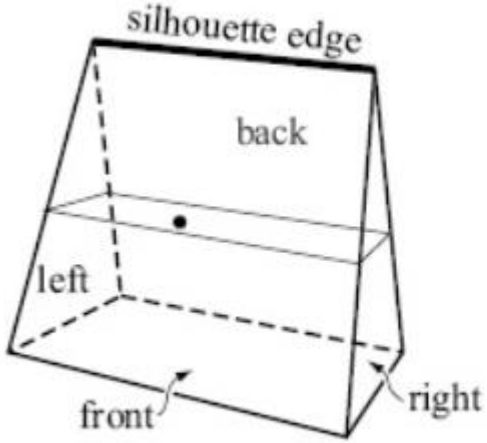
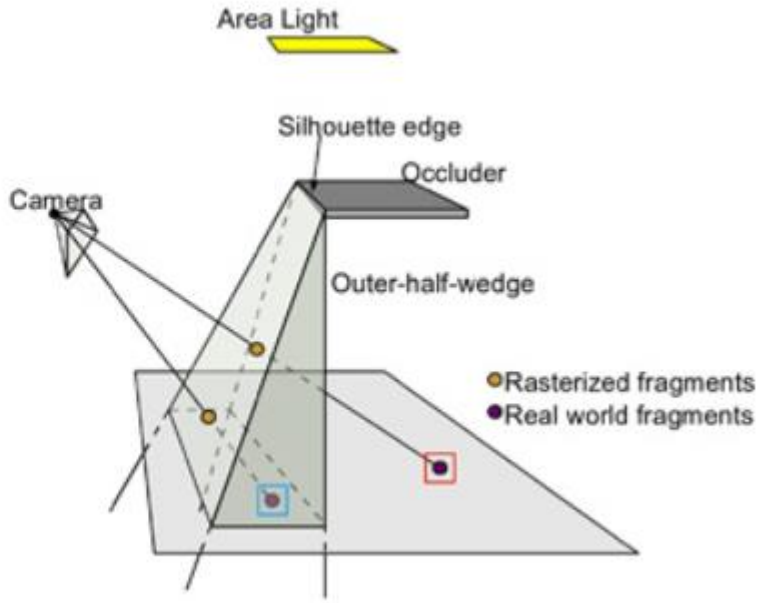
Soft Shadows By Penumbra Wedges

MVS Charan

Algorithm:

- Instead of using a hemicube data structure to find the silhouette edges, we just send the scene into a shader, use visibility buffer to find out the depth of the points, and use alpha-blending for the illumination inside penumbral wedges.

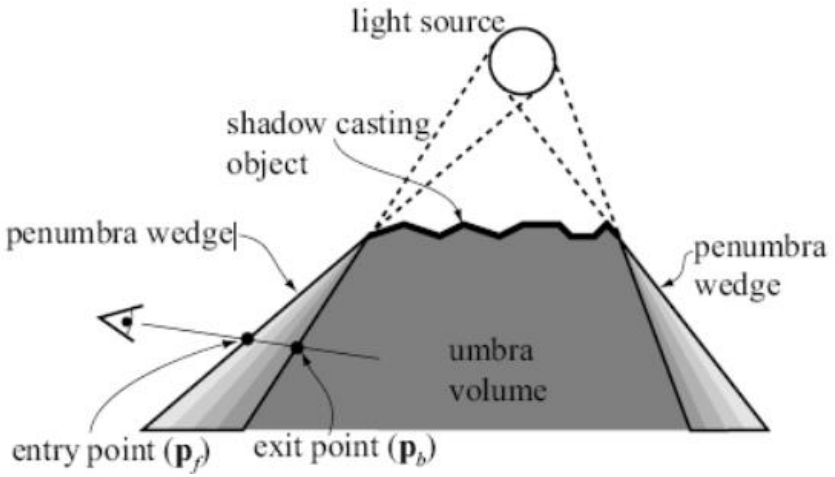




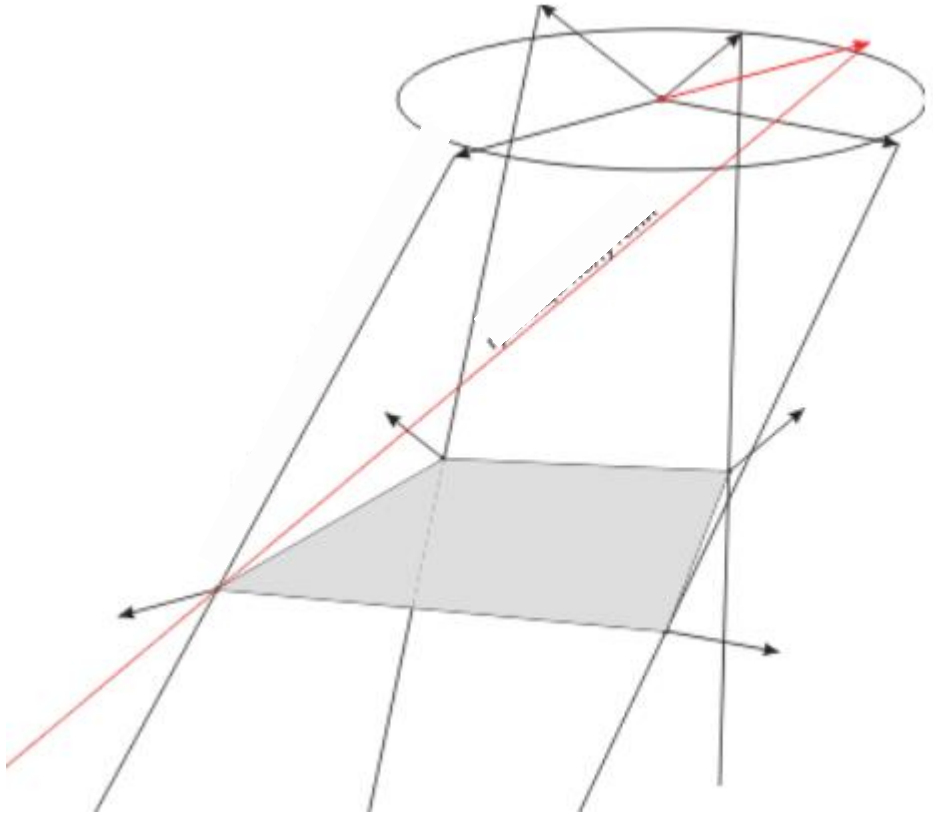
Implementation:

- Depth information is stored in a texture.

- To create penumbral wedges, we extrude the edge vertices onto other surfaces based on the area light geometry.



- Approximation is made when creating wedges, as the spherical light source is considered as a circular area light.



- Any point inside a wedge is illuminated by the value obtained by alpha blending between 0.0 to 1.0, where as a point outside the wedge away from umbra, is illuminated with full intensity of 1.0
- Shader takes care of rendering umbra, penumbra and lighted regions.
- Basically, whole scene is lit with Ambient lighting at first, and then appropriate lighting is done for penumbra regions and regions without occlusion.
- Vertex buffers used to get mesh data, recreate edges, and then extrude the silhouette edges to form penumbral wedges.

Algorithm in Brief:

- We get the texture of the depths (contains the depth of each point of the scene). To do this, you can draw the entire scene into a texture, using a shader that returns the depth of the point.
- Draw a scene with background lighting.
- For each light source

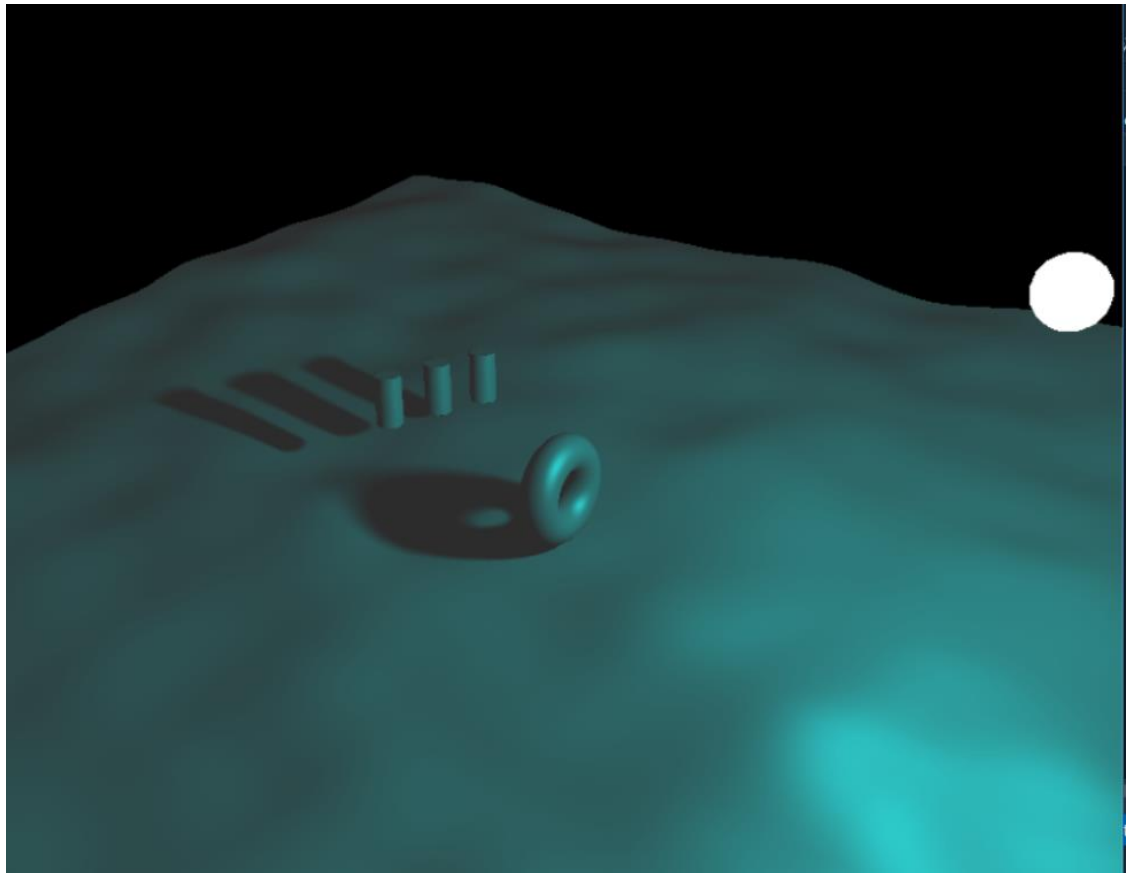
- Clear the stencil buffer. Initialize the alpha component of the framebuffer points.

-We apply the shadow volumes algorithm to limit the zone of the full shadow.

-Drawing the penumbral wedges by the method described above.

-Drawing the penumbral wedges by the method described above, we save the illumination values in the alpha component of the framebuffer.

Output:



Advantages over Shadow volumes:

- Real time soft shadows.

Limitations:

- Works only with spherical shaped light sources.
- Doesn’t give the physically right shadows, as some approximations are considered in light source geometry.

References:

- **Realistic Soft Shadows by Penumbra-Wedges Blending-** Vincent Forest, Loïc Barthe, Mathias Paulin

Directx programming and shader tutorials:

- http://www.uraldev.ru/articles/18
- http://www.drunkenhyena.com/cgi-bin/view_cpp_article.pl?chapter=2;article=23