

Computer Systems Lab  
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Modeling Stage Lighting in Realistic Conditions

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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 view 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 a long time, and therefore the project will save the technicians a lot of wasted resetting time.

## **Introduction**

The problem is that when all of the stage lights that the technicians is using are manually set-up and operated, the technician spends a lot of the time managing the setup and re-setting up of the lights, because he or she cannot see the picture beforehand. This topic is important because all of the performing arts utilize stage lighting, and if it is bad, it is noticed.

The purpose is to create an application that everyone can use so that the lighting can be created only once, because it will be the optimum setup. The project was created by comparing to modeling to realistic lighting instruments, so it is realistic. The approach that was used was by modeling everything in OpenGL, and the comparing to reality. This paper is meant to give the user a basic understanding of stage lighting, i.e. how the lights blend and how the colors are subtracted, and how this project went about accomplishing all of these tasks.

## **Background**

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.

## **Development**

This project is successful if any one user can model stage lighting successfully to the point that they could then use said model to create a lighting plot off of which they could light a concert or some other stage-based presentation. The project was created in OpenGL in C, which both complicates and speeds things up. This project could obviously grow more if anyone wanted to spend more time on it, the main inhibitor is lack of time to work on it.

This project is tested by setting up a configuration and then telling the program to model it. The lights are then set up on a catwalk in reality, and then using an ETC lighting board, the channels are set up in the exact same configuration, and then the two are compared. If the lighting model is unlike that of reality, the model is changed to reflect that, and the process is then repeated.

## **Results, Discussion, Conclusion, Recommendation**

The purpose of this project was to create an application that would model stage lighting in realistic conditions in order for the user to be able to view the lights before he or she set them up in that configuration. The project needed to be held strictly to reality by consistently comparing what was being modeled to what would actually be happening in reality. Since stage lighting is used in all kinds of applications today, this application could be very important in the future. If someone were to continue on with this project, I would suggest allowing a function to optimize light usage for the user.

This research can be used by others to decide what kind of lights to use for their production, i.e. what company to buy from. Additionally, someone could continue study in this field and use the modeling to study normals and other aspects of lighting that can be controlled by this user in this application. My conclusion is that OpenGL can be used to model lighting for a relatively small-scale stage, as long as the user keeps to only eight areas in which they want to light, because of OpenGL's imposed eight light limit.