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Paralllax Occlusion Mapping in GLSL

Posted by Andrew Mamontov at 11:00 PM

This tutorial shows how to implement different Parallax Mapping techniques in GLSL and OpenGL. Starting from Bump Mapping, it covers Parallax Mapping, Parallax Mapping with Offset Limiting, Steep Parallax Mapping, Parallax Mapping with Slope Information, Parallax Occlusion Mapping, Parallax Occlusion Mapping with Slope Information, Relief Parallax Mapping, Parallax Occlusion Mapping with Shadowing (self shadows) in combination with Parallax Mapping, Following shapes (basic results of Parallax Occlusion Mapping), Following shapes with shadows, Parallax Occlusion Shadowing.

Basics of Parallax Mapping

In computer graphics there are two ways to simulate surface details: Normal Mapping, which not only changes normal of lighting, but creates illusion of an uneven surface and Displacement Mapping, which is a geometric Process Images shale Renderer Mapping compared to Normal Mapping, You may think that Displacement Mapping is better than Normal Mapping, but Displacement Mapping is very slow, because it requires tessellation and vertex shaders.

Parallax Mapping is a technique, which simulates Displacement Mapping. The beginning, it uses color coding information about height of the surface. Height from the texture may be interpolated as amount of shadow and amount of light, which is used to calculate color of the pixel. Parallax Mapping with Offset Limiting, which uses values from the heightmap as depth values. Best Color 21 is the heightmap. Parallax Mapping with Slope Information, which uses slope information to calculate offset.

Following examples of Parallax Mapping use three textures: heightmap, diffuse texture and normal map. Normal map is generated from heightmap, in our example. In our example the heightmap, is stored in alpha channel of normal map, and the diffuse texture is stored in alpha channel of the normal map. Storing the normal map into the heightmap, you can receive length in alpha channel, but for convenience we use separate heightmap. Normal map is RGB, and heightmap is Alpha.

The main task of Parallax Mapping technique is to modify texture coordinates in such a way that plane looks like it is not flat, but has some height information. Let's look at the picture below, which shows side view of the following scene: view is in upper-right corner of the scene, there is a flat surface, and there is a cube on the surface. Let's look at the point, which is on the cube, and we want to find, which texel of the surface that we should to draw heightmap, and how texture coordinates are interpolated.