

GPU-driven Reservoir Visualization

Thermo Scientific™ Open Inventor™ is a commercial 3D software development toolkit (SDK) for professional applications in 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.

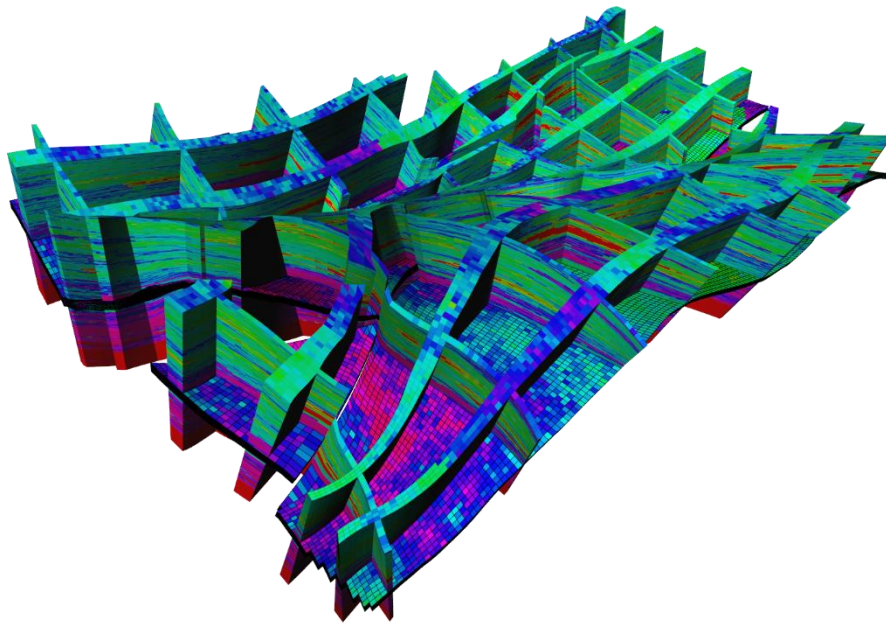


Figure 1 - Reservoir visualization using Open Inventor

Open Inventor Toolkit provides capabilities to extract different types of geometries, such as planar cuts, slabs, iso-surfaces, mesh skins, and any advanced cell filtering based on a user-defined function. Properties can be mapped onto the extracted meshes, accessed through the advanced data interface and visualized using rendering techniques including data-to-color mapping, 2D and 3D vector fields and streamlines, edge fading, and so on. See Figure 1.

However, such extraction and geometry reconstruction are time-consuming and performed exclusively on the CPU. Some parts of the problem can be parallelized using CPU threads as well as run in the background, but the full computation time remains huge.

The GPU computation is increasingly accessible for general purposes. Powerful tools such as CUDA, compute shaders or mesh shaders become the key to efficiency in many applications. In this internship, we would like to make a comparison of these tools and measure the benefit of using such technology for reservoir visualization. By using the existing algorithm as the baseline for reservoir visualization, the student will compare selected GPU tools against our CPU implementation.

The tasks for this internship will be:

- Understand the problematic of the reservoir visualization
- Analyze GPU tools (e.g. CUDA, Compute Shaders, Mesh Shaders, ...) that can be used to achieve such rendering: pro/cons
- Provide a prototype of the reservoir visualization for different GPU tools (at least 2)
- Compare GPU implementation against existing implementation

Feel free to contact Jérôme Baril (jerome.baril@thermofisher.com) for more information or to apply to this internship.