TJHSST Computer Systems Lab
Senior Research Project
Modeling Stage Lighting in Realistic Conditions
2008-2009

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Abstract

This project is centered around modeling stage lighting in OpenGL. My goal is to create an application that can be used by lighting technicians everywhere for when they want to see the lights before they set them up, in order to determine the optimal setup. This project is worth doing because often times setting up the lights can take forever, and this will save them a lot of time. It's a good topic for the Computer Systems Lab because nothing like this has ever been done before and it's an interesting blend of OpenGL, C and python.

Keywords: modeling, lighting, application

1 Introduction

1.1 Scope of Study

I am looking to create an application modeling stage lighting, even though this is incredibly broad. The most important aspects of this project that needs to be completed are that the user can control the position, type of light, level of the light, and the color of the light. Once these are completed,

the rest is beyond the immediate scope of study. As of right now, the user can control the level of the light, and colors is well on its way.

I am also going to need to study the use of shaders and textures in OpenGL, in order to have enough normals to create the desired reflectivity. This will involve learning how to program in GLSL (GL Shading Language) so that the surfaces of the stage reflect light more naturally. I have yet to begin looking into this aspect of my project.

1.2 Expected Results

At the end of this project, I expect to have a working application that will successfully model multiple (up to 8) lights pointed at an artificial stage. I also expect to be able to control all aspects of the light, and all aspects of the stage.

I expect that at the end of this year I will be far more versed in C, OpenGL, python and Tkinter. I also hope to learn more about lighting design than I already know. I'm doing this project because I have spent three years designing lights for various theater productions, and this would be very useful for me later on. My central focus is therefore going to be less on getting all of the controls to work and more on making the lights look very realistic.

1.3 Type of Research

In researching this area of graphics and lights in OpenGL, my goal is to attempt to create an application that can be used by lighting technicians everywhere. This research is therefore definitively use-oriented.

2 Background and Review of Current Literature and Research

There are quite a few groups and students that have created similar projects to this one. One project, out of UPenn, created an "Interactive Lighting Simulation for Theatrical Lighting Design". This project focused on creating a realistic lighting simulation, also in OpenGL. The experimenters went into much greater detail than this project will focus on, using radiosity-based rendering and other complex algorithms.

The area in which lighting is most seen is computer gaming. Lighting can be essential for creating drama or simply making it so that the user feels more involved in the game that they are currently playing. Many of the tutorials in which I find the information that I need come from OpenGL tutorials based around gaming.

3 Procedures and Methodology

By the end of the next quarter, I intend on having an application that models everything and can be controled relatively well by the user. At the end of that quarter, I will be able to being to model the lights, apply them to the real world (set it up on a stage), and then make sure it is modeled correctly. By this repeatable process, I will be able to ensure that the model looks exactly like it is in reality.

This program is being programmed in OpenGL in C, which was chosen because it was relatively simple to learn, not too slow (because of the C aspect) and I already knew something about it. The python wrapper was chosen because it was not meant to be the main aspect of the project. It is meant to get the job done of displaying the data, and that is it.

4 Expected Results

My expected results include having a workable application that renders lights and the user being able to use this application for modeling lights before setting them up. I forsee this project as being a great base project for many more to come, if someone is interested in optimizing usage of lighting, in adding on to let the user create sets, or combining this with a sound program in order to control concerts and such on a stage.