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Forest Generator

Hello, welcome to readme , which contains basic instructions how to use forest generator.

About

This plugin is unity implementation of my bachelof work, about generating forests. There are some specific problem in unity (for example multithreading) which cannot be properly implemented in unity.

Basic idea of this plugin is:

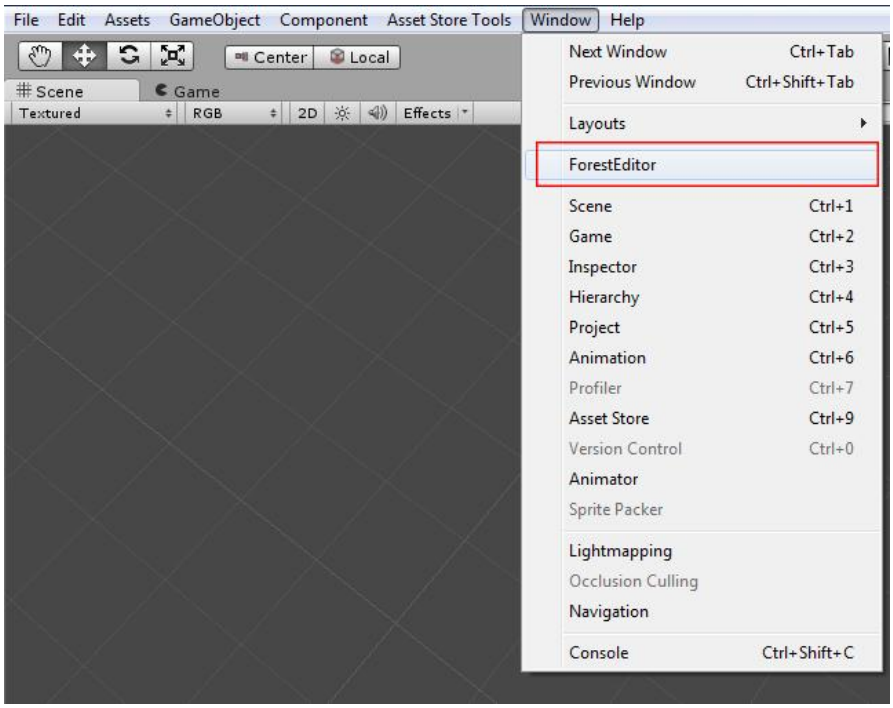
a) 1 terrain in scene (on positivno 0,0,0), with script Map
b) Multiple prefabs of trees with scripts (currently Tree1,Tree2)
c) Editor script

Each year every tree grow a little bit acording to the data a conditions, if conditions are good tree grow and they are healthy, if conditions are bad tree will slowly die. Moreover trees are weakening between themselfs if they are to close. All parametres can be changed and we can work with multiple type sof trees each for another part of map.

Basic setup

Easiest setup for illutration how it is work.

a)Create new scene



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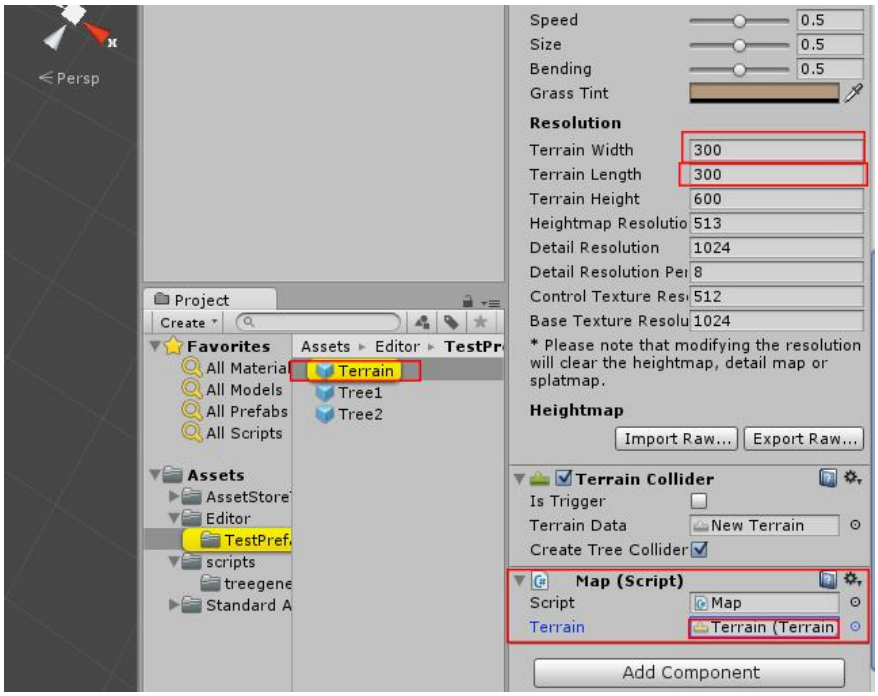
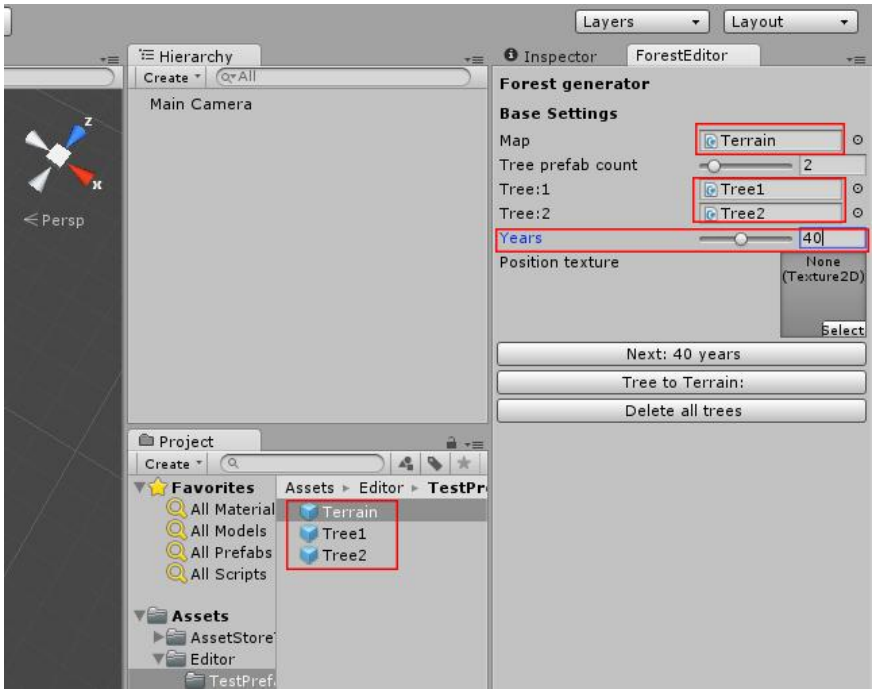
b)Windows- ForestEditor open editor

c) create new terrain (Terrain setting -> resolution-> terrain widht/height 300x300 enought to illustration) **!! terain need to be placed at 0,0,0 position !!**



d) add skript Map to terrain, and fill script Public variable with created terrain



e) Find 2 default tree preafabs Tree1,Tree2 (ForestGenerator -> Prefabs)

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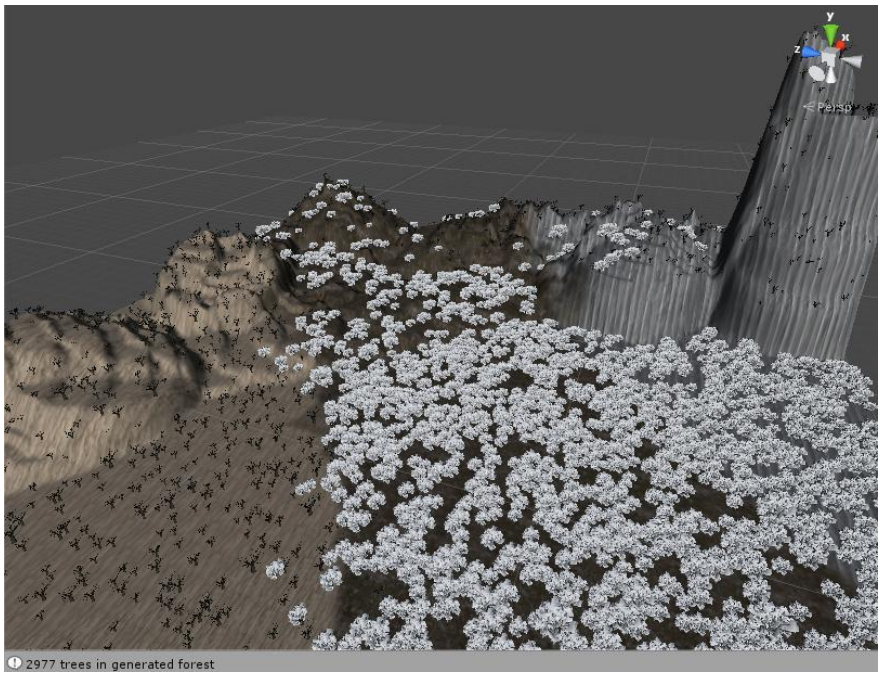
f) Tree prefabs and map drag into editor ,and slide Years set to 40

g) click on „Next:40 years“ button

Result:



Notes:

After that unity wil start procesing, it will looks like that unity freze but this is not that case. Here its problem that uniti editor works in single thread (especially if you need editing scene), so it will counting for a while. If you are not sure if unity really freze, try to look on root folder of your project and search for Debug.txt

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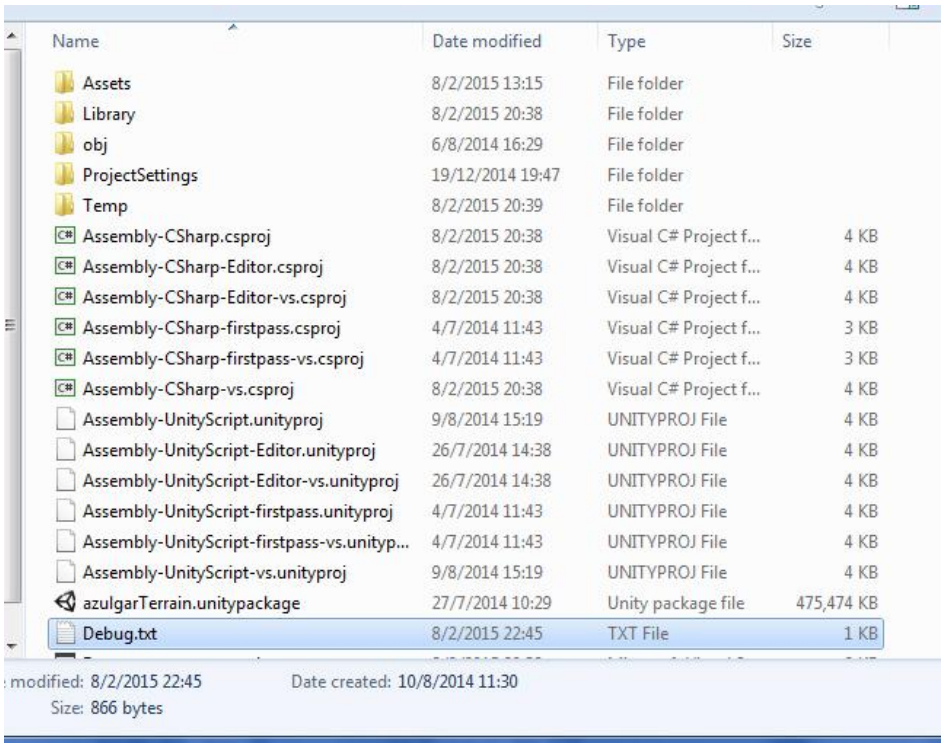

This file is continuously updated “each year”.

But this text case on my computer take only cca 60 seconds and created 3000 trees, 3000 trees is quite large number which can slow unity a little so be careful when you are trying bigger maps.

Additions features

Forest editor can do 3 main task

1) Clear new scene without any terrain, trees
2) Empty terrain wihtout trees
3) Terrain with trees

All these task work same , but with type 3 there is difference, editor won’t work properly if you have already placed trees (gameobject with script) anywhere outside the terrain, keep it at mind.

Trees into terrain

Editor can transfer all Trees into terrain (TreeInstance) with button „Tree to Terrain:“ if you wont use it make sure that in all Tree skript (for examplte Tree1,Tree2 you have filled

```
public static int PREFABID = 1;
```

with position of Treeprefan in Terrain -> Place Trees (edit-add trees), if you want Tree1 to be transfered to terrain as first prefab use PREFABID= 0 (countint start at zero)

this is usefull becaus treeinstances sclaes (and saves performance, LOD). Only problem is if you try it get from treeinstances back to gameobject. Currently stuck on „Out of memory problem“ with will be probalby fixed in unity 5.0.

Deleting trees

You can also delete all trees (gameobject and TreeInstance as well) with button Delete all trees.

Save forest to xml file

You can save created forest into xml file (in root folder of your project) and use it anywhere you want.

Basic structure:

```
<Forest>
	<Size>7780</Size>
	<Map>
		<Position>(0.0, 0.0, 0.0)</Position>
		<MapWidth>500</MapWidth>
		<Mapheight>500</Mapheight>
	</Map>
<Trees>
		<Tree>
			<ID>1</ID>
			<Position>(493.6, 11.2, 481.4)</Position>
			<YearChange>12</YearChange>
			<Health>100</Health>
			<Age>2</Age>
			<TEXTUREEFFECTS>0,-15,5,0,0</TEXTUREEFFECTS>
			<NEWTREELENGHT>25.1</NEWTREELENGHT>
			<CHILDRENNUMBER>0</CHILDRENNUMBER>
			<MAXNEGATIVELENGHT>18.1</MAXNEGATIVELENGHT>
			<MAXAGE>100</MAXAGE>
			<PARRENTAGE>17</PARRENTAGE>
			<MAXALTITUDE>100</MAXALTITUDE>
			<MINALTITUDE>0</MINALTITUDE>
			<MAXGRADIENT>10</MAXGRADIENT>
		</Tree>
</Trees>
</Forest>
```

Collide check

If tree is spawned somewhere where is colliding whith gameobject (other than map, tree) than is not placed. So tree cant spawn in the middle of wall for example

Texture set

If you want for some reasen set where trees can be placed and where cannot (just one simple condition like here is road, and here is park) you can use Texture to define good and bad zones.

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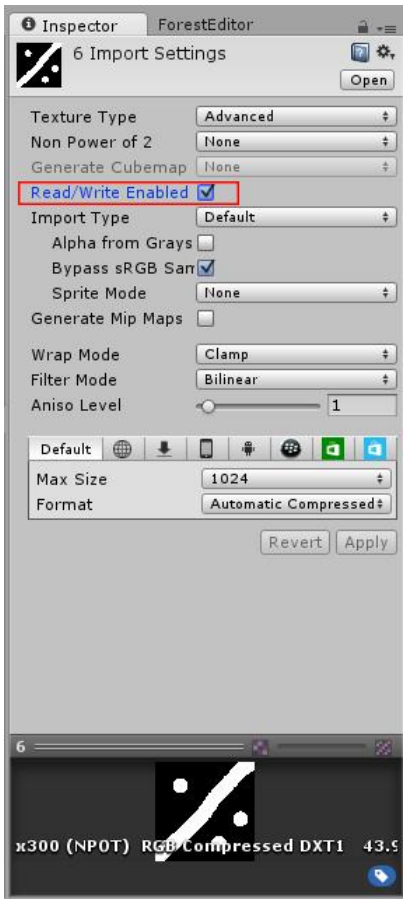
1) Import texture (**same size as terrain!**), texture type advance and read/write enable



2) Set into editor under position texture and generate

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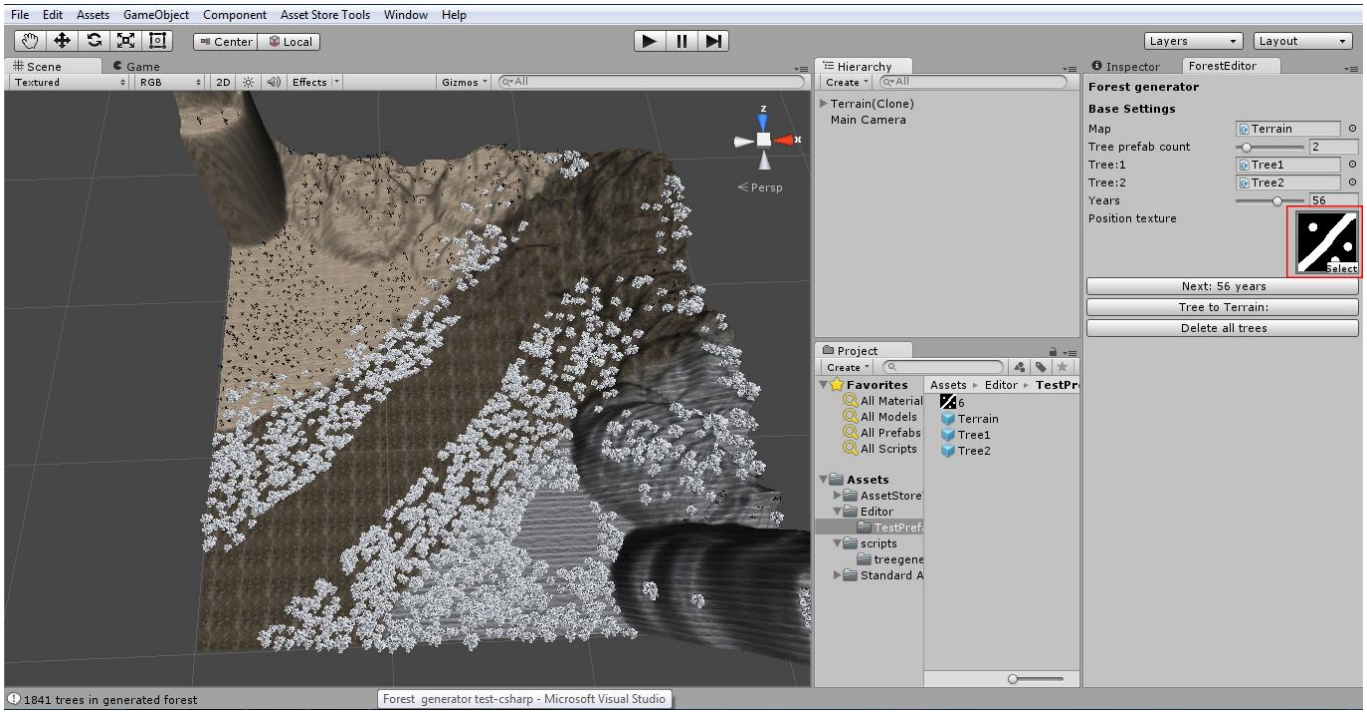

Tree

Each tree contains proprerties which changing tree behavior, and overall result of forest generating

public static int PREFABID = 0; - already mentioned in **Trees into terrain**

```
public static int [] TEXTUREEFFECTS = { 0, 5, -10, 0, 0 };
```

This is property determines in which type of terrian will tree grown better. Firts number in field set bonus if the tree is on first terrain texture, second number second texture. If you have more textures than numbers in field or vice versa, there is no problem, only "terrain and numbers which are left will be ignored". With it, that textured can be combined (at one position could be 80% textureA and 20% textureB its powerfull tools to say when do you want each tree)

```
    public int yearChange = 0; //jakou změnu zdraví mu dává statické prostředí za rok
    public int health = 100; // současné zdraví
    public int nexthealth = 100;
    public int age = 1; // současný věk
```

these property don't set, they are set in code

```
public static float NEWTREELENGH – maximum distance of new spawned tree

public static int CHILDRENNUMBER – maximum children which try to be spawned (depends of
age and health also)

public static float MAXNEGATIVELENGHT – how far trees negative effect (weakening others
tree nearby) is affected, this is strongly affect tree density, also depend on age and
health
```

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```
public static int MAXAGE = 100; - maximum age before dying (won't die immediately bt
after few years)

public static int PARRENTAGE – from which age tree could spawn childrens

public static int MAXALTITUDE = 100;
public static int MINALTITUDE =60; min/max height which is best for tree

public static int MAXGRADIENT = 20; -max slope/gradient of terrain where tree is feel
good
```

New tree

If you want new tree you can edit current scripts or create new one, fastest way copy existing and changing value. New Class need to be derived from `ITree` abstract class.

Limitations

Only limitations is memory and performance of your komputer and unity. When i try maximum tree i created over 90 000 trees on 2000x2000 terrain but it took me about 2 hours,and i am sure that this game will be very laggy, editor was almost unusable.

Tips and tricks

If you are not sure with changes property, try it on smaller terrain.

If you are generating new forest, that you need for good reset cca 2*X years, where X is `PARRENTAGE` of tree (at least 2 generations)

```
MAXALTITUDE and MINALTITUDE are not strick limitation, multiple levels os limit
```

Outer (min-150, max+150) really bad
Outer (min-40, max+40) bad
Outer (min+40, max-40) good

If some screenshot doesnt fit (there are new buttons) , just ignore new button and folow scripts

Same with maxgradient
Gradient > MAXGRADIENT + 20 – really bad
Gradient > MAXGRADIENT + 5 –bad
Gradient > MAXGRADIENT -5 – good

Good bad effects are cumulative, so few good and one bad say most time its enough, but all bad one good – probably not,

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For details you can look at **`SetPositionEffect`** `in Treemanager`

This plugin is combination of rules + random, so if you try it twice you can get diferrent results.

Future plans

1) *Export: i know that unity editor can be slow and with thousand of gameobject could be problems, so i want implemnet easy probably XML export with all data* - **done**
2) Map position – currently map Leeds to be at 0,0,0 for many mason, main reasen is that, i depends on few checks on multiply classes and change it would be really difficult