Ray tracing backend for Open Inventor

Thermo Scientific™ Open Inventor™ [1] is a commercial 3D software development toolkit (SDK) for professional applications in Microscopy, Medical & Dental, Oil & Gas, Engineering. Its object-oriented API, its extensible architecture, and its large set of advanced components provide software developers with a high-level platform for rapid integration of 2D/3D data visualization and processing capabilities into industrial and scientific applications.

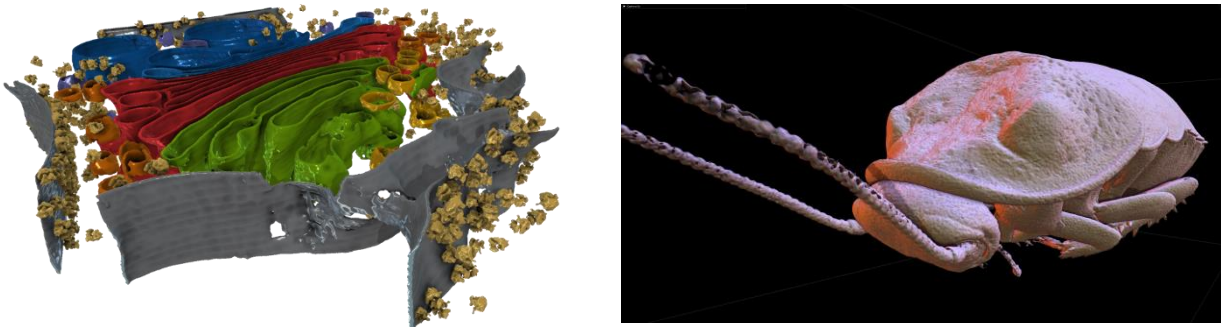

Figure 1 Rendering examples using Open Inventor™. (Left) Golgi apparatus, (Right) Volume Rendering of a scalar field.

The core part of Open Inventor™ performs the rendering of surfaces, defined as a set of primitives such as in Figure 1, customizable in many ways using a scene graph hierarchy. One of the best assets in Open Inventor™ is to provide an out-of-core data management of 2D or 3D data that allows displaying interactively large 2D images or 3D volumes using slices or volume rendering (until, for now, TeraBytes of data). An example of the volume rendering capability is shown in Figure 2.

Open Inventor™ is divided into a public agnostic API to manipulate high level graphical components, such as shapes or volumes, and an internal graphical backend typed according to the targeted graphics API, such as OpenGL. Existing backends are based on rasterization for a balanced result between interactivity and rendering quality. However, recent graphics hardware proposes efficient solution for improving rendering quality with well-known rendering modalities such as ray tracing or path tracing but now, in real-time without losing the interactive capability.

A backend is available in Open Inventor for handling ray tracing engine. OptiX [2] is the technology that supports this backend, for now, only for the rendering of surfaces. The goal of this internship is to extend the existing backend to volume rendering capabilities and then, explore more complex light interactions such as path tracing.

Recommended knowledge

Computer Graphics, C++, OpenGL/Vulkan/Metal, Linear Algebra, Ray Tracing, Path Tracing

References

[1] https://www.openinventor.com/

[2] https://developer.nvidia.com/rtx/ray-tracing/optix

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