

TPA 6: Hybrid Ray-tracing on GPU

Parametric surfaces are used widely in Computer Aided Design (CAD) and other fields. They provide a compact and effective representation of geometrical shapes for engineering, graphics, etc. The most powerful feature of parametric surfaces is their ability to stay curved and smooth even when viewed at close distances. Parametric bicubic patches of the Bezier form is the most popular among the many possibilities and is popular in many engineering and scientific applications. Direct ray tracing of parametric patches has natural advantages over rendering their tessellations.

Implement a scheme for interactive ray tracing of scenes with multiple objects, bounces, soft shadows, etc. using the technique described above.

Input:

Polygonal mesh model and light positions.

Output:

A scene with complex shapes (not just cubes and spheres) showing effects of soft shadows, color bleeding etc.

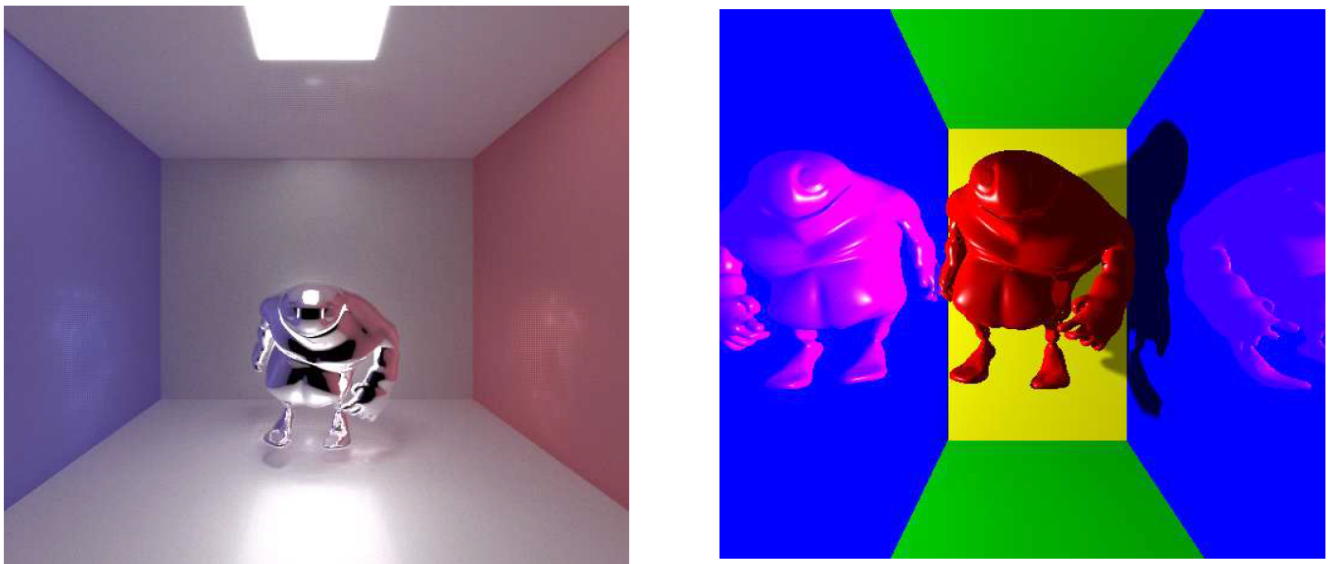


Figure 1: Examples of Scenes you are expected to render.

References

1. Parker, Steven G., et al. "Optix: a general purpose ray tracing engine." *ACM Transactions on Graphics (TOG)* 29.4 (2010): 66.
2. Rohit Nigam and P J Narayanan, Hybrid Ray Tracing And Path Tracing of Bezier Surfaces using a Mixed Hierarchy, Proceedings of the 8th Indian Conference on Vision, Graphics and Image Processing, 16-19 Dec. 2012, Bombay, India.
3. graphics.stanford.edu/papers/i3dkdtree/
4. Rocca, Jean-Patrick, Mathias Paulin, and Christophe Coustet. "Hybrid CPU/GPU KD-Tree Construction for Versatile Ray Tracing." *Eurographics (Short Papers)*. 2012.