

Advanced lighting and shading with Direct3D

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Abstract

This poster explores new possibilities of Direct3D 9. It begins with classical per-pixel shaded Phong's lighting model. Improved for new pixel shaders version 2.0 shows greater quality in rasterization pipeline. Next conversion for vertex and pixel shaders 3.0 shows possibilities of flow control and relative addressing to render geometry lit with multiple spotlights in one pass. Section ends with quality comparison between older Direct3D 8.1 and newer one.

Poster continues with bumped environmental mapping. Fresnel term is added for more realistic effect. First implementation is for specific constraints of DirectX 8.1 and then comes version for shaders 2.0.

The end of poster is reserved for two lighting models that are not very commonly used in real-time computer graphics, mainly due to limitations of hardware prior to new Direct3D. Oren-Nayar's generalization of Lambertian diffuse model is implemented with shaders 2.0. It brings more reality to materials like clay or porcelain. Specular part of Cook-Torrance's model will be presented both for older version of Direct3D and for newer one for quality comparison. This model produces very good results for metallic surfaces.

New Direct3D release has proved to be major evolutionary step for real-time computer graphics. With greater precision and longer shaders are possible effects never seen before. More details and poster are available in [1] or [2].

Keywords: Real-time computer graphics, Phong's lighting, Per-pixel shading, Environmental bump mapping, Fresnel term, Cook-Torrance's lighting, Oren-Nayar's lighting, Pixel shader, Vertex shader.

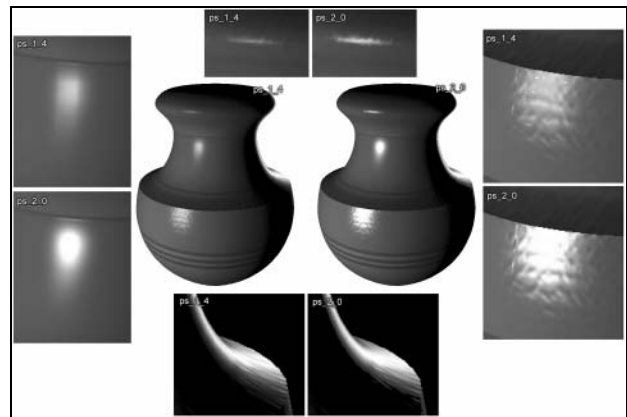


Figure 1: Comparison of Phong's lighting versions



Figure 2: Environmental mapped vase with various indexes of refraction.



Figure 3: Oren-Nayar's lighting model for increasing roughness of a surface.

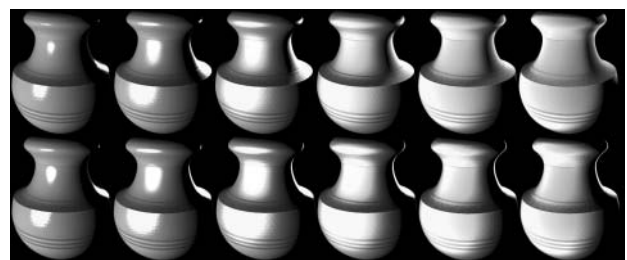


Figure 4: Cook-Torrance's lighting model for increasing roughness of a surface (Direct3D 8.1 version in top row).

References

- [1] Valient, M., "Advanced lighting and shading with Direct3D 9". See <http://www.dimension3.host.sk>
- [2] Valient, M., "Advanced lighting and shading with Direct3D 9", In: Engel, W. F., et al., "ShaderX2 – Vertex and pixel shader programming", Wordware Inc., August 2003, ISBN not yet given.

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