**TYPE QUALIFIERS IN SHADERS**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **V/S** | **F/S** | **Visible in other host programs** |
| **Constants** | Y | Y | N |
| **Attribute** | Y | N | Y |
| **Uniform** | Y | Y | Y |
| **Varying** | Y | Y | N |

**Decal Textures**: Using multiple textures overlaid on top of each other to add “decals” to objects

**Bump Map**: a texture that encodes the “height offset” of a non-flat surface relative to the baseline of an underlying flat model. Use a texture to modify the normal vector,

rather than the underlying color! Remember that the effect goes away if we tilt bump map to parallel with viewing direction.

**Normal Map**: directly stores the two components of the normal (typically, as a different from a “baseline” normal”) at each texture pixel location

**Caustic Dispersion**: Light rays which have been reflected/refracted by a curved surface/object (needs global illumination)

**Refraction**: Being deflected in passing obliquely through the interface between one medium and another or through a medium of varying density

**Subsurface Scattering**: Light that penetrates a translucent object is scattered by interacting with the material and exits the surface at a different point. (needs global illumination)

**Skybox/Cubemap**: a technique used in computer graphics to simulate the appearance of a distant environment such as a sky or background

**Render-To-Texture**: Redirect an operation of rendering/drawing to a texture image instead of drawing directly on the screen

**Dynamic Environment Mapping**: Uses Render-to-Texture to add more detail to environments

**Shadow Mapping**: Uses Render-to-Texture to make shadows (more later)

**Ray Tracing**: Track rays from the camera and out into the world

(hopefully reaching a light source)

**Recursive Ray Tracing**: Each ray allowed a maximum of *N* bounces, first *N-1* are specular, last bounce is allowed to be specular and/or diffuse. At every bounce, spawn reflection ray, shadow ray, and/or transmission ray.

**Shadow Mapping (cont.)**: Here’s how shadow mapping works:   
1. Place camera at light’s location

2. Render/store depth image (shadow map)

3. Render from normal camera viewpoint; at every fragment’s location, compare distance to light (fragment should be shadowed if SM value is larger; else, no)

*Issues:*

1. Sampling/Resolution of shadow map
2. Thin objects
3. Multiple light sources

A diagram of a computer process

Description automatically generated**PIXEL MAPPING:**

**Z-Buffer Algorithm**: For every pixel drawn, we record not only its color (in the frame buffer), but also its depth (z-value); subsequent drawing calls are only allowed to complete if the depth of the newly written pixel is “nearer” – this is used in pixel testing

**Mipmapping**: a technique used in computer graphics, particularly in texture mapping, to optimize the rendering of textures at different levels of detail.

A screenshot of a test

Description automatically generated**Ambient Lighting Coefficient**: represents the contribution of ambient light to the overall lighting of a surface. Ambient light is the general, non-directional light present in a scene that illuminates all objects uniformly.

**Diffuse Reflection Coefficient**: determines how much of the incoming light is diffusely reflected by the surface. Diffuse reflection is responsible for the perceived brightness of a surface based on the angle between the surface normal and the direction of the incoming light.

**Specular Reflection Coefficient**: represents the contribution of specular highlights on a surface. Specular highlights are bright, shiny spots that occur when light reflects off a surface in a concentrated manner. The specular reflection coefficient controls the intensity of these highlights.

**Specular Exponent**: determines the focus or spread of the specular highlights. Higher specular exponents result in smaller, more concentrated highlights, while lower exponents produce larger, more diffused highlights.

A screenshot of a computer

Description automatically generated