

# OpenCascade Ray Tracing Rendering

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摘要 Abstract: OpenCascade6.7.0 中引入了光线跟踪算法的实现。使用光线跟踪算法可实现高质量的渲染效果，且可以使用 GPU 加速渲染效率。

关键字 Key Words: OpenCascade, Ray Tracing

参考链接: Ray tracing as alternative rendering method for OCCT visualization component  
<http://dev.opencascade.org/index.php?q=node/898>

OpenCascade 6.7.0 对显示部分做了些重大改进，其中突破性的改变是使用 OpenCL 实现了光线跟踪算法。作为库 TKOpenGL 的一部分，光线跟踪算法与标准的显示模块完全集成。从此，光线跟踪也可以作为显示的一种方法。与其他第三方库的光线跟踪库的区别是，内置的光线跟踪算法确保了实时渲染时的性能，性能与 OpenGL 的性能相近，在有大量模型时性能比 OpenGL 的还要好。

光线跟踪功能如下：

- High-quality shading by interpolating normal across the triangle pixels and using advanced illumination model (Phong shading);
- Depth-correct order-independent transparency for any number of overlapped objects;
- Sharp shadows from isotropic point and directional lights without any approximation - greatly improve visual appearance;
- Specular reflections and environment mapping - for high-quality rendering of metallic surfaces;
- Low-cost adaptive anti-aliasing allows to improve image quality by removing jagged edges from the image;
- Based on cross-platform OpenCL framework - runs on GPUs of major vendors (NVIDIA and AMD/ATI);
- Makes the most of the mid-/top-range GPUs but also runs successfully on low-end GPUs that support OpenCL.

只要 OpenCascade 编译时启用 OpenCL 支持，光线跟踪的使用是相当简单，只需要调用函数 `V3d_View::SetRaytracingMode()` 就可以把 3D view 切换到光线跟踪渲染啦。参考 `V3d_View` 和文档或者 `Draw Test Harness` 的 `vraytrace` 和 `vsetraytracemode` 命令实现的源程序去详细了解如何设置光线跟踪的一些选项。

最简单的测试光线跟踪的方式是在 `Draw Test Harness` 中输入如下命令：

```
Draw[2]> source samples/tcl/bottle.tcl
```

生成效果如下图所示：

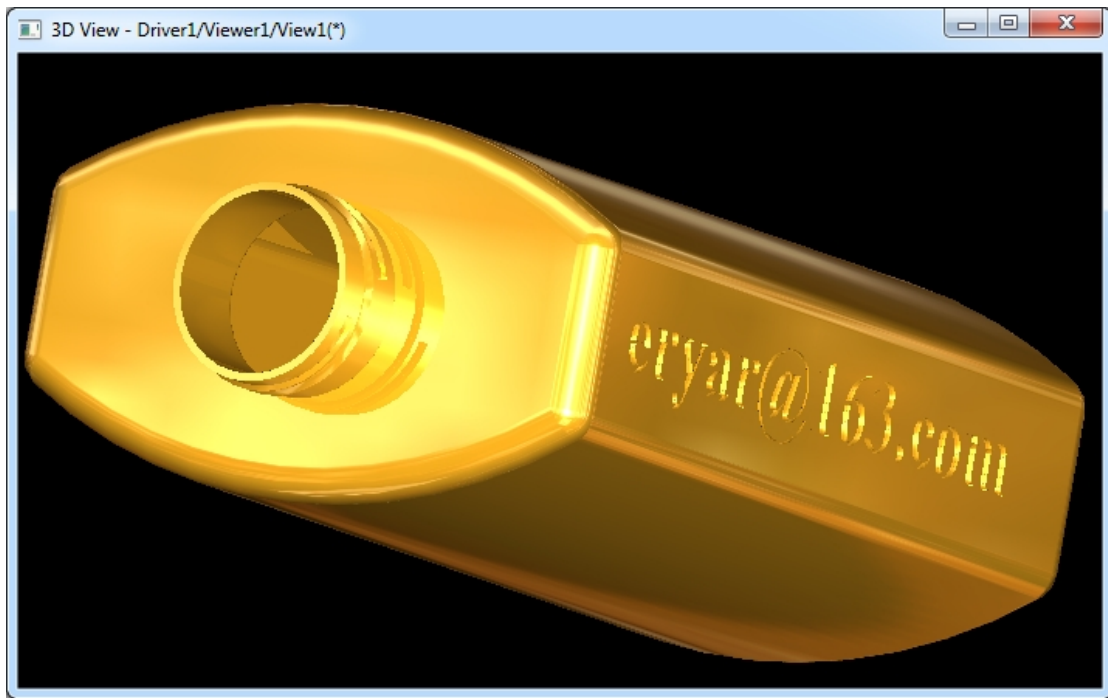


Figure 1.1 Render bottle and text with ray tracing

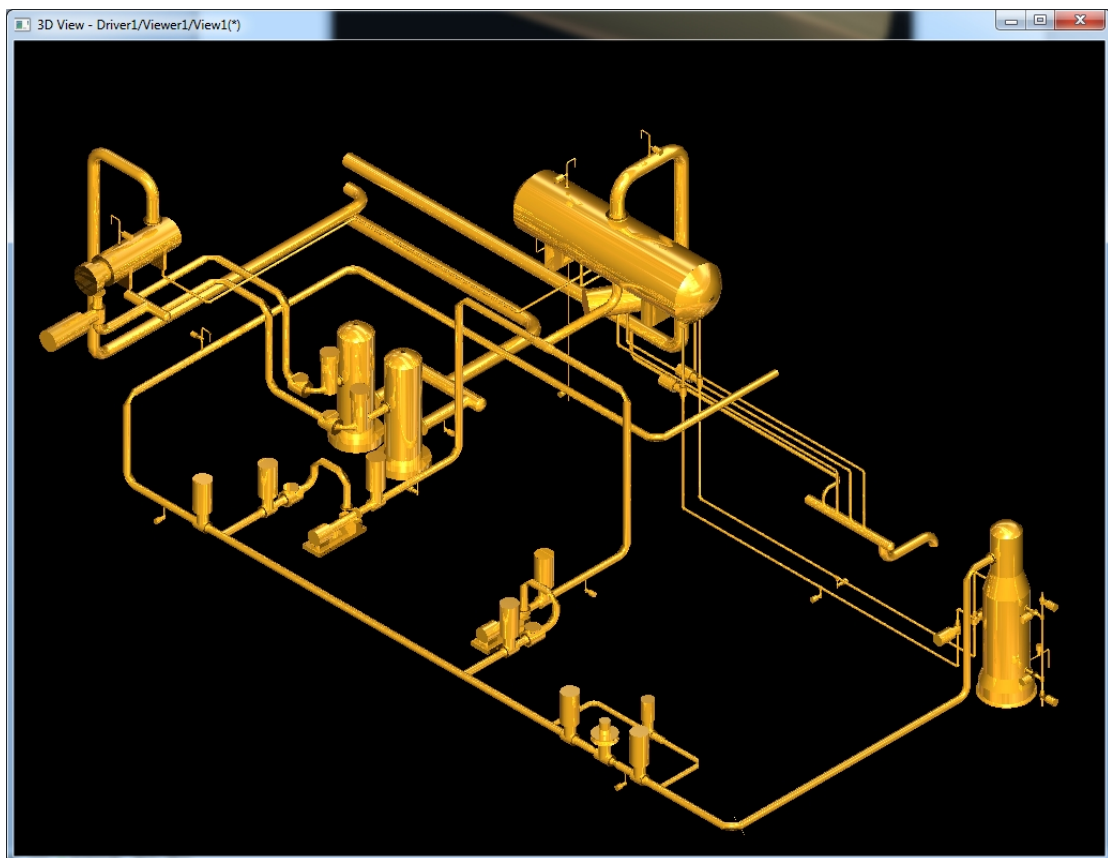


Figure 1.2 Render pipe and equipment models with ray tracing

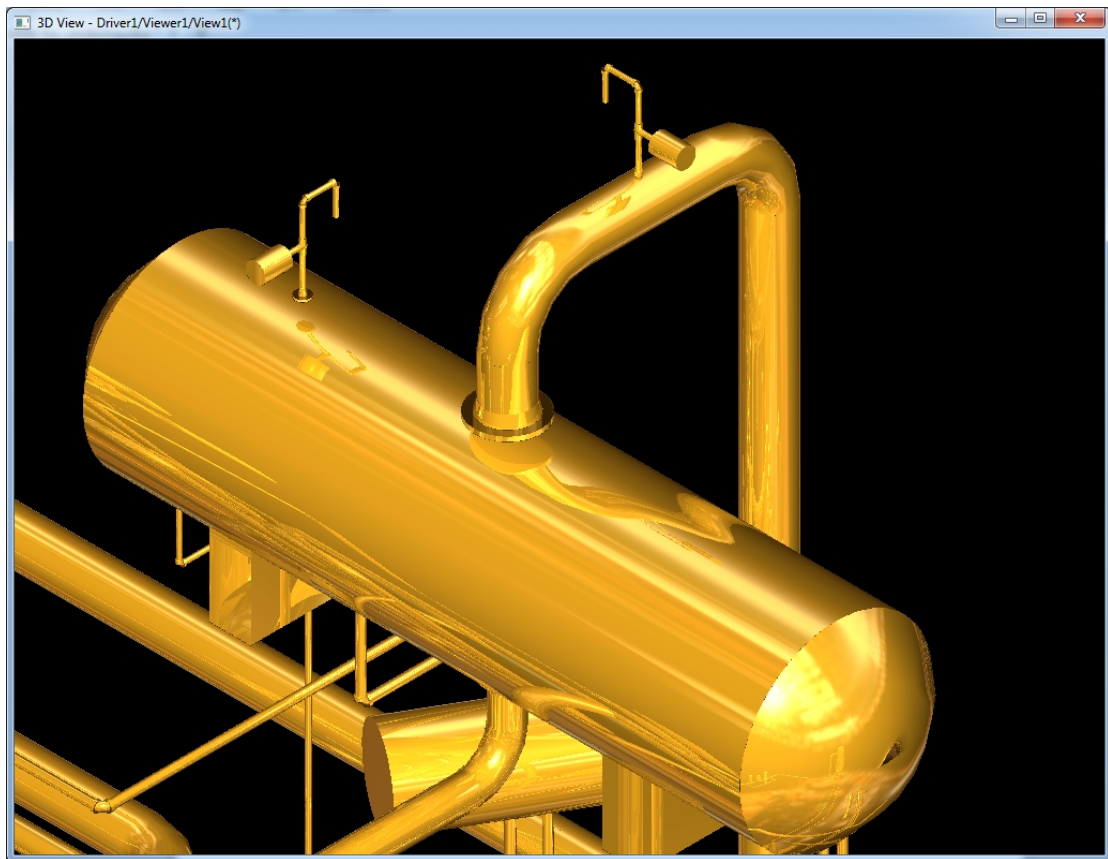


Figure 1.3 Render pipe and equipment models with ray tracing  
从上图可知，使用光线跟踪效果很不错，可以看到镜面效果，很 Cool!