

CS148 Final Image

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My final image recreates a potions classroom from the Harry Potter movies. It is based on images of the movie set.



Models, Materials, and Textures

Though potions classes are supposed to be held in the dungeons of Hogwarts, I decided to place my scene in a tower room with windows. I felt that I could not create the right atmosphere in a dungeon without realistically lit torches and found that I liked the effect of natural light. I created all the models and materials for the room, torches, and windows from scratch in Blender. The view out the windows is a cylindrical panorama of Hogwarts castle at sunset which I took from pottermore.com. I found the wall and floor textures through Google images and tiled them to create larger, better quality images that would cover the large surface areas.

The objects in the scene are items that you would expect to find in a potions class. I created the models and materials for the bubbles, mortar and pestle, the test tube rack, and all of the glass bottles, beakers, test tubes, liquids and corks. I downloaded models for the table, cauldron, Bunsen burner, books, gemstones, chopping board and knife from various sources, such as TurboSquid and Free3D. Except for the cauldron, I textured everything manually myself, with textures I found through Google images. I used a software

called CrazyBump to create normal maps from textures to create deformations in the floor, cauldron, book pages, and corks.

A few of the objects reference specifics from the movies. The open book is a book called "Moste Potente Potions." I carefully textured it so that it features the recipes for Polyjuice potion (left) and Skele-Gro (right). The wand lying next to the book belongs to Luna Lovegood, a quirky and unpredictable Ravenclaw witch. The books stacked on the left are "Advanced Potion Making," a textbook featured in the 6th Harry potter movie and book, and "Defense Against the Dark Arts."

Lighting

To mimic the sun shining through the windows at sunset, I positioned several directional lights in an arc along the panoramic cylinder and pointed them each inward towards the tower room. I also linearly decreased the intensity of these lights as they moved farther from the implied position of the sun (through the right window of the scene). I also placed area lights on the above ceiling to increase the general illumination of the scene and to soften the shadows created by the directional lights. Finally, I placed point lights within several objects (the liquids in the test tubes and the blue Bunsen burner flame) to give them a glowing effect and to cast their colors outward.

Technical Improvements

I heavily modified the LoadMaterialFromAssimp function to extract more information from the mtl files and set those values automatically. These included, values for transmittance and reflectivity as well as normal maps. This allowed me to control all the specific values from Blender rather than in code.

Because I have several glass containers with contents inside, I wrote code to allow shadow rays to continue through transmissive objects. I had the Backward Renderer continue tracing rays when it hits a transmissive object by creating a new ray in the same direction starting at the intersection point (offset by a small epsilon) and by attenuating the light by a factor of the material's transmittance and its diffuse color.

Though I did not end up using it in my final image, I implemented depth of field by tweaking the Perspective Camera's GenerateRayForNormalizedCoordinates method to simulate a lens rather than a pinhole. To do this, I had to change the ray direction and origin. I positioned the new ray origin O_1 at a random coordinate within a given radius from the original ray origin O_0 . I calculated the convergence point C of the lens using the original ray origin O_0 and direction D_0 and a given focal distance f :

$$C = O_0 + f * D_0$$

The new ray points from the new origin to this convergence point, so I set the new ray direction to be $D_1 = C - O_1$.