Visualization of Inner Structure of Complex 3D Objects Based on Opacity Modulation

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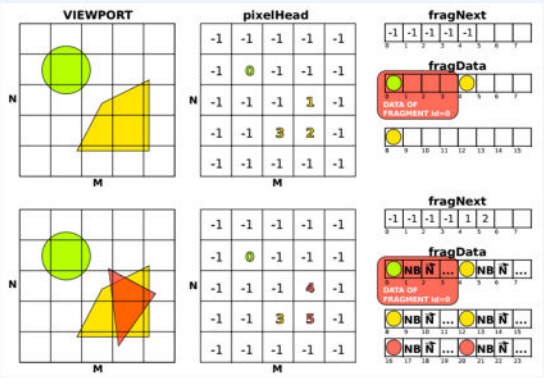
We focus on non-local opacity modulation where desired information needed for the modulation is a matter of global context and it is not known for current primitive directly. An algorithm to solve the Order Independent Transparency with non-local opacity modulation based on the Illustration Buffer is introduced.

Algorithm Steps Overview

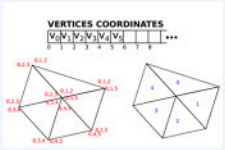
We construct our version of the Illustration Buffer on GPU using linked lists of fragments

1. Construct linked lists along the view ray
2. Sort the fragments by depth
3. Find geodesic neighbors along the surface using our new algorithn
3. Locate important image feautures such as: curvature, silhouettes, distance from silhouettes, etc.
4. Compose final image w.r.t. found image features

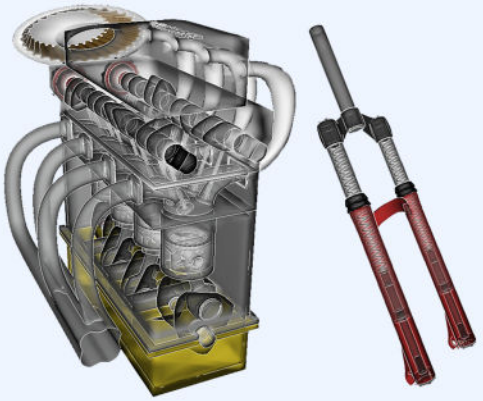


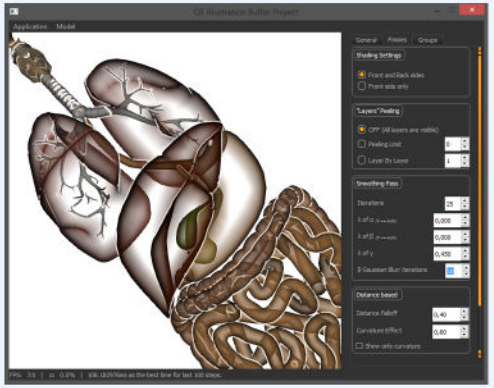
Contributions

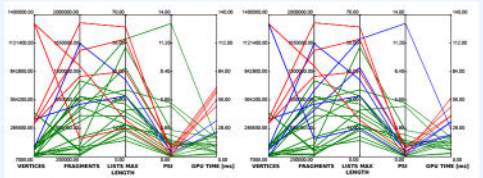
- We propose a novel method of locating the geodesic neighbors inspired by indexed geometry.
- Proposed OIT algorithm for 3D meshes along with the measurements of the algorithm stages and stages variants that provide better insight to the behaviour and performance bottlenecks of the algorithm.
- Comparison with existing algorithms solving OIT w.r.t. speed, memory requirements and ease of use.
- Our comparison also allows to decide which algorithm to use w.r.t. chosen opacity modulation technique.
- Fully interactive OpenGL application demonstrating our algorithm and variety of opacity modulation techniques.



Results

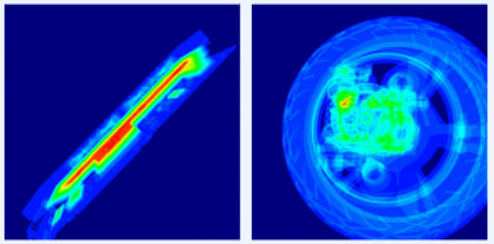


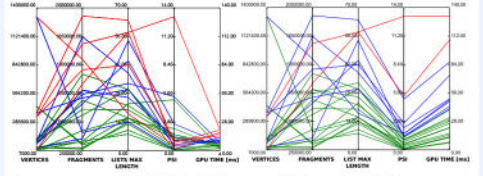




Depth peeling

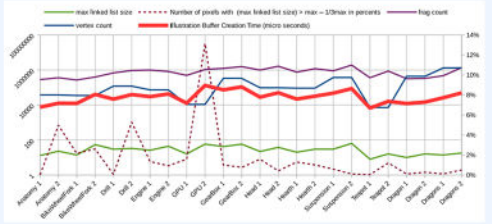
Dual depth peeling





Concurrent per pixel linked lists

Illustration buffer



Publications

Order Independent Transparency with Non-local Opacity Modulation for 3D Meshes, Central European Seminar on Computer Graphics (CESCG), 2015, In Proceedings

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