Camera Interact: An Interactive Explanation of Cameras

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Camera Interact is an educational project to explain how cameras work. We take a ground-up approach to explanation, starting from basic sensor and light behavior and building up to a complete camera model. Instead of traditional text and image-based approaches, we emphasize animation and user interaction as teaching tools.

1 INTRODUCTION

Cameras have a lot of moving parts, literally and figuratively. The number of new vocabulary terms alone (f-stop, aperture, shutter speed, FOV, circle of confusion etc.) makes cameras challenging to deeply understand. Unfortunately, previously available work often explained the usage of camera parameters without giving intuition, leading students towards rote memorization instead of actual understanding[1]. Existing applets for explaining cameras typically only focus on one narrow parameter of the camera at a time[2] , helping students understand that particular concept but making it difficult to connect ideas together. With this in mind, we create a ground-up approach to explaining how and why cameras work. By using animations that also allow the user to interactively examine the scene we can help the user build intuition and understanding.

2 Progress to Date

2.1 Interactive Camera Demo

All of the progress made up until this point has been focused on learning three.js packages and functionalities, and applying those in order to create a set of scenes where a user can interact with a GUI to manipulate camera parameters and have those parameters affect a rendered image. We create a split-screen view of an environment where the top view renders an overhead visual of the scene (scene elements including the camera), and the bottom view renders what our fictional camera would actually see. We have three parameters so far: FOV, shutter speed, and f-stop. When the user interacts with FOV, the camera's FOV changes in real time. When the shutter speed and f-stop parameters are changed, the lighting of the scene is affected. A proper model for how the lighting is affected by these parameters needs to be implemented.

3 Future Work

We are actively working on the interactive animations needed to complete our explanation of how a camera works. This will likely occupy the rest of our available time.

[1] For example: http://photography-mapped.com/interact.html
[2] For example: http://graphics.stanford.edu/courses/cs178-10/applets/thinlens.html