Procedural City Generation Manual

The following steps describe how to get the Procedural City Generation up and running.

Prerequisites

In order to run the tool, the following are needed:

1. An installation of the Unity Game Engine (version 5.5+) is required. The Unity Game Engine can be downloaded at `https://store.unity.com/download?ref=personal`. Installation instructions for Unity can be found at `https://docs.unity3d.com/Manual/InstallingUnity.html`.

2. The project source files for the City Generator. A zipped folder with these files will be provided alongside this document. Or the files can be downloaded from `https://www.dropbox.com/sh/wvtdn43hzewy47j/AAD78dPygCXa1UrYtdPq9Lnia?dl=0`

Opening the Unity Project

After these requirements are met, the following steps are required to open the project inside of the Unity Editor.

1. Open Unity

2. In order to work with Unity, a free account is required. Sign up for Unity in the displayed interface and log in with your account.

3. Now open the provided Unity project in the Unity editor by clicking on "Open" (Figure 1), and navigating towards the (unzipped) project folder.

Running the CityGenerator Tool

After the project has been opened, the Unity Editor should correctly load in the Editor tool. To then generate a city, the following steps should be performed:

1. Ensure there is exactly one 'Terrain' object in the Unity Scene. The Unity hierarchy window shows which objects are placed in the scene (Figure 2). To open the hierarchy window: **Window** > **Hierarchy**. If there is no such object, a Terrain object can be added from the menu, under
GameObject > **3D Object** > **Terrain**.

2. Open the City Generator Editor Script from the menu, under
Tools > **CityGenerator**.

3. Generate a Terrain. Modify the parameters inside the GUI if desired, and click the **Generate New Terrain** button. In the Scene View, the original terrain object is now changed. Clicking the **Generate New Terrain** button again changes the terrain. When satisfied with the result, click **Save and Proceed**.

4. The Population Map Generation step of the algorithm is now shown. Again, modify the parameters if desired, and click **Generate Population Map** to generate a population map. The terrain will now be colored according to population data, as visible in the Scene View. Repeat this step until satisfied, and click **Save and Proceed** when done.

5. The Growth Map generation component is now shown. You will now see that the Growth Map GUI has more parameters to adjust than the population map generation, giving you more control over the Growth Rules to be used. When satisfied with your parameters, click **Generate Growth Map**. Your generated growth map is now displayed on the terrain. When satisified with the result, click **Save and Proceed**.

6. Next is the Road Map Generation. You will be presented with 10 parameters to adjust, where 12 more parameters are available under "Advanced Settings". The exact meaning of these parameters is described in our project report. If desired, there are also two buttons to again preview the growth map and population map on the terrain, these can be used to compare the generated road map to your previous inputs.

   - When satisfied with the parameters, click on **Generate Road Map**.
     Note that this may have very different results due to the nature of the algorithm. If the button does NOT work (e.g. it generates zero roads), click it again to generate a different road map. In general, a few tries should be enough to generate an interesting road map.
   - After this is done, click on **Generate Road Meshes and Blocks**. When this is completed, the Scene View should display smoothly generated road meshes.

   Click on **Save and Proceed** to continue to the next step.

7. You will be presented with the Building Generator Component. Check 'Generate Windows' if you want to generate windows on the buildings, or leave this empty. Click **Generate Buildings** to generate buildings for your generated city.

Going into Play Mode

The Unity editor is basically a game engine. Everything you have been doing so far was in your game scene. So now you can play and walk around in the "game" you just made! In order to play, a camera is required. The provided project should already contain a "FPSController" (Figure 2). Make sure this FPSController is positioned above the terrain (this should already be the case). All you need to do now is press the play button (Figure 3).

Source Code

The source code for the City Generator can be located in the project folder under **Assets** > **Editor**.

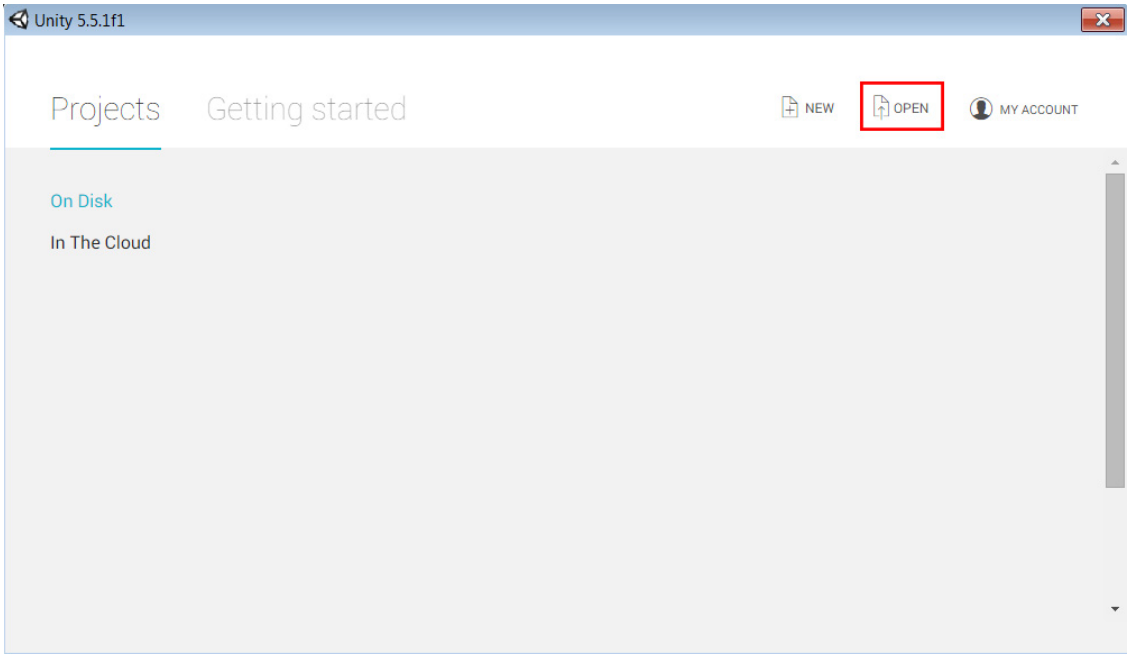

Figure 1: Once you open unity, click on open project.

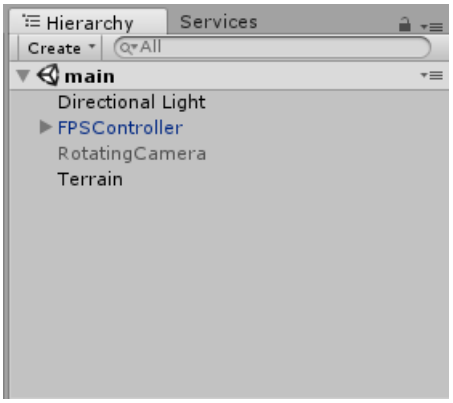

Figure 2: Unity Hierarchy shows which objects are in the scene. In this case there is a Directional Light which makes sure there is light in the scene. There is a FPSController which can be used to walk around in the game. There is a RotatingCamera (disabled). And there is a Terrain object.

Figure 3: The leftmost button starts the game