

# Daylighting Design Tools - COMM 6965

## Assignment 2

Yu Sheng

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### 1 Shadow Volumes

There are many different techniques and approaches to implementing shadows. Chapter 6 of [1] has a wonderful talk about most of the well-known shadowing techniques. What I am working on is a generally-used one called Stencil Shadow Volumes.

The first shadow volume technique was proposed by Frank Crow in 1977. In 1991, Tim Heidmann implemented the algorithm with the stencil buffer, making it quick enough for use in real time applications. Till now, there are three common variations to this technique, depth pass, depth fail, and exclusive-or [2]. Figure 1 is an image rendered by this technique using Depth-fail algorithm.

### 2 My Work

I am currently working on a daylighting simulation system. The system will aid architects and lighting engineers in the design of new buildings and the renovation of existing buildings.

### 3 Progress

I have implemented both depth-pass and depth-fail algorithm using OpenGL. The system now could read obj(a 3D file format) files, and cast shadows to the object in the scene. Here are some rendering images.



Figure 1: Example of stencil shadowing in Doom 3.

Figure 2(a) shows the shadows casted by a sunlight. Since I do not have building models now, I use a cubic box instead. The box is just simulating a building with a door in the left side. We can clearly see the shadows of the building and the object in it.

Figure 2(b) is an visual effect of how the shadow volume is drawn.

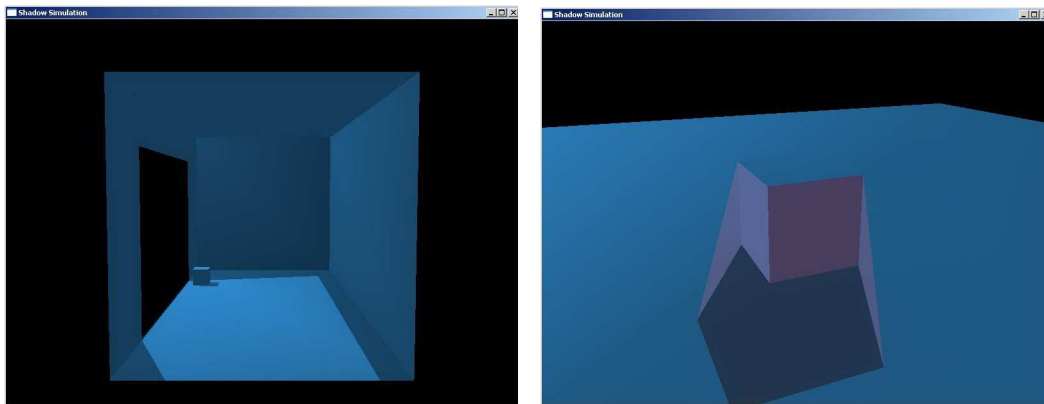


Figure 2: (a) Rendering image of my system. (b) Visualization of shadow volumes.

Figure 3 shows a plain color Sponza Palace with shadows (I have not got my program working with textures).

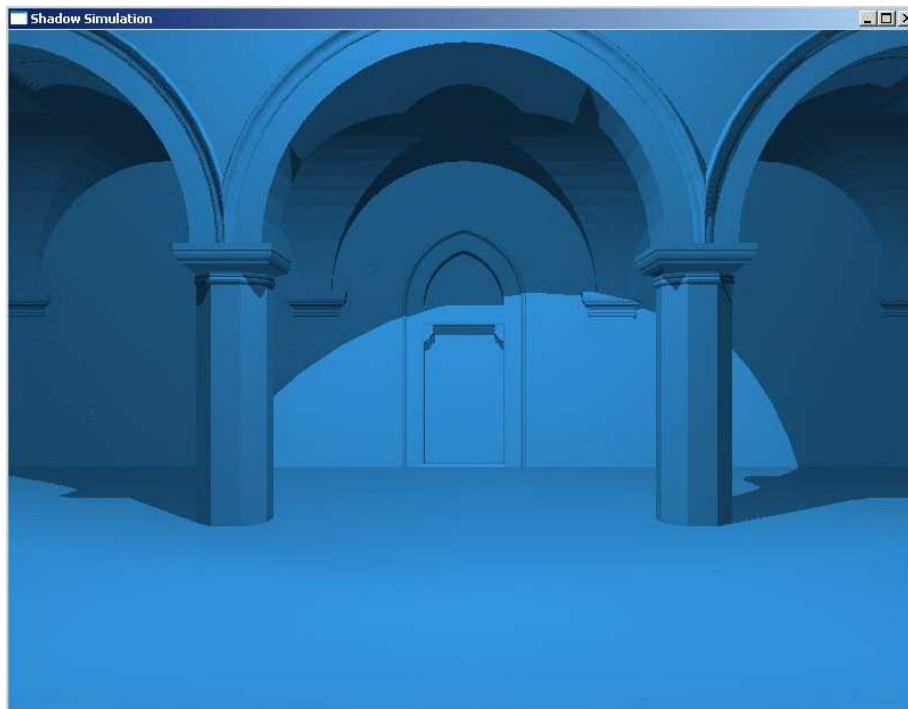


Figure 3: Sponza Palace.

## 4 Future work

Photorealistic rendering is one direction of my future work. I am just starting to learn Radiosity. I will implement Radiosity on current system.

Real-time rendering might be another direction. Our system is designed to provide real-time visualization tools for the architects. However, Radiosity could not meet that need. So the next step of my work will be improving the rendering speed of current system.

## References

- [1] Tomas Moller, Eric Haines. "Realtime Rendering", 2nd Edition, A K Peters Ltd, 2002, ISBN: 1-56881-182-9.
- [2] [http://en.wikipedia.org/wiki/Shadow\\_volume](http://en.wikipedia.org/wiki/Shadow_volume)