Shadow Mapping

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Shadow Mapping is technique to create shadows in computer graphics. If you look at the scene from the light’s perspective, everything that is not visible is shadowed. This is the basic principle of shadow map. This technique can create good looking shadows with decent cost but may require a lot of tweaking to get working in certain special cases.

First step is to render the scene from the light’s perspective using the z-buffer algorithm. This means that color, texturing and other “enhancements” can be turned off. The z-buffer includes depth information of the scene. The buffer is then saved and it is called *shadow map*. The shadow map is often saved as a texture.

In the next step the scene is rendered again from the viewers perspective. As each pixel is rendered, the depth information is compared to the corresponding one in the shadow map. If the rendered point is farther from the light source than the one in shadow map, it means that it is shadowed and shadow can be applied to the pixels.

However there are some difficulties with this approach such as aliasing problems especially with close to contact objects. There are number of solutions to minimize these kind of problems but it might be tricky to get everything work perfectly.

# Advantages and disadvantages

## Advantages

* Cost of building a shadow map is linear with the amount of rendered primitives
* Shadow map access time is constant
* Works with all kinds of environments

## Disadvantages

* Quality of the shadow depends of resolution of the shadow map and numerical precision of the z-buffer
* Problems with aliasing in certain cases.
* Other smallish problems that require applying special methods to mitigate.