerrainComposer from your Scene all the data you created within Terrain Composer will be lost. If this would happen by mistake, there is the possibility to do Undo. Click unity menu "Edit" -> "Undo". If that doesn't work you can reload the Scene. It's best to save your Scene and also separate TerrainComposer project regularly. Once you build your project and don't use TC for runtime, it's best to delete the TerrainComposer object from the Scene, as it saves memory. Before doing this, make sure the TC project is saved.

## Online Updates

TerrainComposer has an auto update feature which looks online for an update once every day (when you start it). With default settings it will automatically update. You can change update settings in TC Menu -> Help -> Update...

The update notes are in the file at the TerrainComposer folder -> TerrainComposer Release Notes.

## Maximal visual Quality

For the maximal visual quality you can use additional terrain shaders. Depending on the shader, these add the ability to use bump/spec splat textures, overlay textures, colormaps and normal maps. You can only use 1 shader for your terrains, so you have choose between them.

## RTP Relief Terrain Pack

This is to my opinion the **best Terrain shader** available for Unity. I'm working together with Tom, the RTP developer to integrate features from our packages. RTP is so full packed of features, that it is in my opinion the best terrain shader ever created. Also compared to the terrains of the big engines like Frostbite, Cryengine, Unreal Engine, Unigine,etc, RTP is the best.

# A first Introduction

The picture below is the TerrainComposer window. In the picture at the top you see twelve buttons. The first six buttons are the output buttons. From left to right the output button for heightmap, colormap, splatmap, trees, grass and objects. These buttons are the main switches that determine if there will be any generation to that output. If an output button category is inactive there will be no output to this category. With these buttons you can quickly active and deactivate your desired output generation, without having to disable each layer of this category output.



\* An overview of Terrain Composer output buttons and TC layer system with filter and mask.

Before you can start generating or setting up layers you need to set up at least one terrain. To setup terrain(s) is explained in the section 'Setup Terrain in TerrainComposer'.

## Component Interface Buttons






To prevent deleting or changing data by mistake. A security is built in for clicking some buttons. If a button has <...> around it, you need to hold the 'shift' key while clicking the button. Otherwise the button will not work. For the erasing '-' button you need to hold the 'control' key while clicking the button. And buttons with '-...-' around them you also have to hold control for them to work. There is also Undo/Redo available if you want to undo a deleted component.

Undo/Redo is in the TC menu under 'Edit', and you can use Undo/Redo from the Unity menu which does the same. Also the control-z (undo) and control-y (redo) short cut keys are working with it.




The '>' before a button, means this button has more clicking options. A normal click and a shift click. The operations are often related to each other but a little different in execution.

Each major component like layer groups, layers, filters, mask and color ranges have interface buttons like:



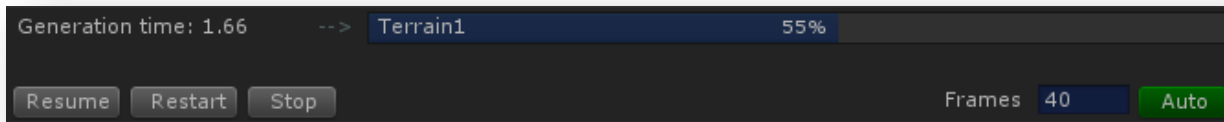
-  The 'swap up' button. To swap between this component and the previous component.
-  The 'swap/copy button. By clicking it the 'S' will change in '?'. This is for swapping the component with another component of its own kind. If you click another 'S' button of the same kind of component, they will swap. For copying click the 'S' and hold the 'alt' key. Now the button text will change in '\*S\*'. By clicking on a '+' button (on a component of its own kind) while holding the 'alt' key the component will be pasted.
-  The 'swap down' button. To swap between this component and the next component.
-  The 'add' button. Clicking this button will add another component. Holding 'shift' key while clicking will duplicate the component.
-  The 'erase' button. Control clicking this button will erase the component.



-  The 'foldout' button. Clicking this will fold/unfold the child components of this component. Shift clicking will invert the foldout of the child components.
-  The 'activation' button. Clicking this will activate/deactivate the child components of this component. Shift clicking it will invert the activation of the child components.
-  The 'interface display' button. Clicking this will hide/show the child components interface buttons. Shift clicking in a tree and object layer will hide/show the preview buttons.

## Generation

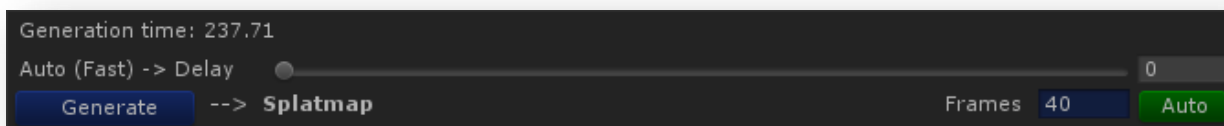
With the 'Generate' button at the bottom of the TC window, you can generate your output.



While generating you can see the progress in the progress bar, the generation time and the terrain that is currently generated on. The generate button will change into three buttons to either pause, restart or stop the generation. With every generation the whole TC setup is cloned and put into the <Generate> GameObject in the Hierarchy. Every component from the clone is removed that is not active. If a layer output is not active all the layers with that output will also be removed. So the Output Buttons (at the top under the TC menu) are a quick way to enable/disable an output while you don't have to deactivate the layers with this output every time. You can also activate/deactivate each terrain. If a terrain is not active it will be skipped. The more layers, filters and masks you use the more time it takes to generate. It's always best to deactivate what doesn't bring a different result. If an error in the loop might occur, you can delete the <Generate> GameObject in the Hierarchy. Then the 'Generate' button will be visible again.

## Auto Generation

You can use the Auto Generate feature to view the changes you make immediately. To enable/disable it **shift click the 'Generate' button**. After enabling the 'Auto (Fast)' text will appear behind it.



There are 2 modes of auto generation, fast and slow mode. You can switch between them by alt clicking the 'Generate' button. The difference is that the fast mode will generate after the set delay time when you changed/sliced/toggled something, while slow mode will wait with generating until you do nothing for the set delay time. The delay time you can change with the slider. So depending on your system performance and your preferences, you can choose between the 2 modes. If you want to see your output fast you can only activate 1 terrain to speed up generation. What you can also do if you have a high resolution is to make the local area smaller.

## Multi-threading

A feature of TerrainComposer is that you can continue working while generating. With the auto generate speed, the framerate of the Unity editor won't drop below the selectable 'Frames' next to the generate button. Also in runtime this feature works so you can generate on the fly while your game is running, without losing FPS.

## Layer Levels, Layer Groups, Layers, Filters and Masks

There is a hierarchy inside Terrain Composer: Layer Levels -> Layer Groups -> Layers -> Filters -> masks. A layer level has its own output area and consists of multiple layers arranged in a layer group. An area is a square area in World Space.

### Layers

The Layers (Yellow color) are the main components. A layer will generate to its selected output. A layer has six different output options:



1. Heightmap.
2. Colormap.
3. Splatmap.
4. Tree.
5. Grass/Detail.
6. Object.

### Changing a layer output

You can change a layer output by clicking the popup field at 'output' and selecting a different output.

### Changing default output of new layers

The output popup field next to the global '+' button under 'Layer Level0' is for adding new layers. The new layer will have the output selected in this popup field.

### Changing a layer name

You can name each layer. To do this you can double click at the layer foldout text or you can click the yellow 'E' button in the layer interface. This will add a textfield under the layer where you can type the name. To close it again, you can hit enter after editing the text, double click the layer foldout text or click the yellow 'E' button.

### Load/Save for each layer

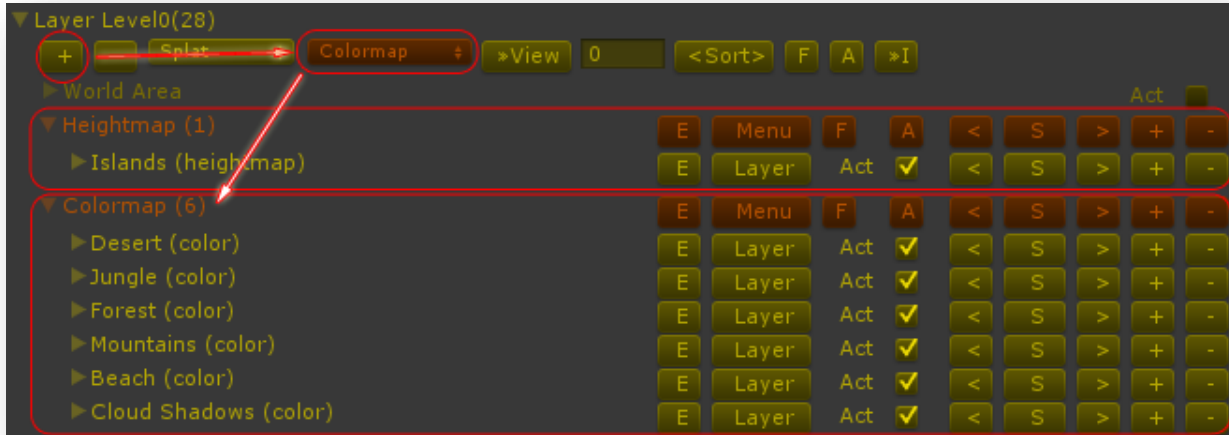
You can load/save each layer if you click the yellow 'Layer' button in the layer interface. A popup menu will appear with File -> New/Open/Save.



## Layer Groups

The Layer Groups (brown color) can be used to arrange layers. This is almost not needed anymore since the newer TerrainComposer version automatically arranges each layer under its own output. However if for example you want to make more kinds of splat texturing, like dessert, forest, jungle etc. And you use many layers for each category texturing then it is handy to use more Layer Groups.

Every layer is counted and the number is displayed between the parentheses behind a layer group foldout text. Also the total amount of layers in a layer level are displayed behind the layer level foldout text. Each layer based on output is also counted and displayed under the output buttons. You can enable/disable this with TC Menu -> View -> Layer Count.



### Adding a new layer to a layer group

To add a new layer to a layer group, you can select the layer group in the brown popup field. The layer will be added to the end of the group. To insert a new layer within a layer group you can click the yellow '+' button at the layer interface. This will insert the layer under the layer where you clicked '+'. Shift click '+' to duplicate a layer.

### Moving a layer to another layer group

To move a layer from one layer group to the other click the yellow 'Layer' button, a popup menu will appear with Parent -> ....., there you can select the layer group where you want to move the layer to. The layer will be moved to the end of the selected layer group. You can use the '<S>' buttons to move the layer to the desired position within the layer group.

### Changing a layer group name

You can name each layer group. This works the same as with naming layers -> Double click layer group foldout text or the brown 'E' button in the layer group interface.

### Load/Save for each layer group

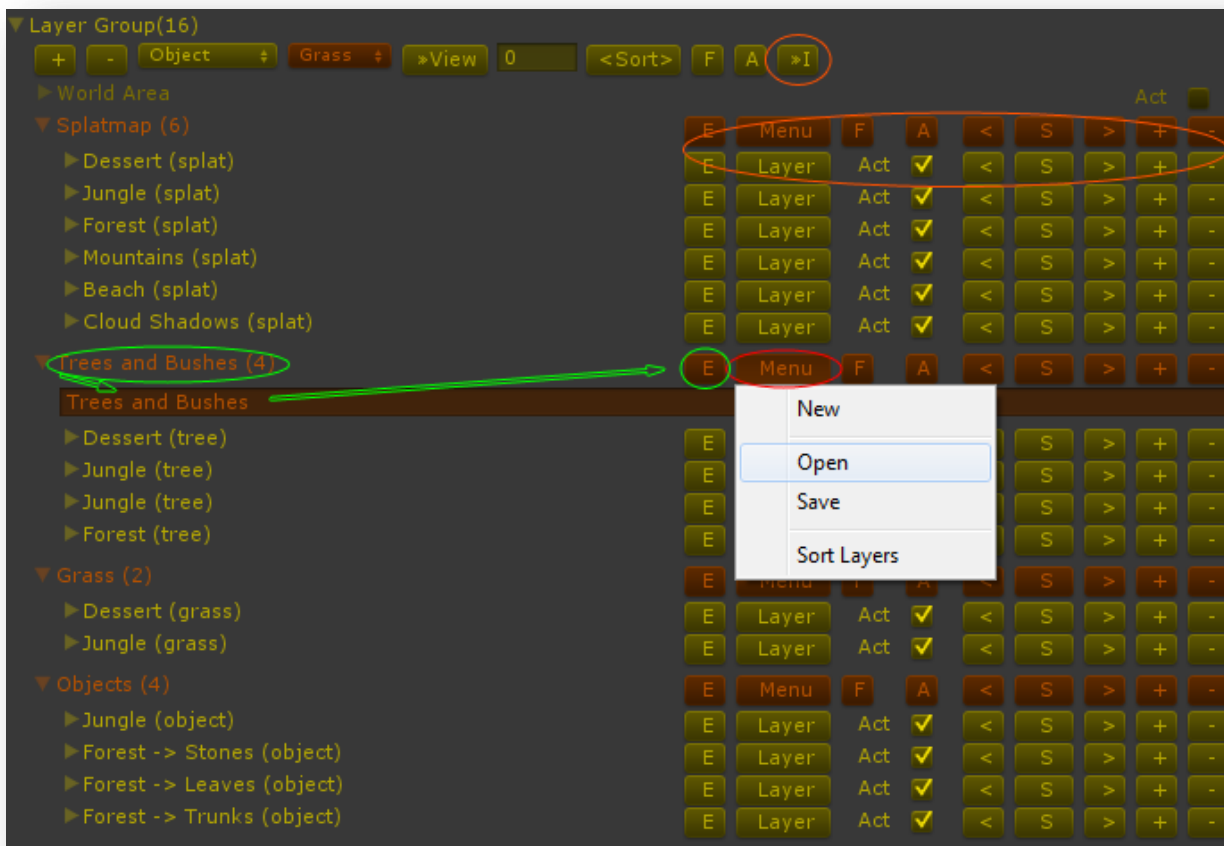
You can load/save each layer group, which will load/save its containing layers. You can do this by click the brown 'Menu' button in the layer group interface, a popup menu will appear with Open/Save.

### Sorting layers in the layer group

You can sort layers based on output in the order which is displayed on the previous page. To do this click the brown 'Menu' button in the layer group interface, choose for 'Sort'. You can undo this.

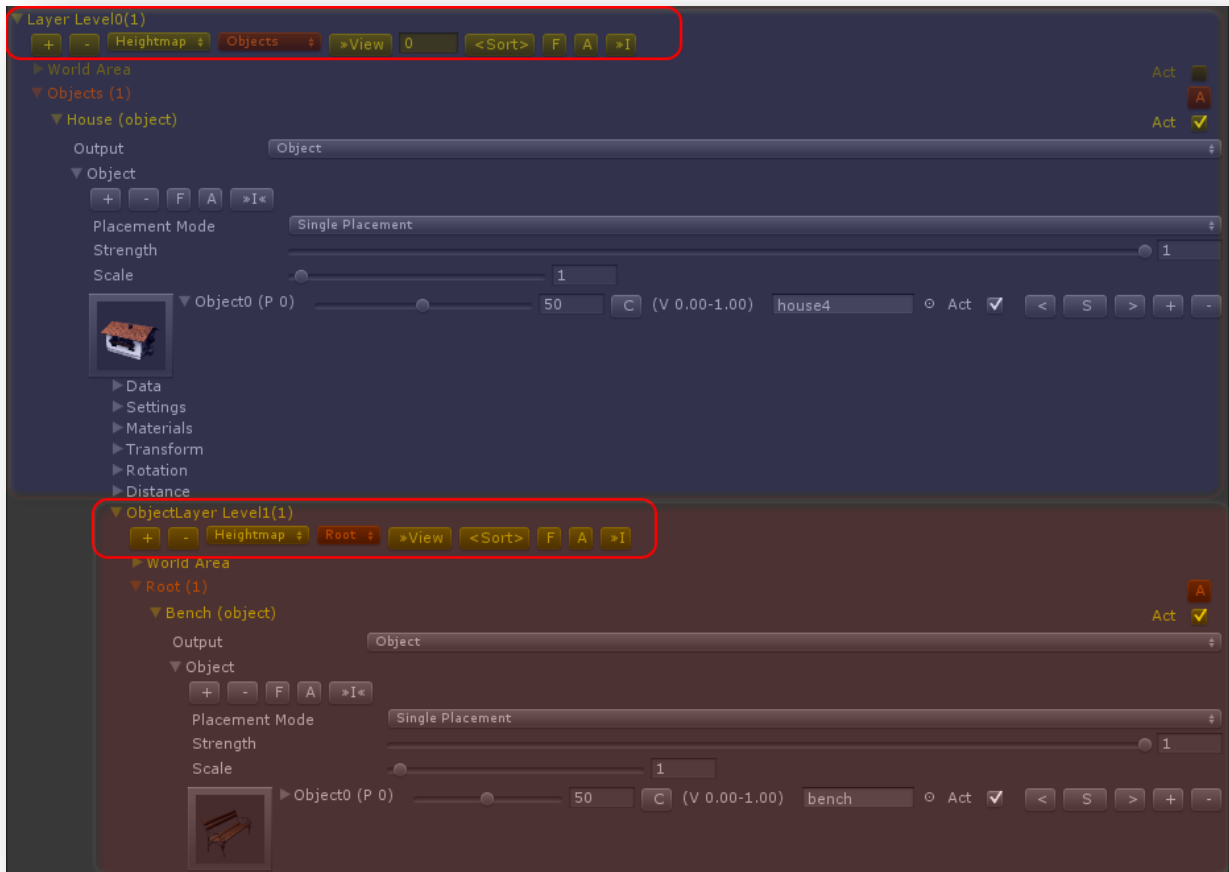
### Hiding layer and layer group interface buttons

To show/hide the layer interface buttons click the '»I' button. To show/hide the Layer group buttons shift click the '»I' button (orange circle). This can be useful for getting a better overlook.



## Layer Levels

Layer Levels consist of layers arranged in layer groups which have their own output area. In the picture you can see that there is Layer Level0 at the top (blue square) and another ObjectLayer Level1 at the bottom (red square).



## Multi-level placement

This multi-layer level system is used for multi-level placement. You can create a layer level inside an object layer. Then you can give this layer level its own square area (under world area foldout). For example in the picture there is a house selected in the object layer. As soon as the house is placed while generating it will switch over to the ObjectLayer Level1, generating in its defined world area. The pivot of the world area will be the pivot of the house. This example places benches around each house that is placed. And again you can create a layer level within the bench object that places objects on or around the bench, like papers, bottles, stones, vegetation etc. You can do this to an unlimited amount of levels. As soon as the world area is generated TC will return to its previous layer level and continue generation from there on.

## Viewing Layer Levels

A layer level can be moved to the top view (zoom) so that you can get a better overlook. To do this you can shift click the yellow '»View' button at the layer level you want to zoom or enter the layer level number next to the '»View' button at layer level 0. The return to layer level0 you can shift click the '»View' button again or enter number 0 next to the button.

# Setup Terrain in TerrainComposer

## Unity Terrain in TerrainComposer

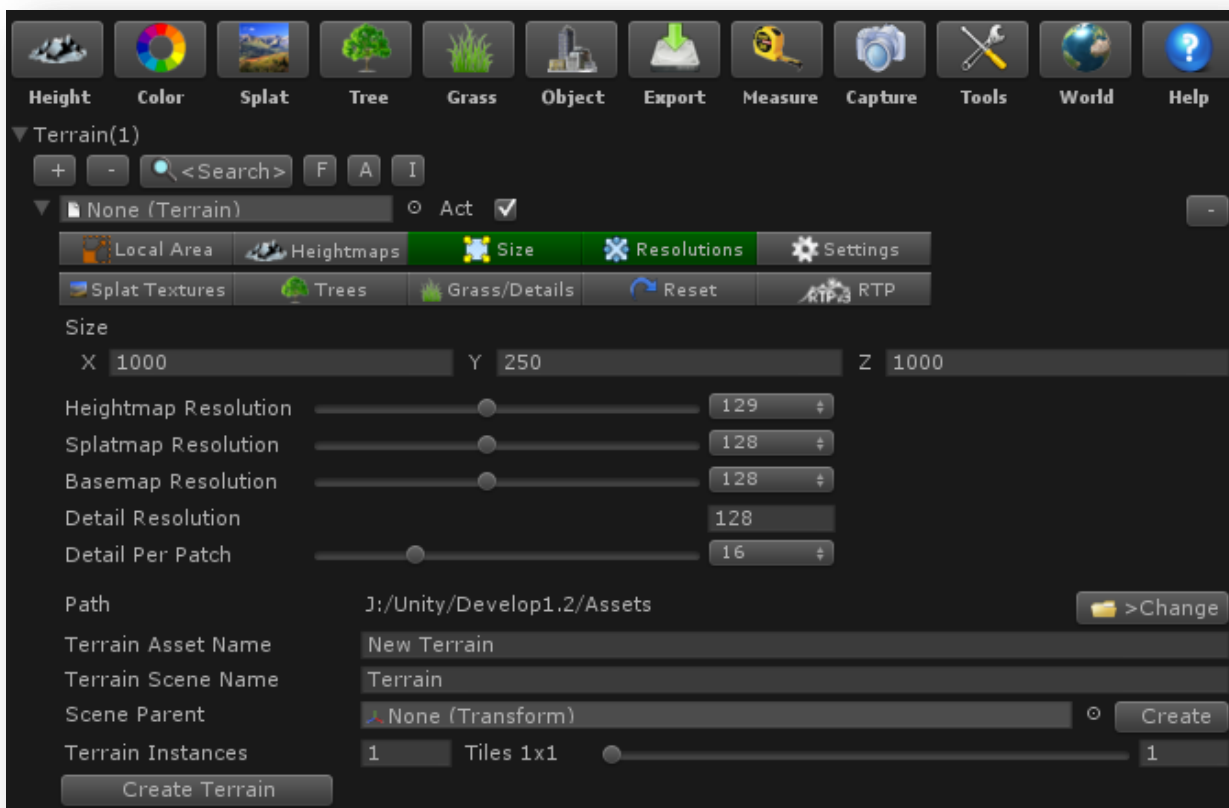
1. If you don't have a terrain in your Scene you can create it with TerrainComposer. You can also do it still manually and then drag it into the terrain slot in TC. But creating terrain with TC is much faster, it will do most of the work for you. But there is absolutely no difference TC makes to the standard Unity Terrain. It uses Unity Terrain just like you would do manually.
2. If you already have terrains in your scene, TC has a terrain auto search feature. This makes it possible to get all the terrains from you Scene into TC. Your terrains need to be numbered in the right order at the end according to the TC tile system (see picture).
3. TC uses a square tile system (2x2,3x3,4x4,etc). And the tile system works in the order from top to bottom, from left to right. There's an auto fit feature that will stitch all your terrain tiles together into one big terrain. In TC Terrain List -> Size -> shift click the <Fit All> button, does this. For the auto fit feature to work all the terrains must be present. It doesn't work when you have for example 3 terrains. It must be  $2 \times 2 = 4$  terrains,  $3 \times 3 = 9$  terrains,  $4 \times 4 = 16$  Terrains etc. You can resize the terrain tiles and fit them together again with the <Fit All> button.





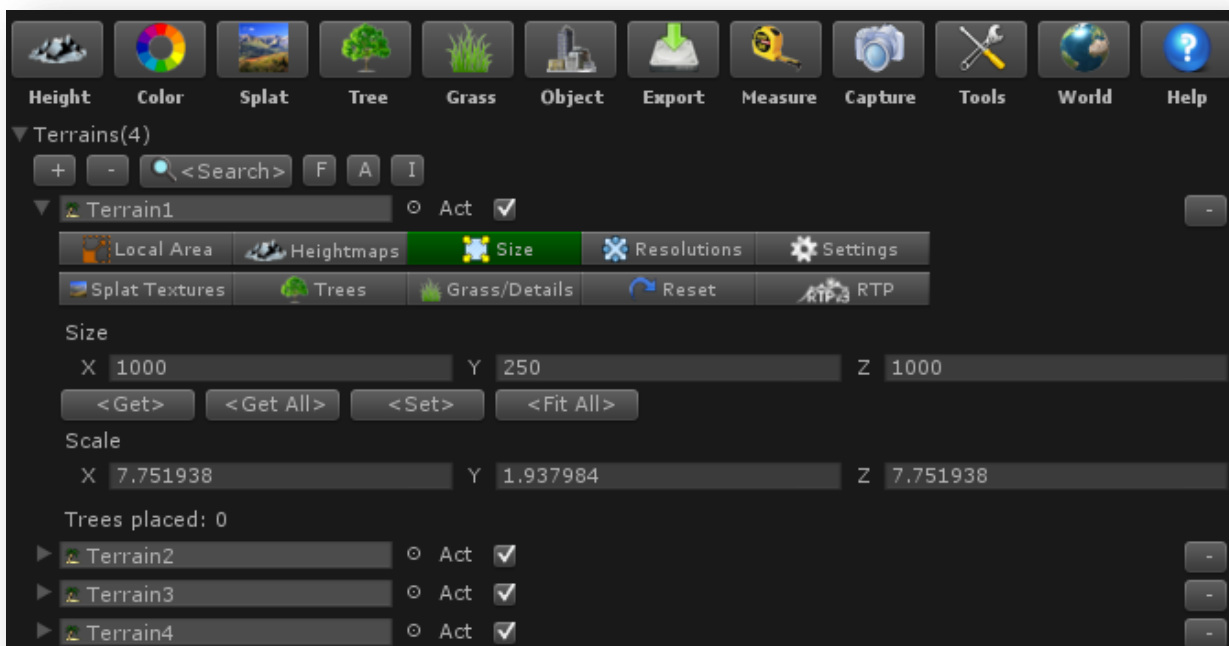
## Creating new Unity Terrain(s) in TerrainComposer

1. To create a new terrain go to the TC Terrain foldout. Another terrain can be added to existing ones by clicking the '+' button. The numbering will be automatically started from the last terrain. So if there are 4 terrains, the next terrain(s) that will be created will start with number 5.
2. Choose your desired size and resolutions.
3. Choose a Path where the terrain data should be stored in your project.
4. Choose the Terrain Asset Name for the name of the terrain data. The terrain number will be automatically added to the end of the name also if you create multiple terrain instances.
5. Create a Scene Parent GameObject (optional), to parent the terrain to in the Scene.
6. Choose the terrain name for your scene. Also here the terrain number will be added to the terrain(s).
7. Choose how many terrains you want to create in 'Terrain Instances'.
8. Click the 'Create Terrain' button to create the terrain(s). Now all the terrain data is created in your project, and you will see the terrain(s) appear in the Scene.



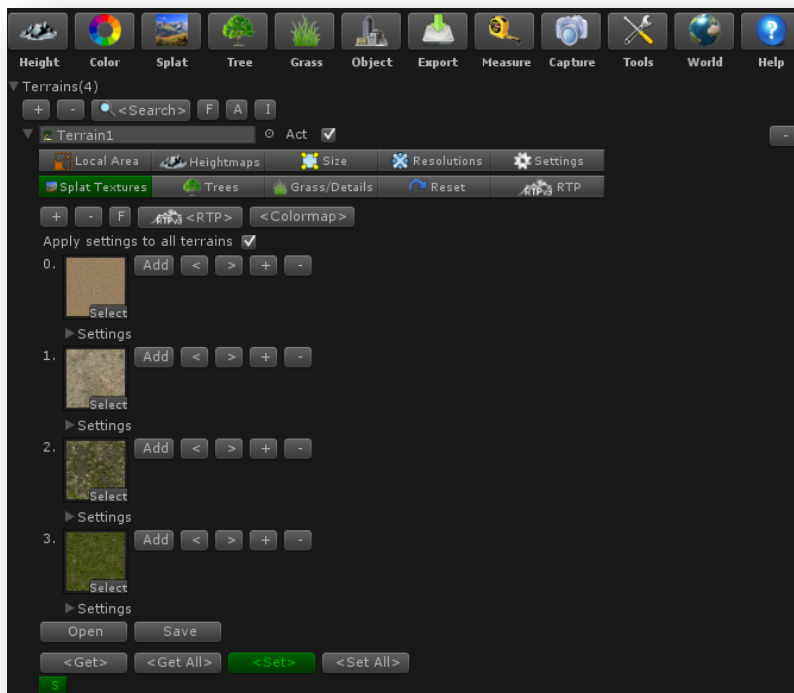
## Terrain options in TerrainComposer

- Once you created the terrain(s) with TC, new options will appear. If you have more terrains in the list then the buttons <Set All> will appear. By shift clicking these buttons the setting of that particular tab will be copied and pasted to all the terrains in the list.
- Also the <Get> and <Set> buttons will appear, because the terrains in the TC terrain list have their own class that holds the data and need to be synced with Terrains in the Hierarchy. With the get and set buttons you can read/write (synchronize) the information with the terrain in the Hierarchy. If you already had a terrain in the Scene or you would manually change the terrain in the Scene, you can get the settings from the terrain by shift clicking <Get>. If you change information in TC then you need to shift click the <Set> button to write the changes to the terrain in the Scene. The <Set> button color will get green if the information between the two are not synchronous, so you can either click <Get> or <Set>.
- The Scale under the size tab is the scale between terrain size and heightmap resolution. So in the picture 2.44 meter per heightmap pixel.
- Under the Reset tab you can reset heightmap, splatmap, trees, grass/detail and placed objects by holding the control key and clicking. If you want to do this for all terrains shift control click.



## Assigning Splat textures to your Terrain

- Every terrain needs splat textures. These are the textures that are used to decorate your terrain. The optimal performance is using only 4 splat textures. For every 4 splat textures Unity creates another splat map. A splatmap is an image where each of the RGBA channels is used for the location of 1 splat texture.
- Adjust the Tile size of each splat Texture to look realistic. For ground/grass/dirt I recommend keeping it on the low side 5-20, and for rock/cliff textures you can choose higher Tile settings like 40-100. It also depends on your splat texture resolution import settings.
- Once you are done with assigning the splat Textures and the Tile sizes, shift click '<Set>' to transfer these settings to the terrain in the Hierarchy. If you shift click '<Set All>', all the terrains in the TC Terrain List will be set to these splat settings and synced with the terrains in the Hierarchy.
- You can save/load assigned splat textures. So splat textures can be quickly assigned, without doing all the manual assignment over again each time.
- There is a colormap option for each terrain. It uses a splat texture with the tile size that of the terrain size, so the whole texture is spread out over the terrain. To enable/disable shift click <Colormap>. The advantage of using the colormap button is that for multiple terrains the colormap splat texture won't be overwritten with <Set All>, since they are unique for every terrain. Also the colormaps can be assigned using auto search in the Select window.
- If you have RTP you first have to assign with Set All, 4 or 8 splat textures and then shift click <RTP> to enable RTP in TerrainComposer. This will automatically assign the RTP script to each terrain. And you can setup the diffuse, normal and height texture in TerrainComposer. Also the global colormap and normal maps can be assigned with auto search in the Select window.



## Assigning Trees/Grass and detail meshes to your Terrain

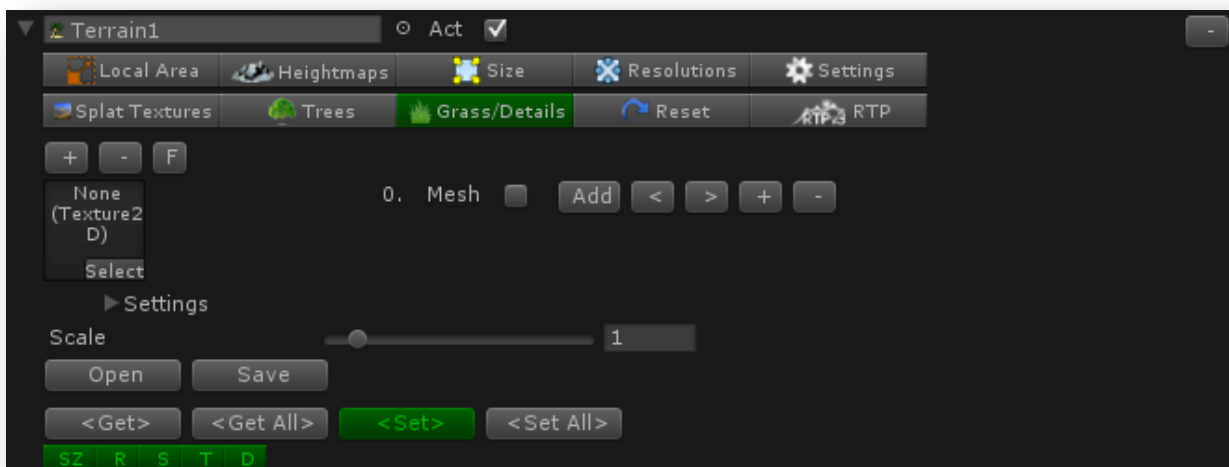
### Trees

1. You can assign trees at the Trees foldout, this works the same as the Splat foldout, here you can add your trees from your project. There must be at least one tree added for the tree layer to work.
2. Click '<Set>' to transfer the data to the terrain in your Scene.

### Grass/Detail meshes

1. You can assign grass/detail meshes at the Details foldout, this will also work the same way. There must be at least one texture assigned for the grass layer to work.
2. You can choose between textures and meshes. For textures assign the texture field.
3. To my opinion the best and fastest performance is to set Render Mode to -> Grass, this will not let the grass always face the camera. Billboard will always face the camera.
4. Click <Set>/<Set ALL> to transfer the data to the terrain(s) in the hierarchy.

## Asynchronous Terrain Messages



If a setting in the TC terrain list is not synchronous a green colored button will be added under the terrain, so you can see it easily and correct it.

- The 'SZ' button is for asynchrone Size.
- The 'R' button is for asynchrone Resolutions.
- The 'S' button is for asynchrone Splat Textures.
- The 'T' button for asynchrone Trees .
- The 'D' button for asynchrone Grass/Details.

If you click the buttons it will automatically foldout to where you can click the <Get> or <Set> button to remove the message button.

If you have multiple terrains active, for the tile system to work you need to shift click <Fit All> button. If the tile system is inactive it will be indicated by the red button behind the terrain. The tile system will break after clicking the <Search> button, so you will have to shift click <Fit All> again.



## Terrain Settings

These are the same settings which you can set with Unity terrain. The difference is that in TerrainComposer you can set higher values, and you can set them for the editor mode as well as runtime mode. Also settings can be applied automatically for multiple terrains, saving you tons of time. You can change the max settings in TC Menu -> Options -> Terrain Max Settings. You also have the option to apply it to all terrains, which saves a lot of time. Keep in mind to not set the settings too high for Editor mode, especially the grass distance, it might crash Unity.

## Base Terrain

### Pixel Error

Controls the amount of allowable errors in the display of Terrain Geometry. This is essentially a geometry LOD setting; the higher the value, the less dense terrain geometry will be.

### Heightmap Maximum LOD

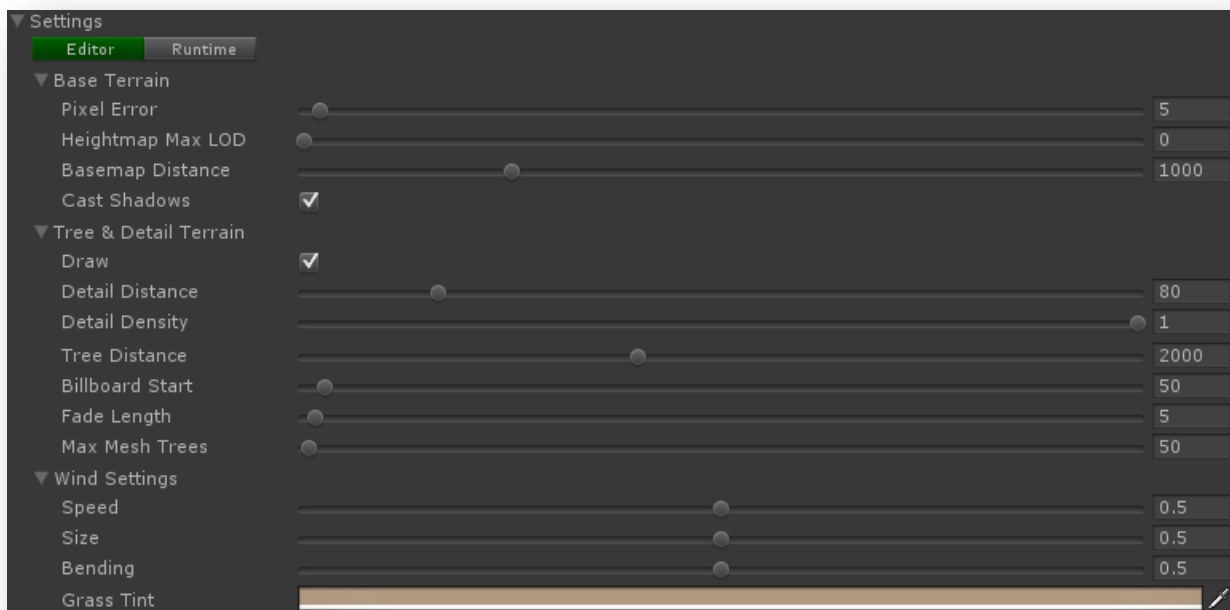
Lets you essentially lower the heightmap resolution used for rendering. This can be used on low end cards to never display the highest lod terrain. A value of 0 means always showing highest detail. A value of 1 means the triangle count will be reduced to 1/4th. The heightmap resolution will be halved for width and height.

### Base Map Distance

The distance that Terrain Textures will be displayed in high-resolution. After this distance, a low-resolution composited texture will be displayed.

### Cast Shadows

Should terrain cast shadows?



## Tree & Detail Settings

### Draw

If enabled, all trees, grass, and detail meshes will be drawn.

### Detail Distance

Distance from the camera that details will stop being displayed.

### Tree Distance

Distance from the camera that trees will stop being displayed. The higher this is, the further-distance trees can be seen.

### Billboard Start

Distance from the camera that trees will start appearing as Billboards instead of Meshes.

### Fade Length

Total distance delta that trees will use to transition from Billboard orientation to Mesh orientation.

### Max Mesh Trees

Total number of allowed mesh trees to be capped in the Terrain.

## Wind Settings

### Speed

The speed that wind blows through grass.

### Size

The areas of grass that are affected by wind all at once.

### Bending

Amount that grass will bend due to wind.

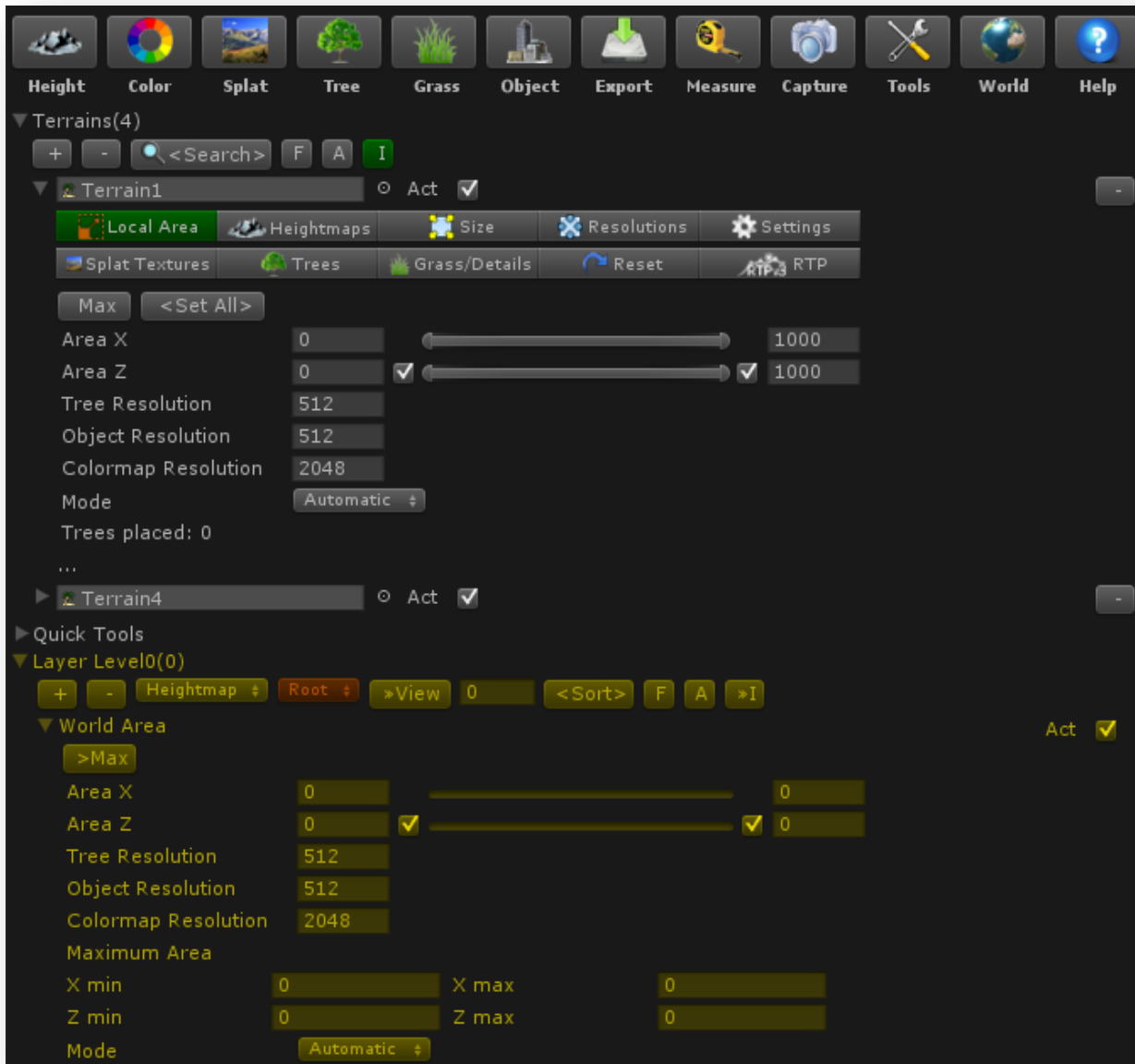
### Grass Tint

Overall tint amount for all Grass and Detail Meshes.

# Local Area and World Area

## Customize output Areas

TerrainComposer can use custom square areas. It is used with multi-level placement and I can be useful if you only want to output to a certain area to see quick results, as a bigger area takes more time to calculate. TC support two area modes, Local Area and World Area.



## Generate Resolution

An area can be setup with different generate resolutions. The Step is the distance jump in Unity units that TC makes within its generation loop (x is the x-axis, y is the world z-axis). That this is customizable, is needed for faster performance in generation as well as for placing objects and trees that need more placement precision. It's not an option to put the step mode to -> custom -> 0.1 always, because it would take too long to generate. Standard the mode is on automatic, which will automatically select the highest resolution from the categories of the active output buttons.

## Local Area

The Local Area mode restrict the area to the borders of its terrain. However with multi level placement there is only World Area, because for correct generation on multiple terrains. For example you place a building through layer Level0 and for layer level1 you have an Area of 512x512 Unity units. You want to place trees around the building. But if the building would be placed near the border of the current terrain, at where the level1 area would exceed the border of the current terrain, there would be no placement.

In local area mode TC will generate each terrain one by one, by starting with the terrain in the top of the TC Terrain List, to all the way down. If you deactivate a Terrain it will be skipped. It is very usefull with multiple terrains to only activate one terrain and disable the rest between final setup, to lower generation time.

You can select a local area in every terrain in the list. If you use multiple terrains and you want to use the Local Area of the terrain for the rest of the other terrains (including Step Mode), shift click <Set All>.





## World Area

The World Area mode has no boundary limitations. It can run outside the terrain boundaries also where there is no terrain next to it, this options might be needed for object placement. So you don't need a terrain to place objects. However most of the time you don't want to set the world area bigger than the total size of your combined terrains.

To have all the freedom you want, you can change the max boundaries of the area yourself, by setting the Maximum Area values. By clicking the '>Max' button the area will automatically be set to the maximum you defined. To calculate the maximum area of your combined terrains shift click '>Max' button. And by clicking it again without holding shift, will set the area to the maximum.



# The Generation System

## Introduction

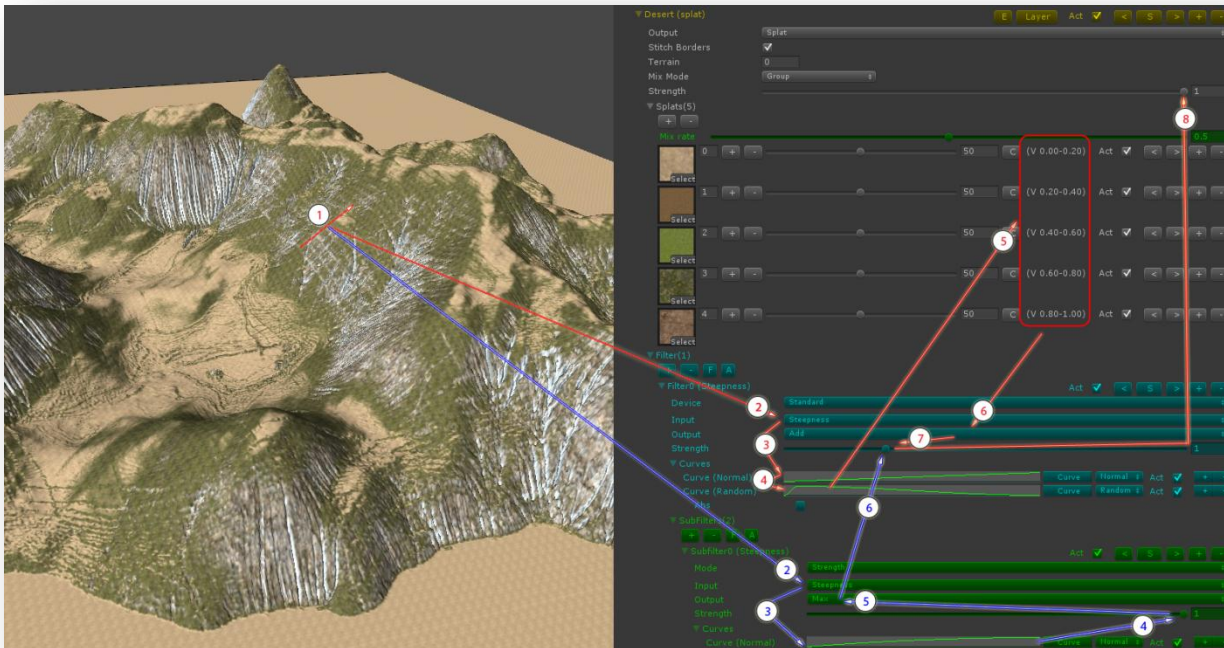
Because TerrainComposer uses a generation system that works the same for every output you can duplicate a layer with its filters and masks, change to another layer output, and go from there.

For example you created a tree layer for placing forests on your terrain. Now if you want to place grass at where you placed the trees, you can duplicate the layer, change the layer output to grass, and the same rules are already there. And then you can make small modifications for the rules to fit your need. Or if you want to place rocks in your forest, you just change layer output to object and go from there on. Another example if you make colormaps and splatmaps, you can just duplicate your color layers and change them to splat layers or vice versa.

For understanding how filters and masks work. I recommend watching the short tutorial videos on my site about this topic: [TerrainComposer Tutorial Videos](#)

Each layer has its filter system, where you can add an unlimited amount of filters (blue color). And every filter can use multiple masks. With filters and masks you can create the rules for how each layer generates its output. Filters are for choosing the items from the layer, while masks are for density.

The picture is an example of a splat layer with a filter and a mask. The filter is for selecting the splat textures in the layer, while a mask is for the how much opacity of the splat texture selected by the filter. For each filter and mask you can choose an input parameter, for example parameters from the terrain like height, steepness and normal or certain colors or color ranges from an image, etc. TerrainComposer works with normalized values with a range from 0 to 1. The filter in the picture reads the normalized steepness from the terrain, 0 degrees steepness is normalized to 0, 45 degrees is normalized to 0.5, while maximum steepness of 90 degrees is normalized to 1. This is done because then you can use each input parameter the same way and also because the Unity curve editor default curves have ranges from 0-1.



## Filter from input to output

1. The filter reads the steepness for example 45 degrees from the terrain at certain coordinate.
2. The read 45 degrees will be normalized to an input value 0.5.
3. The normal curve is active and will be evaluated at time 0.5. Because the curve is linear going from 0.0 to 1.1, the filter value will stay 0.5.
4. The random curve is active and will be also evaluated at time 0.5. You can't see it on the picture but this is about 0.14. Because this is a random curve a random value between -0.14-0.14 will be chosen and added to the filter value. Let's say 0.1, so the filter value now is  $0.5 + 0.1 = 0.6$ .
5. Because mix is on 0.5, splat 2 and splat 3 are chosen, and are added with each alpha of 0.5..
6. The splat2 and splat3 alpha values will be added to the filter value, how much is depending on the next step.
7. The strength of the filter influences how much alpha value will be added for the selected splat to the layer value. A strength of 0.5 will decrease the chosen alpha by 50%. While strength of 1 is a 100%.
8. The layer strength will decrease/increase all the strength of its filters inside the layer. A layer strength of 0.5, will decrease them by 50%. This you can use to mix 2 layers.

1. The mask reads the steepness of terrain at the same coordinate, which is 45 degrees.
2. The read 45 degrees will be normalized to an input value of 0.5.
3. The normal curve is active and will be evaluated at time 0.5. Because the curve line is deviating from a linear line from 0.0-1.1, the mask value changes to 0.75.

4. The mask strength will determine how much influence the mask value has on the filter strength. If it's on 0.5, then it will only influence the filter strength for a max deviation of 50%.
5. This filter contains 2 masks (only the first mask is visible on the picture). The output is on 'max', so the if the value of mask0 is bigger than the value of mask1, mask0 value will be chosen.
6. The mask value will change the filter strength, because it is 0.75. The filter strength (1) will become  $1 * 0.75 = 0.75$ .

The layer strength is on 100% so the total output value of this layer is splat 2 ->  $0.5 * 0.75 = 0.375$  and splat 3 also 0.375. To see how it works its best to experiment with it, you can use auto generation to quickly see any changes you make.

### Filter and mask use in a layer

Here is a short overview of what each filter and mask in the different layer outputs are for:

	Filter	Mask
<b>Heightmap Layer</b>	Height	Height
<b>Color Layer</b>	Color	Opacity
<b>Splat Layer</b>	Splat Texture	Opacity
<b>Tree Layer</b>	Tree	Placement Density
<b>Grass Layer</b>	Grass	Placement Density
<b>Object Layer</b>	Object	Placement Density

### Layer Strength, Filter Strength and mask value

The mask value and layer strength are linked. With layer strength you will decrease the mask strength as the layer strength and mask are multiplied. A filter without masks has a default mask value of 1, that will always give 100% height, alpha or density (based on the layer output).

### Input

There's the following different filter and masks input you can use:

- Height -> reads the normalized terrain height.
- Steepness -> reads the normalized terrain angle.
- Direction -> reads the terrain normal.
- Image -> reads from image using colors or color ranges.
- Random -> selects a random number between 0 and 1.
- Random Range -> selects a random number between 0 and 1000 and choose a range.
- Always -> select the input value yourself.
- Current -> reads the current total filter value.
- Max Count -> gives a set amount of 1. Once the max is reached input will be 0.
- Raw Heightmap -> reads from a raw 16 bit grey scale image.
- Splatmap -> reads from the splatmap.
- RayCast -> does a raycast to get a height or hit of selected layers.



## Output

If you use multiple filters in a layer or multiple masks in a filter, a total filter/mask value is used. With the output you can choose how your filter/mask will influence this total value. For masks there are less options to choose from.

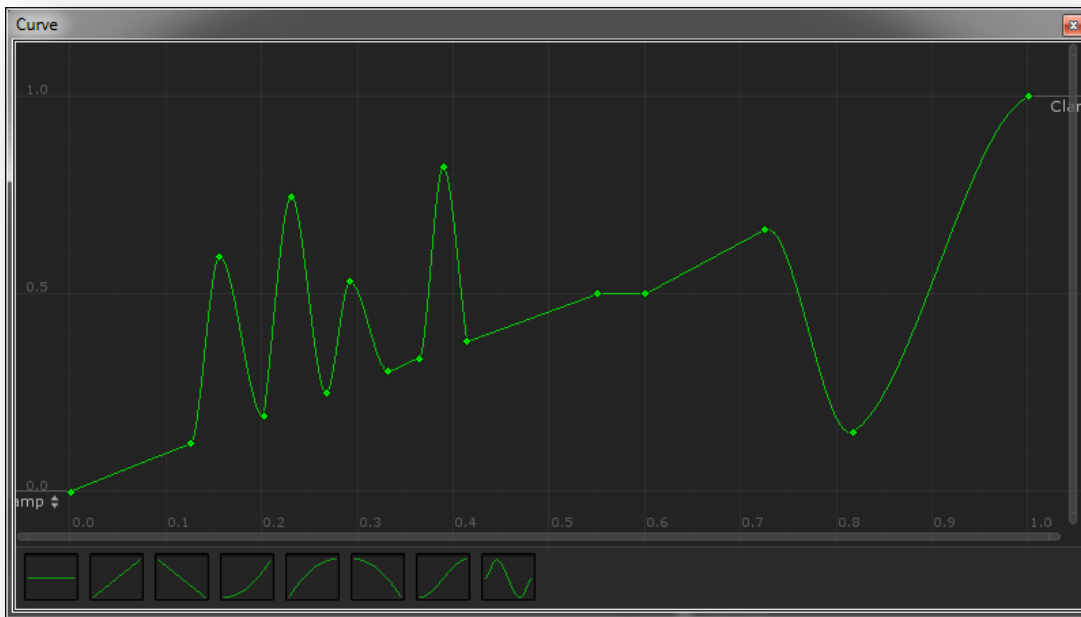
- Add -> Adds to the total filter value.
- Subtract -> Subtract from the total filter value.
- Change -> Changes the total filter value to this filter value (overlay).
- Multiply -> Multiplies with total filter value.
- Divide -> Divides with total filter value.
- Difference -> Takes difference between total filter value.
- Average -> Divides by amount of filters and then adds to total filter value.
- Max -> Compare this filter value and total filter value, chooses the highest value.
- Min -> Compare this filter value and total filter value, chooses the lowest value.

## Combine

If you use a splat or color layer, for each filter it will choose a splat/color and then draw. If you want to use the filter total instead of choosing for each filter you can enable combine. This option appears on each filter that is not the last in the list.

## Curves

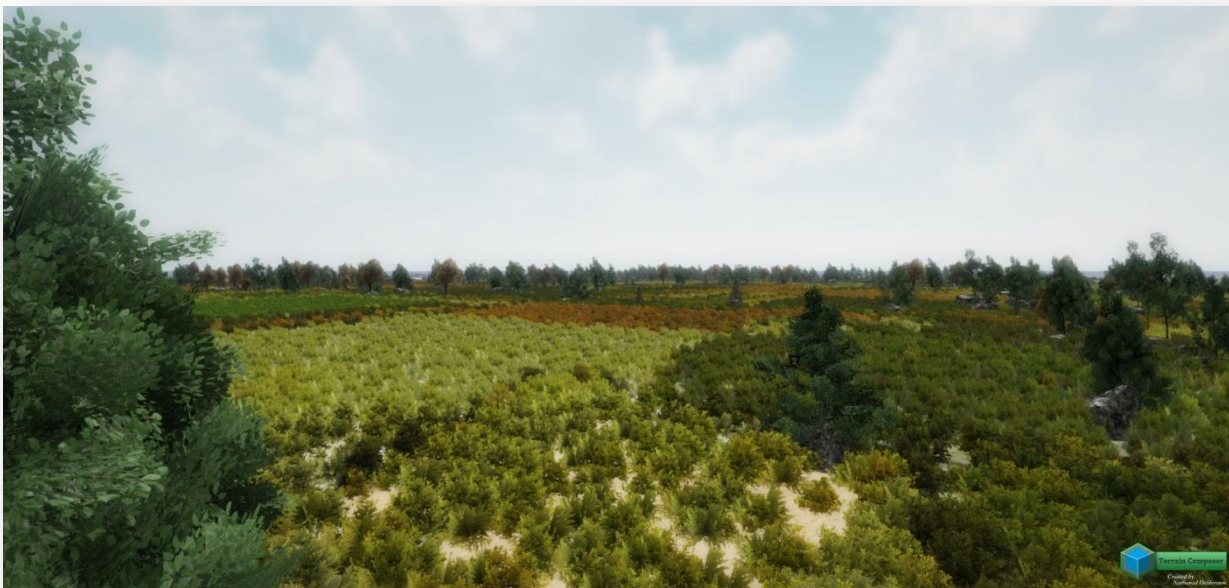
In each filter and mask you can add/remove curves. At the moment there are 3 types, a 'normal' curve, a 'random curve' and a 'perlin curve'. A 'normal' curve will change the input data. A 'random' and 'perlin' curve will be added or subtracted from the input data. Here a random range will be chosen from 0 to the vertical value you set. It will also randomize negative values in the same range. if you want only positive values to be added enable -> Curve Abs.



## Deviate the output with a curve

You can use a curve to change an input value to another value. A curve works like this, first the filter/mask read its input value. Then that value (horizontal) will become the vertical value that will be evaluated in the curve, which will give a new value if the curve line isn't going linear from key 0.0 to key 1.1. There are two variables in each curve, the input which is on the horizontal axis and the new value which is on the vertical axis. You can use the curves in filters and masks to give all kinds of effects, simply invert an output or for mixing filters and layers, etc.

## Tree Colors from an Image

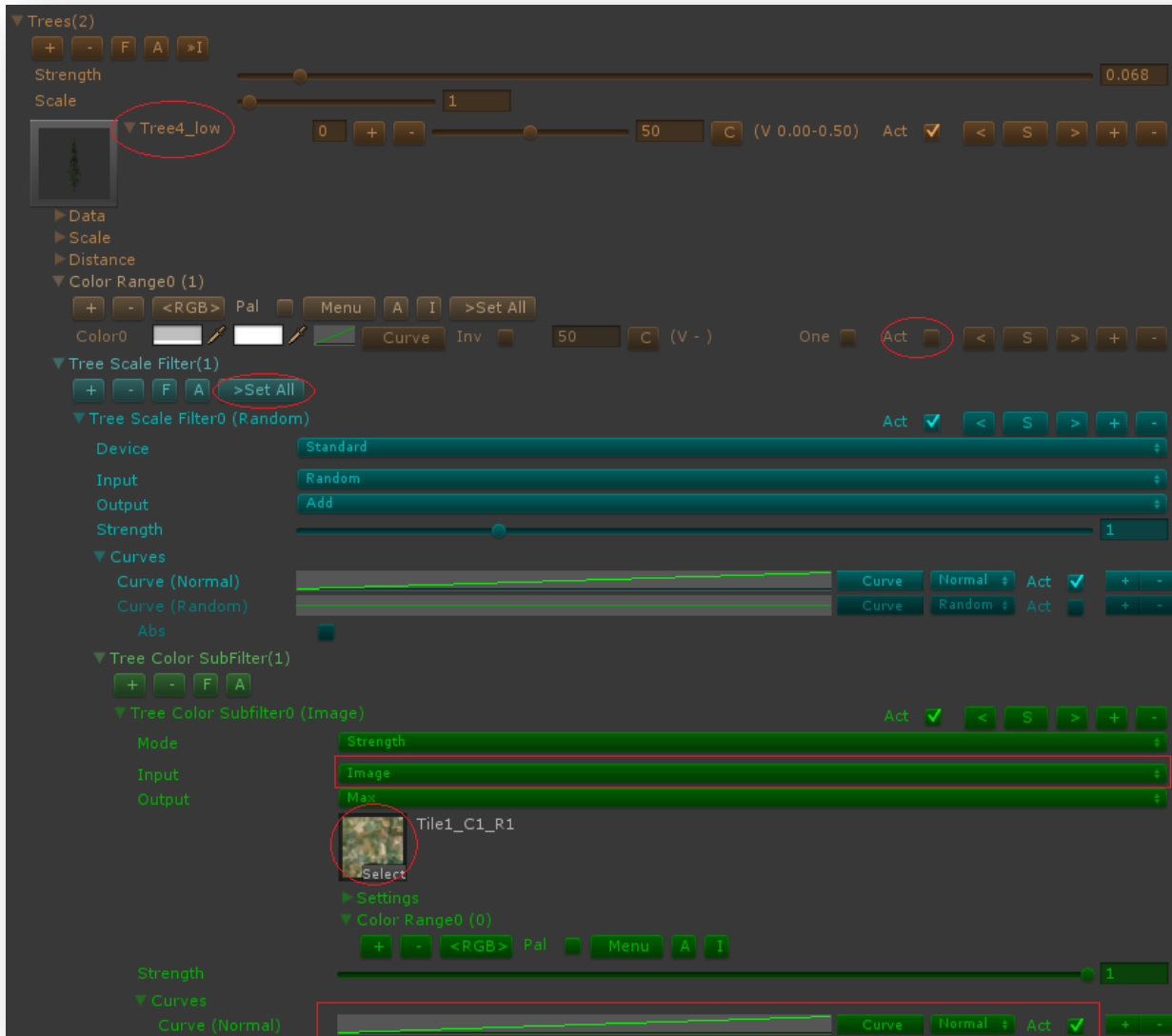


In these two example screenshots, I use a satellite image to color the trees. This can give very good looking results. The satellite image I used is included.

## Setting up tree layer for tree colors from image

To setup a tree layer for this:

1. Unfold a tree in the tree layer.
2. Deactivate or erase color0 from 'Color Range0'.
3. Unfold the filter (Tree Scale Select) and the mask (Tree Color Select).
4. Change Input from 'Random' -> Image.
5. Assign your image.
6. You can use the normal curve to make the colors brighter (higher curve key0) and darker (lower curve key1).
7. Click '>Set All' at the 'Tree Scale Filter' if you want to apply this for all active trees in the layer. Shift click to apply to all trees.



## Generate Settings

With generate settings you can adjust the speed of generation and set different parameters for generation. To display generate settings go to TC Menu -> Options -> Generate Settings.

### Generate Speed

This is the manual speed of generation. The generate speed are the number of rows TC will generate before returning to Unity. You can use manual generate speed if you want to generate at the maximum speed. If auto speed is enabled this setting has no influence.

### Object Place Speed

This is the speed for object placement. This is the number of objects that can be maximum placed in a row before returning to Unity. It works the same way as Generate Speed and only in manual speed mode.



### Run in Background

Generate keeps running even when the focus is on another window outside Unity.

### Auto Save Global Settings

The global TerrainComposer settings are saved each time after the selected minutes pass. The global settings area stored in the folder TerrainComposer -> Templates -> 'global\_settings.prefab'. If you delete this prefab it will reset the settings. If you have WorldComposer it will save your regions and areas into this prefab. You can also backup this prefab manually.

### Progressbar Auto Generate

Shows the generation progress bar when generating in auto generate mode.

### Auto Fit Terrains

Will automatically stitch terrains together after creating and resizing.

### Grass Density

This is the default max value that will be assigned for grass. The maximum value is 16 as more can give gaps between grass placement.

### **Angle Smoothing**

This is the square area size on the terrain that is read with 'Steepness'. A higher value will give more smoothing with texturing. TerrainComposer uses its own angle calculation function to calculate the angle at the border of multiple terrains. This will give seamless texturing from one terrain to another.

### **Angle Rounding**

If you get a dark-light pattern in texturing with 'Steepness' then you can set the Angle Rounding to about 50. Unity GetHeight function has 1% deviation. I only noticed this with texturing a terrain that was straight going up with 30 degrees. It might be needed in rare cases.

### **Unload Textures and Clean Memory**

These options attempt to keep the memory more clean, by doing manual garbage collection after each generation.

### **Project Prefab Mode**

Use this if you want to use the same TerrainComposer project in different Unity Scenes without having to manually save/load to project in every Scene after modifying it.

### **Runtime Create Terrain**

Enable this if you want to use TerrainComposer in runtime to create terrains on the fly.

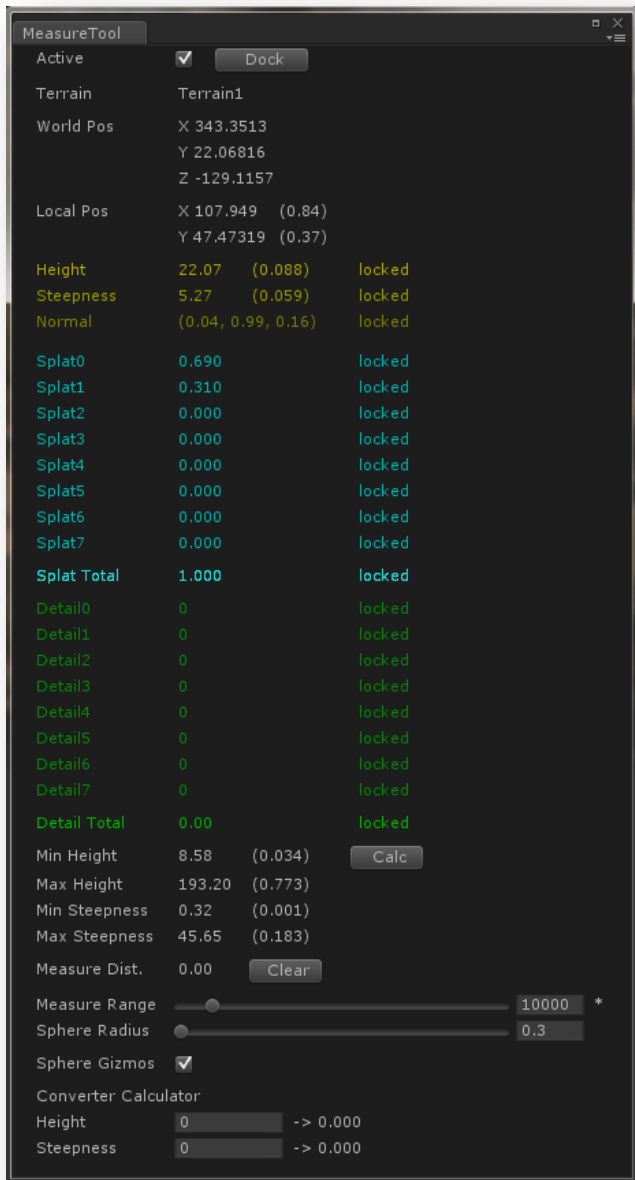
### **Load Terrain Data**

Load terrain settings from saved TerrainComposer projects. The default value is off. And if you load a TerrainComposer project, the terrain list will stay the same.

# Tools

## Measure Tool

With the measure tool you can measure terrains. The terrain will be measured at the mouse pointer in the Scene view. You can measure the height, steepness and normal of a terrain. The normalized height and steepness is displayed behind between the parentheses. You can use the measure tool to create rules in the filters and masks by visually measuring terrain height and steepness. If you want to freeze at a certain position to read the values, hold control and right click at that position. Now 'locked' will appear behind the values, control right click again to unfreeze again. The splat values are also measured including the splat total value. With splat texturing this should be always 1 (when higher you get over bright texturing), except if you use shadows with splat texturing on your terrain.



The grass/detail is also measured (green color). There is also a converter calculator if you want to know the normalized values of height and steepness, you can enter them there, and the normalized value will be displayed behind it.

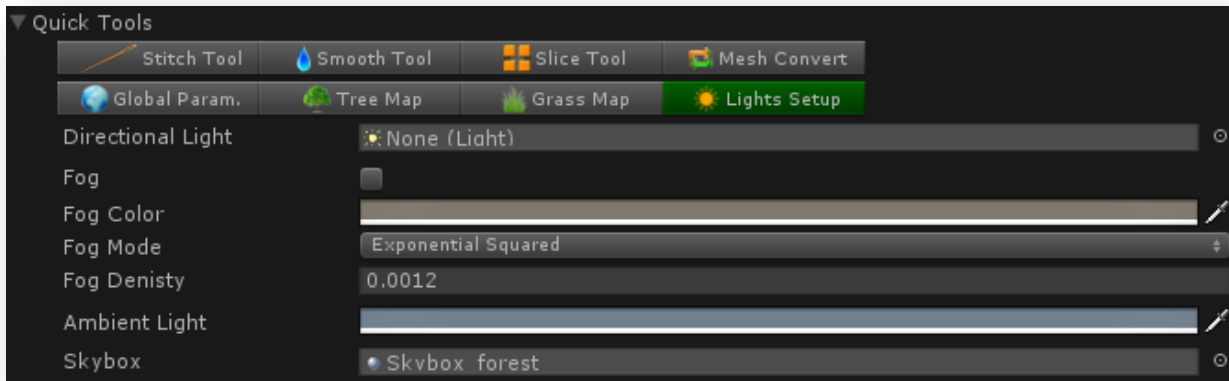


## Quick Tools

### Stitch Tool

If you create multiple terrains and there are seams at the border of the terrains you can use the Stitch Tool. This is located in Quick Tools foldout -> Stitch Tool. You can choose the stitch length in 'Border Influence', this length is in Unity units. Depending on how well the terrain heightmaps fit, you can choose a value. If they almost fit a low value will give the best results. If they do not fit at all a higher value is needed.

The 'Stitch' button will execute the stitch. Remember that in the editor mode you will always see a seam, even if the terrains fit perfectly. If you go to runtime mode there should be no seam visible. In the heightmap layer you can enable 'Stitch Borders'. Which will automatically stitch the terrains after generating. The border length is read from the Stitch Tool.



### Smooth Tool

There is also a Smooth Tool located in Quick Tools, this is for smoothing the terrain. You can select the smooth strength, this can be a decimal value like 0.1. The repeat is the amount of times the smooth is executed. For example if you choose repeat 3 it will smooth the terrain 3 times with the smooth strength. In the heightmap layer is also the smooth toggle. If you enable this it will automatically smooth the terrain after generation, with the value from 'Layer Strength' in the Smooth Tool.

### Slice Tool

With the slice tool you can slice each terrain in the terrain list into 4 terrains. And those terrains again into 4 terrains, etc. The heightmap, splatmap, trees and grass will be sliced. To slice choose a path and terrain scene and asset name. If the path is the same as where the terrain that you want to slice you must use a different terrain asset name. Always make a backup of you terrains before doing such operations on terrain. Erase terrain scene will delete the unsliced terrain from the scene. Erase TerrainData project will delete the unsliced terrain from the project. For each terrain there will appear 4 terrains into the terrain list.

### Mesh Convert

Will convert multiple Unity terrains into meshes. You can only do 33, 65 and 129 heightmap resolution at the moment. Choose a path where you want to save the meshes. You can also choose a material that will be automatically assigned to each mesh.

## **Global Parameters**

Changing the height scale and height sea level, changes the how TerrainComposer reads the height input. Changing these values give you a different generate result without having to change each height input in filters and masks. The same for Degree, it is for changing steepness input globally.

Stitch heightmap will automatically execute a heightmap stitch after generating heightmap layers.

Stitch splatmap will automatically share splat texturing on the terrain edges, so you will see no seam of it. This should be enabled on default.

## **Tree Map and grass map**

You can export trees and grass of every terrain by selecting the tree/grass output and enabling the export button. After exporting you can load the tree/grass map with quick tools. If you click generate the maps will be generated again. You can use multiple maps and also generate with tree/grass layers over it.

You can use it for saving manual changes you made to the trees/grass. Also it can be used in runtime to generate the terrains before starting a level. Then you have the option to reduce the density which will give faster performance. So a way for a user to select vegetation resolution in your game. This is faster than using Unity terrain distance/density settings, as when not there trees/grass will still have some overhead.

## **Lights Setup**

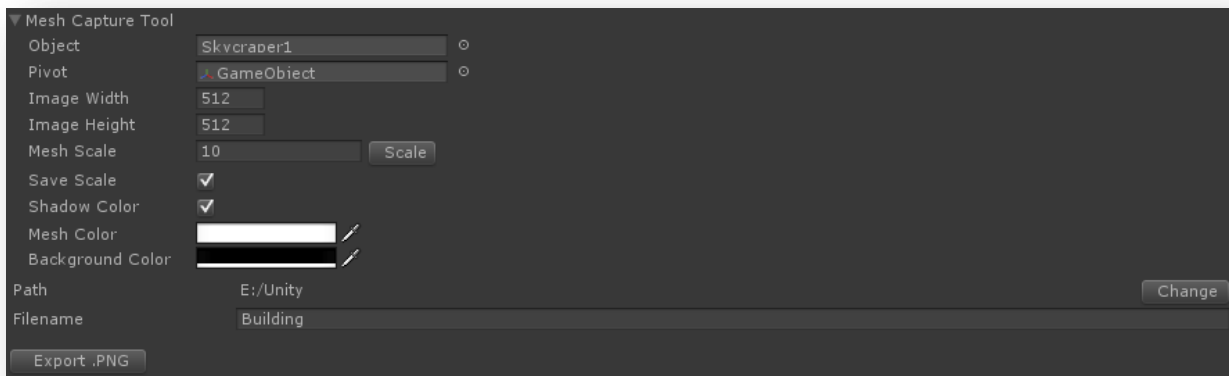
Setup your directional light and other parameters like fog and ambient light without having to go to different menus in Unity.

## Mesh Capture Tool

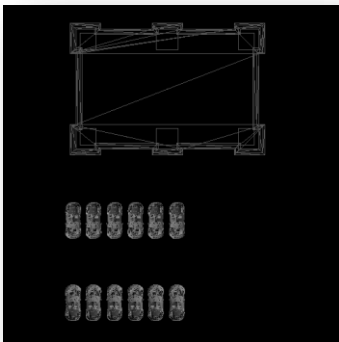
With the Mesh Capture Tool you can make a top view wireframe image of 3d models in your Scene. This is about the same view as selecting 'wireframe' display in Scene View and Scene Gizmo on top (in Unity). The difference is that the mesh capture tool will capture an exact scale. The image can be used for filters and masks (in Input -> Image). And especially in multi-level placement.

To make a top view image of meshes:

1. Enable the mesh capture tool, click the camera button at the top, or go to TC Menu -> Tools -> Mesh Capture Tool.
2. The 3d models you want to make an image for have to be in the Scene.
3. Drag the GameObject that has the mesh into 'Object'.
4. If you want to make an image of more meshes these GameObjects containing the meshes must be children of the GameObject in 'Object', and you must place them all relative to each other and to the right scale in the Scene View.
5. You can choose a manual pivot. It's easy to use an empty GameObject, position it in the Scene View, and drag it into 'Pivot'. If the 'Pivot' is left empty, the pivot will be the pivot of the GameObject in 'Object'.
6. You can choose the image resolution. Each pixel has a 1 Unity until resolution if the Mesh Scale is 1. If the Mesh Scale is 0.5 you have a 2 Unity until per pixel resolution, etc.
7. You can choose the zoom scale.
8. You can choose the mesh color and the background color.
9. Choose a path and filename.
10. Click 'Export .PNG'.

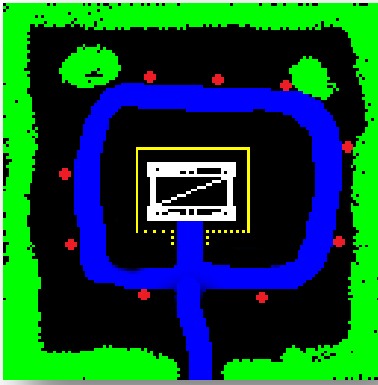


You can use the mesh capture image as a mask for example placing grass. When you don't want grass to be placed inside your meshes, etc.



\* An example image of a top view 3d model building with parked cars created with the mesh capture tool.

The mesh capture tool is especially useful when using multi-level placement. In the example image the building is the part that is created with the mesh capture tool. This then is used to design the garden around the building. You can assign any color to anything in TC, so what colors you use is totally up to you.



I used the white color for the building (not used for placement). The yellow color for the vegetation around the building (tree layer), the blue color to make a path (splat layer), the green color to place trees (tree layer) and the red color to place benches that face the building (object layer). In the picture below you can see the end result created with TC of this simple design.

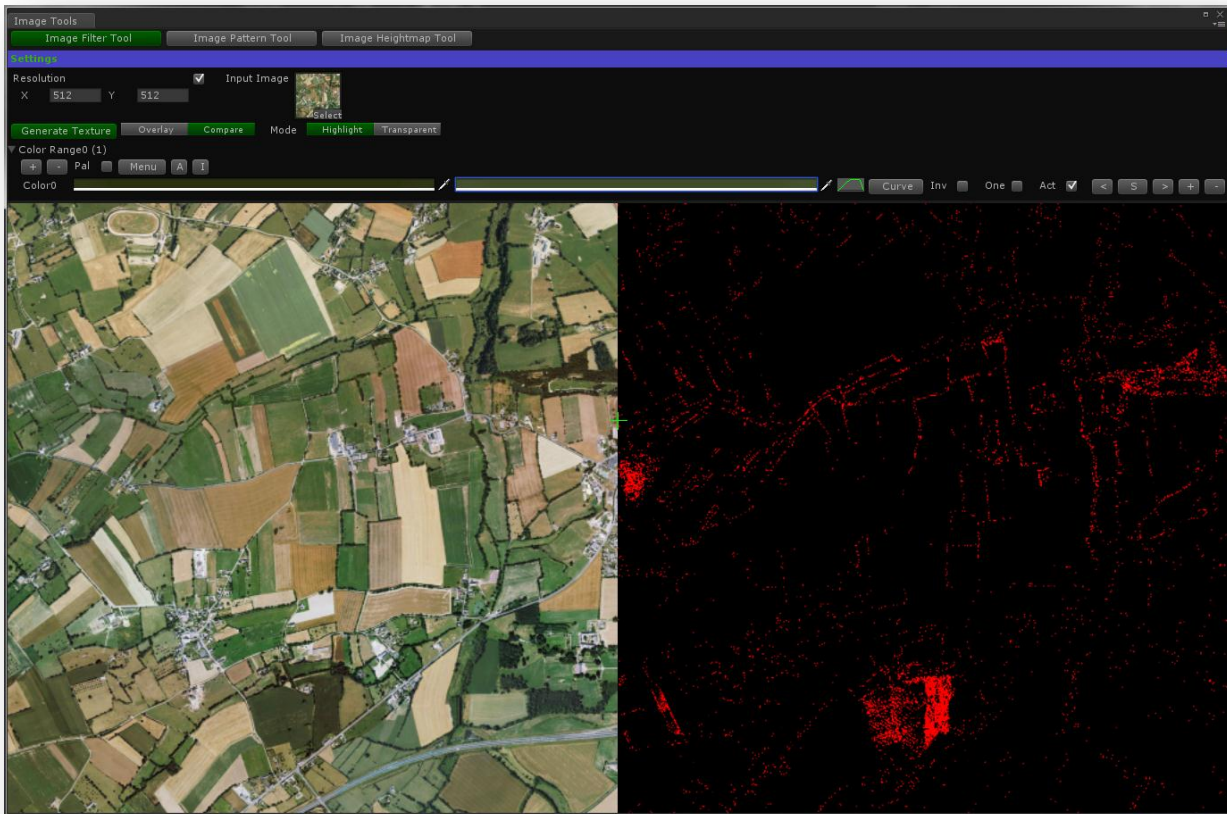


## Image Filter Tool

The Image Filter Tool can be used to visualize the output you get with using color ranges as rules with an image. This is the same output you would get with using 'Image' input in filters/masks with using the same color ranges.

To start it:

1. Click the blue tool button at the top, and select 'Image Filter Tool' button in the 'Image Tools' window. Or go to TC Menu -> Tools -> Image Filter Tool.
2. Select the image you want to use in the Input Image box.
3. Add color range(s), and pick your condition colors. You can zoom in on the image with the your mouse scroll wheel. Right click to zoom out to the real size again. slider. You can scroll around by holding left mouse click and drag.
4. Click 'Generate Texture' button. The filtering result will be displayed at the right texture box. You can also use auto generate for this, by shift click 'Generate Texture'.
5. You can load/save the color ranges. To do this click the 'Menu' button (above the first color of the color range), a menu will appear with Open/Save. If you have 1 color range you can copy and paste it directly into your filter/mask. Alt click on 'S' of the color range interface button. Alt click on the '+' on your image color range in your filter/mask.



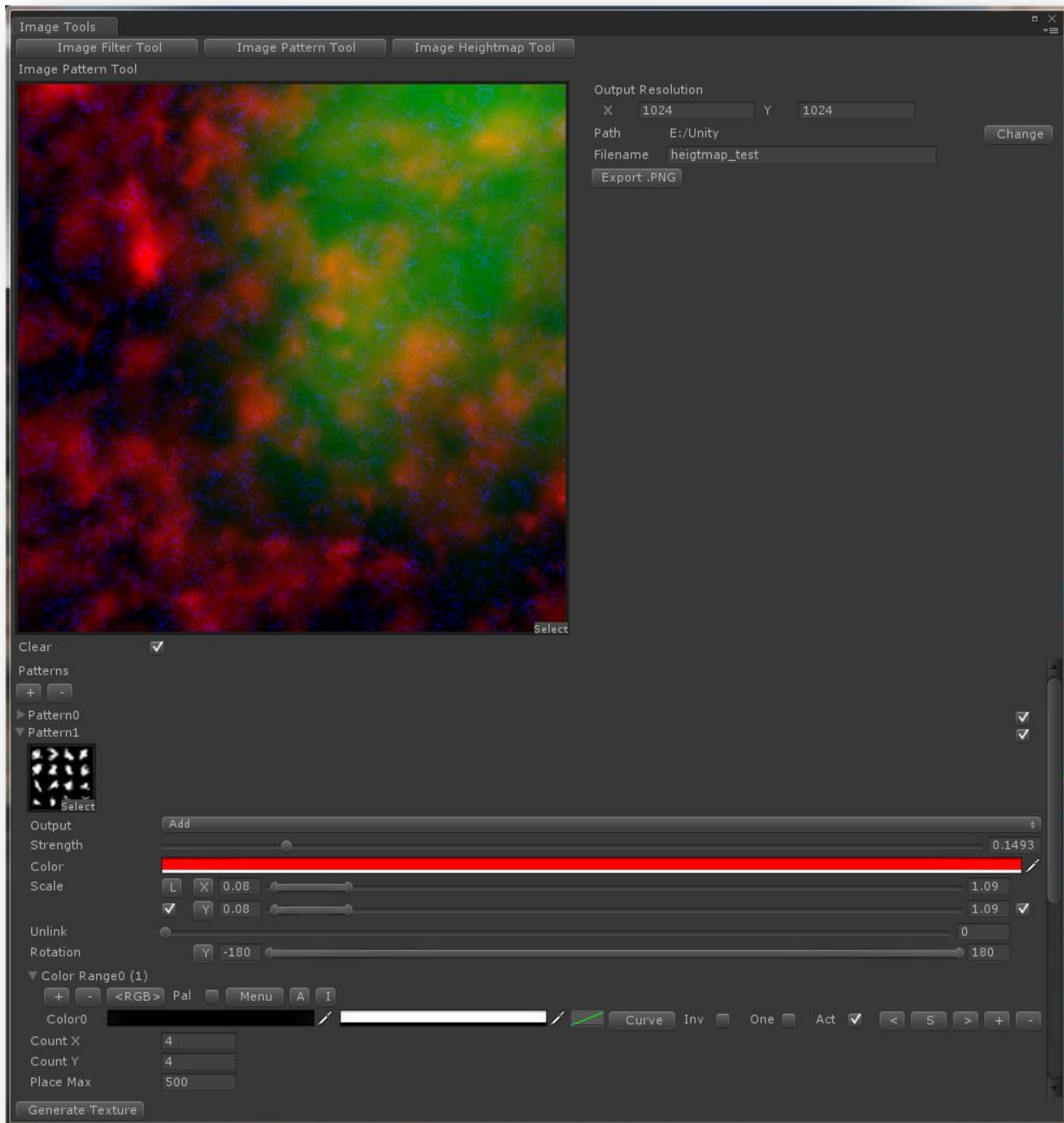
This tool is very useful for example when using satellite images where you want to choose a certain color range for placement of something. Like for the placement of trees in the example picture, because you see the preview you can fine-tune the output.

You can choose between Overlay and Compare. Overlay will draw the generated image over the input image, compare will put them next to each other. Highlight will make the color range a bright color in the generated image, so it easy to see. Transparent will draw the whole image with the highlight color on top.



## Image Pattern Tool

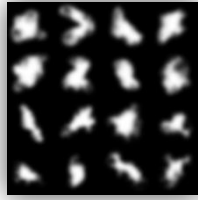
The Image Pattern Tool can be used to create all kind of images, which can be used for heightmap creation as well as texturing the terrain, or for placed rules, etc. It's based on input images that are painted with a different scale and rotation a chosen amount of times. You can also use multiple images in 1 image and split it in for example 4x4, which I did in the example pictures. You can add multiple images (patterns) and can use a color for each pattern. I used 3 patterns in the example picture, each one on a different color channel (RGB).



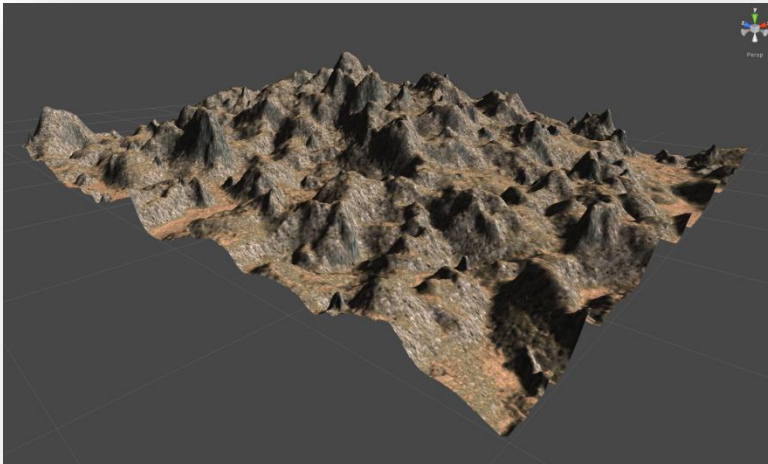
How it works:

1. Click the blue tool button at the top, and select 'Image Pattern Tool' button in the 'Image Tools' window. Or go to TC Menu -> Tools -> Image Pattern Tool.
2. You can choose an output resolution for your output texture, as soon as you change it the 'Change' button will appear, click it if you want it to take effect.
3. You can add/erase patterns with the '+' and '-' button under 'Patterns'.
4. You can select the picture in the texture box. I used these two images.





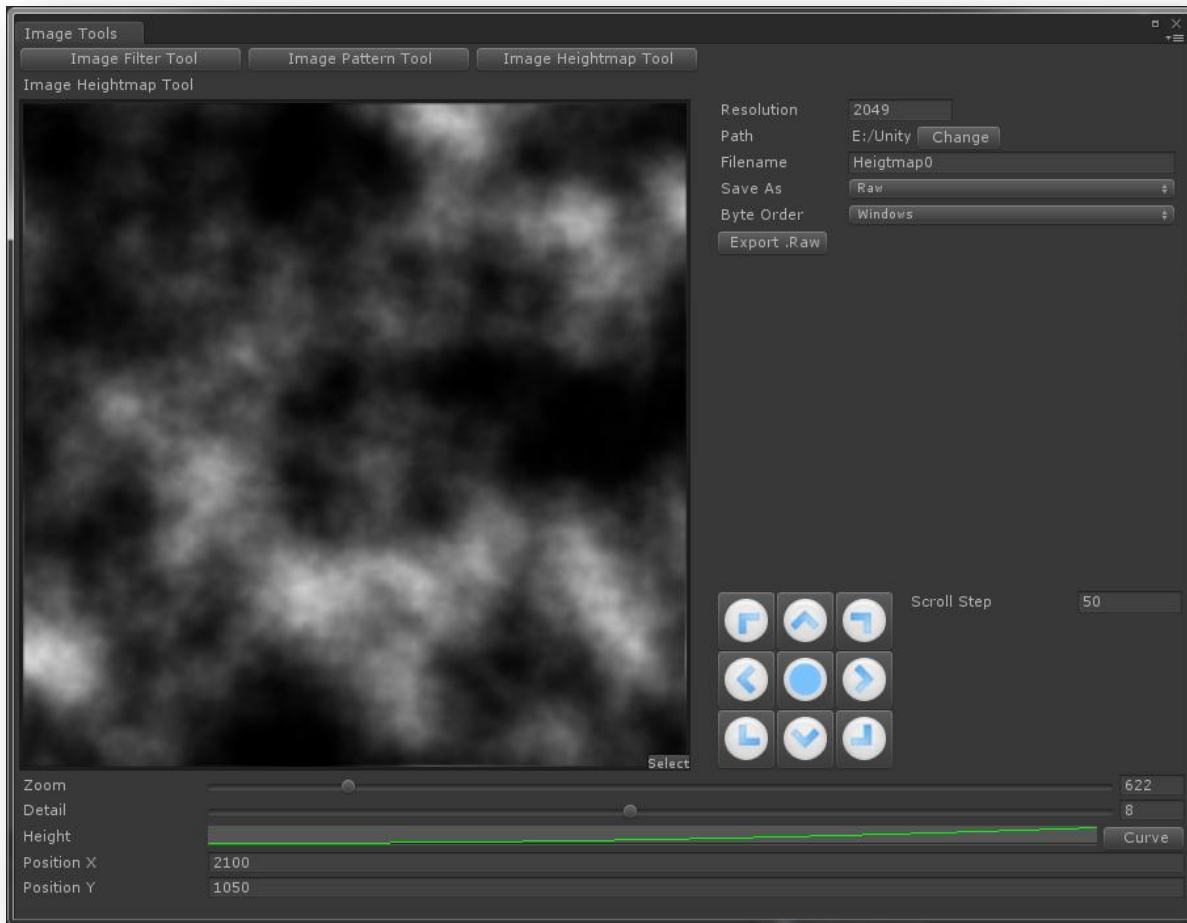
5. The 'Count X' is for how many images you have on a column, in this case 4. The 'Count Y' is how many images you have on a row, in this case also 4.
6. You can pick the scale range and rotation range, they will be randomly chosen within the range when generating the texture.
7. The scale y is linked to scale x, with unlink you can weaken the link strength. This works the same as with tree scale.
8. You can select an output, like Add, Subtract, Max, Min, etc. Also the strength of the output.
9. You can pick the color for the output, so it will change the color from the input texture to the color you chose. If you want it to be the same, leave it on white.
10. Add a color range to select color ranges from the input picture. If you want it to be draw completely add 1 color range, with first color black and second color white. Without a color range, it will not paint anything.
11. Choose how many times it has to be drawn in the output texture with 'Place Max'.
12. With 'Clear' you can erase the output texture each time you click 'Generate Texture'.
13. Click 'Generate Texture'.
14. Adjust and generate until you are happy with the result.
15. Select a path and filename and click 'Export .PNG'.
16. Now you can use the image in a filter/mask.



- \* Heightmap made with using the image (on the previous page) made with the image pattern tool. I use 1 heightmap layer and 3 filters (one for every color ) with input on 'Image'.

## Image Heightmap Tool

The Image Heightmap Tool can be used to make heightmaps and images. You can export them as 16bit raw files or as png images. If you are going to use it to make a heightmap, I recommend using the raw export, as it has more precision. Using an image with a heightmap layer gives a blocky result because of the 8bit. Because of this the terrain needs to be smoothed afterwards. This tool uses a perlin function, and it is the same as is used in perlin curves in filters/masks. The preview image will be updated immediately after changing something. This is very handy to see the end result, you can also use this tool to learn how perlin works and what can be done with a curve.



### How it works:

1. Click the blue tool button at the top, and select 'Image Heightmap Tool' button in the 'Image Tools' window. Or go to TC Menu -> Tools -> Image Heightmap Tool.
2. Select your resolution. For heightmaps it's best to use the same resolution that Unity terrain supports like 34,65,129,257,513,1025,2049,4097. Always use  $(2^n)+1$ . You can use a higher resolution for raw and spread it over more terrains.
3. With 'Zoom' you can zoom in and out depending on the scale you want.
4. With 'Detail' you can add more detail.
5. The curve works exactly the same as the normal curve in filters and masks.
6. The position can be changed with 'Position X' for horizontal and 'Position Y' for vertical. You can also scroll in all directions with the arrow buttons (white-blue). The speed you can set in scroll step. If you hold shift while clicking the buttons, the speed will be 3x faster.
7. If you alt click the middle button, the position will be randomized. To reset the position to 0,0 control click the middle button.
8. You can choose path and filename. Save it as an image or raw. Click 'Export .Raw'.

# Tips

## Performance

- For fast performance it's best to use 'lower' resolution output first as it saves generating time. If you double the resolution the size will be 4 times bigger so generation time takes 4 times as long. Another option is use high resolution and a smaller area.
- Use auto generation (Shift click 'Generate' button to activate/deactivate).
- Use auto generate speed.

## Realism

- To get realistic looking mountains and rocks and avoid tiling artifact. You can set higher tile size for those splat textures in the Terrain. It all depends on the distance vs. detail, so you need to find a balance between close and far view.