Lab7 : Putting Everything Together

Introduction

In the previous six OpenGL tutorials you've learned to use textures, programmable shaders, basic shading, cube-mapping, render-to-texture and shadow maps. You also implemented a very simple lighting model and some camera control and animation. Each of these were implemented and demonstrated in very simple isolated programs.

It's time to put everything together into something larger. In this final OpenGL tutorial you'll get to work on a somewhat more complete program:

- Try out some 3D-modelling software
- Export data from that software
- Implement enhancements to a small 3D application

In this file, you'll find instructions for using Blender, a "free open source 3D content creation suit", which is available for most major operating systems. Alternatively, instructions for 3D Studio Max exist (find them in the `project.pdf` file in the `project`-subdirectory.).

First, you'll have to install Blender. Make sure that you work with a version newer or equal to 2.5 - the UI has undergone major changes between 2.4 and 2.5.

On StuDAT-machines, you should download the 64-bit ZIP Archive (at the time of writing, the version available is 2.68a) from

http://www.blender.org/download/get-blender/

and just extract it somewhere. In the extracted folder, there's a `blender.exe`, which you should run. **Important: on StuDAT machines you need to use the .ZIP archive, and not the installer. You do not have sufficient permissions to install software using the installer.**

If you're using your own machine, feel free to use the installer. Under Linux, Blender might also be available through the distributions package manager. Just make sure to get a version newer or equal to 2.5!

Getting Started

Right now, the example program will load a scene from an OBJ model. If you run the example program, you'll see a sun that orbits a small island. Check it out yourself - it's not very stylish, right?
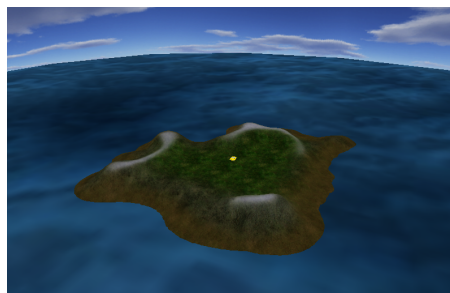

We'll want to add some stuff to the island. We'll perhaps want to add some buildings, some trees, or, well, anything. Later, you'll also get the chance to improve the rendering with the techniques

you learned during the course.

Getting started with Blender

To get going, start Blender. You should see the something similar to the image on the left. Dismiss the Splash-screen by clicking outside of it; now your screen should look like the right image below:
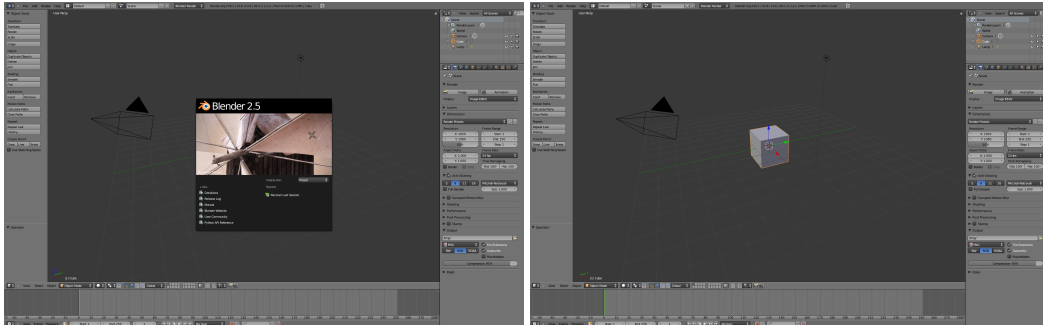
By default, you have a small scene with a camera, a light and a box (highlighted in the left image below). We'll want to get rid of those now. Objects are, by default, selected by *right-clicking* on them[1]. Hold *shift* to select multiple objects. When you have selected all objects, press *x* to delete them, and confirm using the dialog that pops up (see right image below).
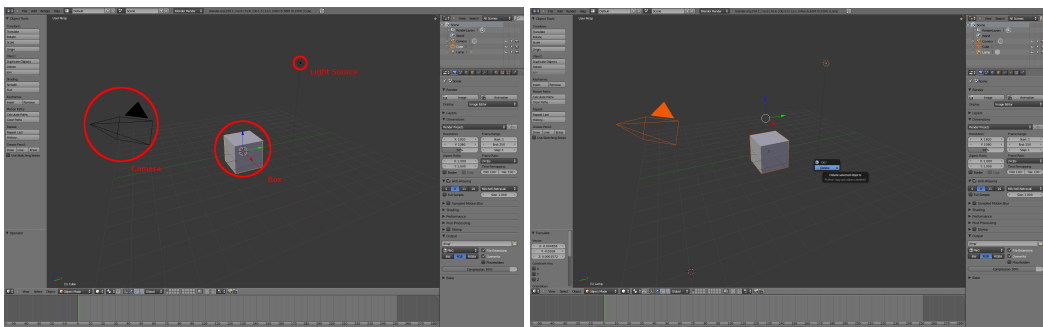

You should now have an empty scene to work with. Now, let's add a simple object that we can play around with. For Blender, this will be a Monkey. Use either the *Add*-menu in the top menu-bar, or press *shift-a*. From the menu select *Mesh→Monkey* (left image below). Ensure that your result looks something like the right image below.


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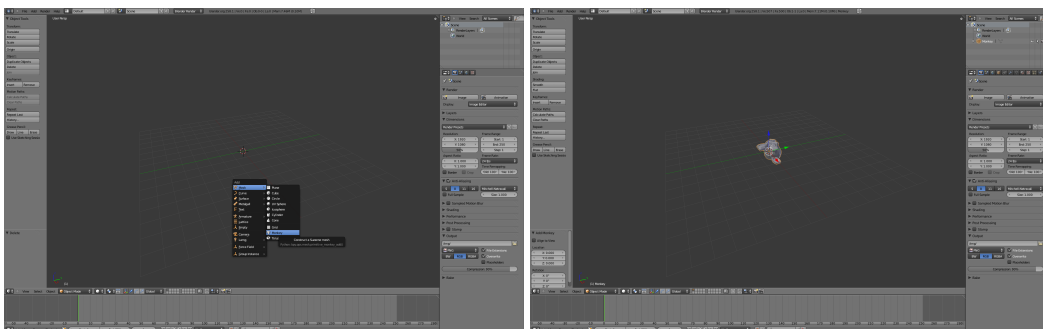
[1]It's possible to configure Blender to select things by left-clicking on them instead. This might seem more natural, and therefore Appendix A shows you how to change this setting.

To look around in the scene, you can use middle mouse button. Zoom using the *scroll wheel*, and look around by clicking and holding the *middle mouse button*. Try find a view similar to the one in the left image below. Additionally, you can select a few predefined view-points using the numpad. For instance, pressing numpad-**7** will change the current view to a top-view (right image below). Pressing numpad-**5** changes between orthographic and perspective projections. You can find some information about the current view in the top-left corner of the view-port.
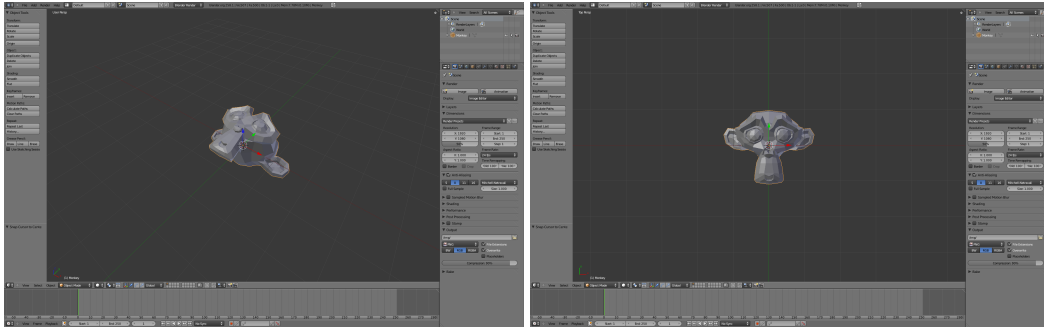
Next, you'll want to change the monkey-object, rather than the view. Make sure that the monkey is selected – if it's selected, there should be a faint yellow outline. To move the monkey, press *g* (*g* as in 'grab'). The monkey should now move with the mouse pointer (see left image below). If you find a new satisfactory position, left-click to place the monkey there. Right-clicking will return the object to the old position. If you want to move the monkey along a single axis, press one of the keys *x*, *y* or *z* after *g*. This will limit movement to that axis (the axis you've selected is also highlighted in white). In the right image below, we've pressed *gx* to move the monkey along the x-axis.
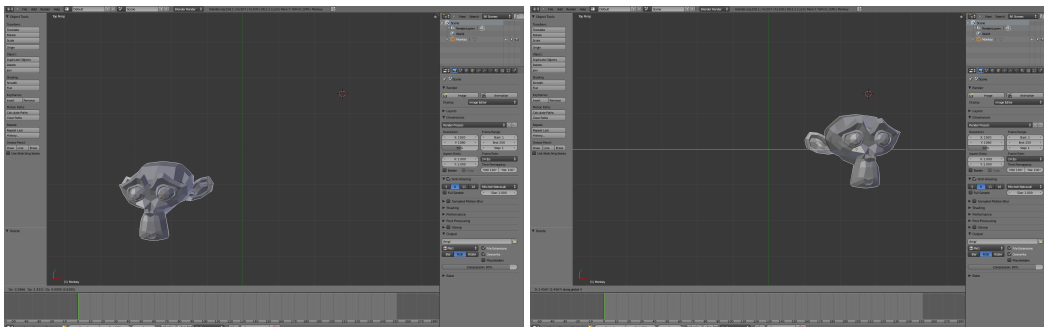
Similarly, you can use *s* to **s**cale the monkey, and *r* to **r**otate it. Again, pressing one of *x*, *y* or *z* will limit the scaling or rotation to/around that axis.
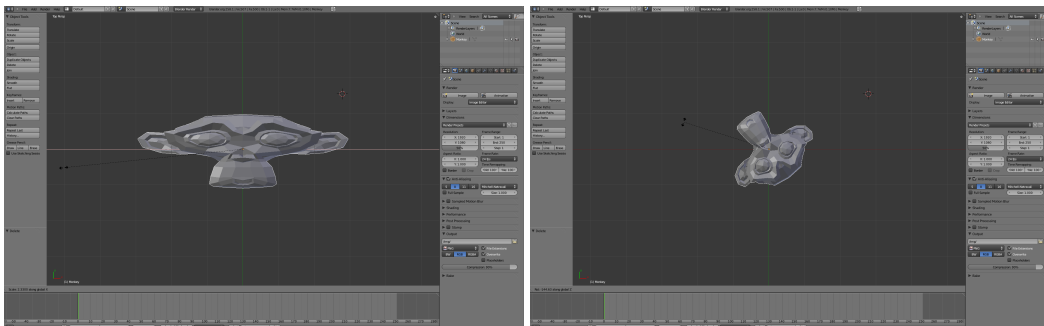
Finally, you can duplicate objects by selecting them and then pressing *shift-d*. Immediately after pressing *shift-d*, you can move the new object around, as if you were in **g**rab-mode.

Play around with these controls a little bit. Next, you'll be adding some stuff to your island.

Populating the Island

Start by ~~murdering~~ deleting your monkey (or monkeys) – you'll want to have an empty scene before continuing with the next tasks.

First, lets get a nice island. There's an empty island that you can import from the OBJ file `island_blender.obj` and its associated material file, `island_blender.mtl`. **Important: If you use the standard `island.obj`, textures may be missing. So, make sure that you use the correct `island_blender.obj` file!**

To import an OBJ model into the current scene, select, in the *File*-menu in the top menu bar, *File→Import→Wavefront OBJ* (left image below). You'll get a file-selection window (right image), where you'll have to locate the `island_blender.obj` file.
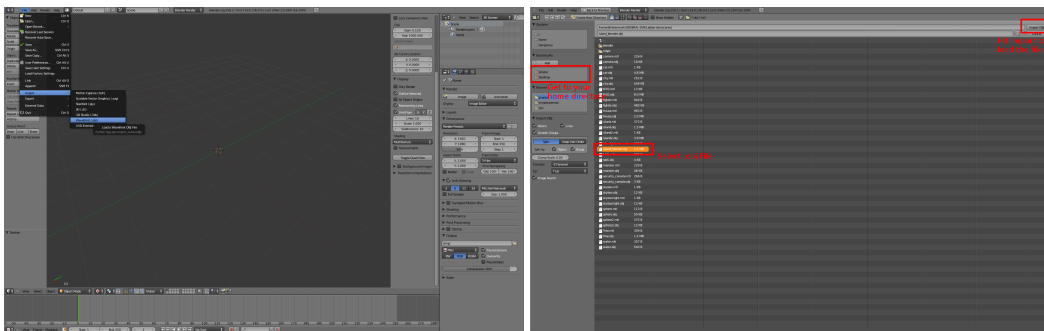
Now, chances are that you'll see something like the image below, on the left hand side. Turns out that the island is quite large, at least compared to the default view. Zoom out until you see the whole island (right image).
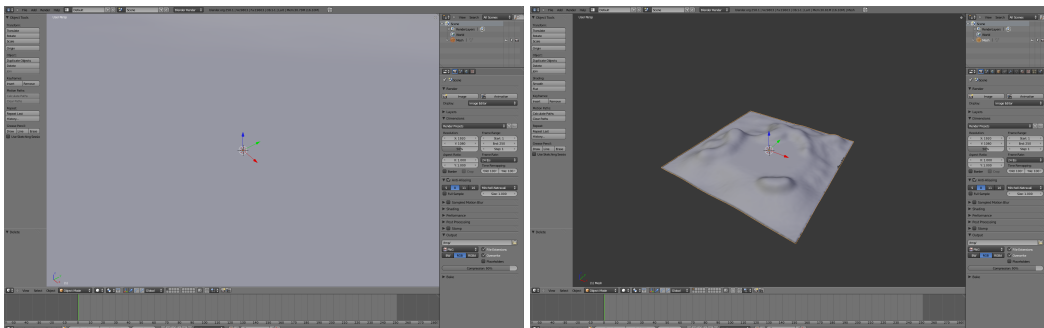

To make sure that materials were correctly loaded, you're going to enable texturing in the main view. Refer to the image on the left (below) to find the menu where you can do this. Select *Textured* shading, and you should see something similar to the image on the right.
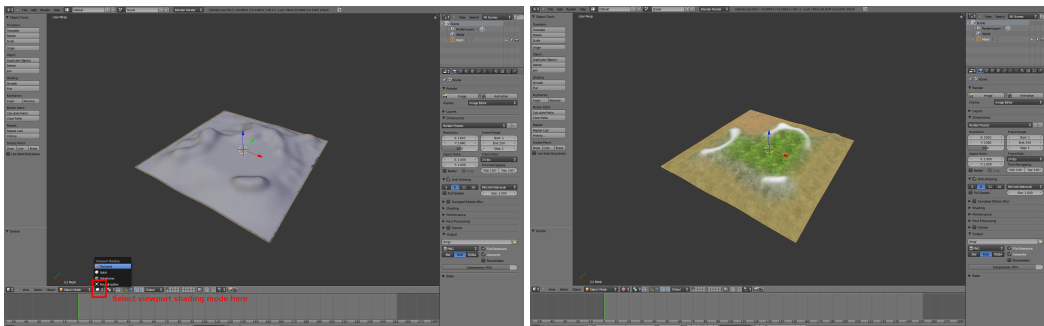
Still, the island is somewhat empty. Lets try to fix that... But before we do this, save your work so far by pressing *ctrl-s* or by selecting *File→Save*. You'll be asked to store a `untitled.blend` file - rename it if you wish, but keep the `.blend` extension.

Next, let's add a house to the island. Using *File→Import→Wavefront OBJ*, import the OBJ model in `house_blender.obj`. Place it somewhere sensible by using *g*rab. Make sure that the house is firmly attached to the ground - flying houses are somewhat weird. You'll see something similar to the image below (left). Duplicate the house, and place a copy somewhere nice (right).
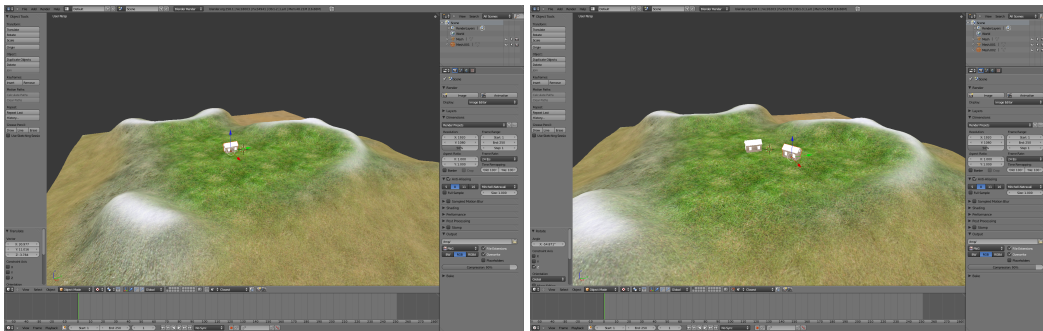
Similarly, add a few trees (`tree_blender.obj`). If you have objects of you own, you can try adding those as well. Keep an eye on the triangle count, since that'll eventually slow down rendering and loading of your scene.

Finally you could have something similar to the view below:
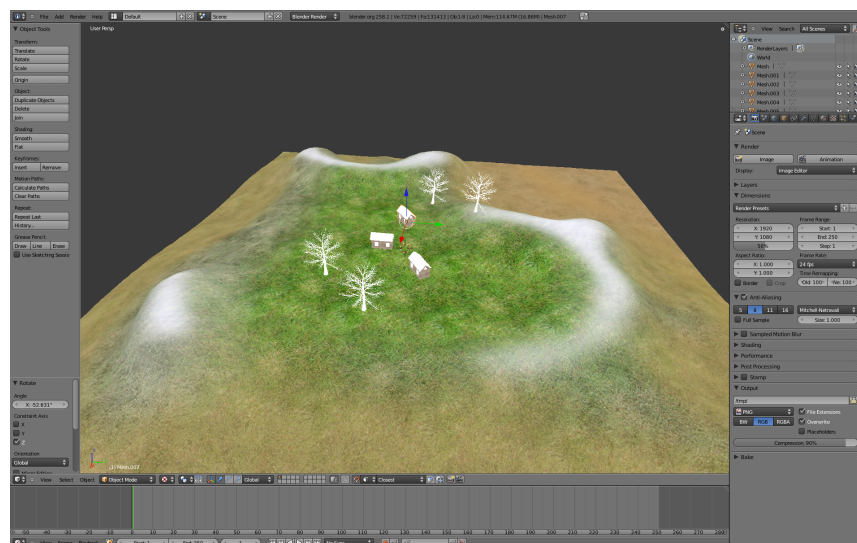

Save the `.blend` file.

Before we can show this in our own example program, we'll have to export it to a OBJ file. From the *File* menu in the top menu bar, select *File→Export→Wavefront (.obj)*. You should see something similar to the screenshot below (left). For everything to work, you'll have to select a few options in the left panel (see right image). Make sure that the following are enabled:

- Apply Modifiers
- Normals, High Quality Normals
- UVs
- Materials
- Triangulate
- Objects as OBJ Objects, Objects as OBJ Groups

- Material Groups
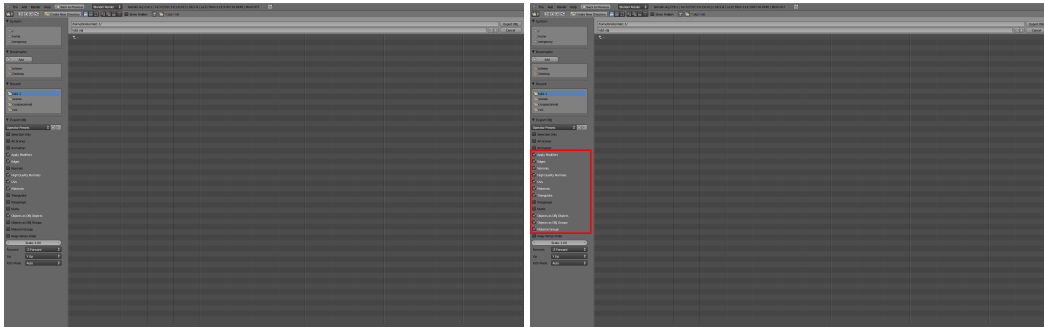
Make sure to place the exported scene in the `blender_data` directory (that is the same directory where you have the `island_blender.obj` file), and call it something like e.g. `island2.obj`. Change the code to read your new OBJ file, and you should be greeted by something similar to the picture below:
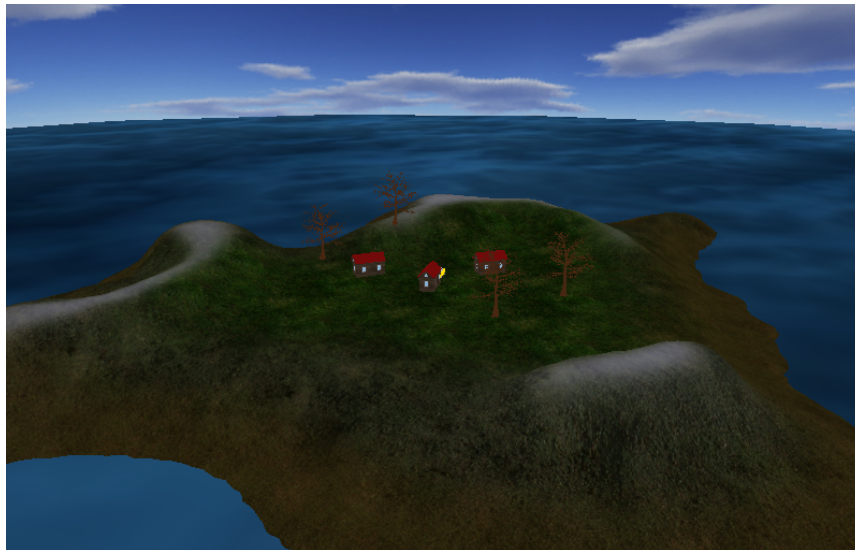

At this point, you have a somewhat more interesting scene. Your next task is to implement some of the techniques from the previous labs. This part is described in the original `project.pdf` in more detail, in the section called "*Making it not suck...*" on page nine and forward.

Now, open the `project.pdf` from `project` subdirectory, and do the tasks described in the section "*Making it not suck...*" on page nine and forward!

A- Preferences: Selecting with the left mouse button

By default, objects are selected with the right mouse button in Blender. You might prefer selecting with the left mouse button (which is the default in most other programs). To change this behaviour, select, in the *File*-menu in the top menu-bar, *File→User Preferences...*. There, go to the tab labeled *Input* and select *Left* under *Select With:*. Dismiss the dialog by pressing *Save as Default*. The items are shown in the image below.
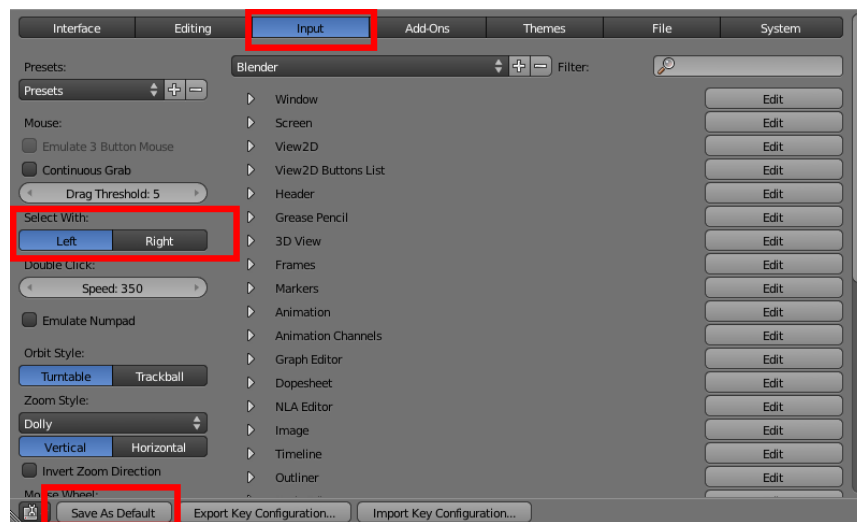
You might also want to change the *Orbit Style:* setting, depending on your personal preferences.