University of Massachusetts Boston

CS460

CS460 Fall 2022
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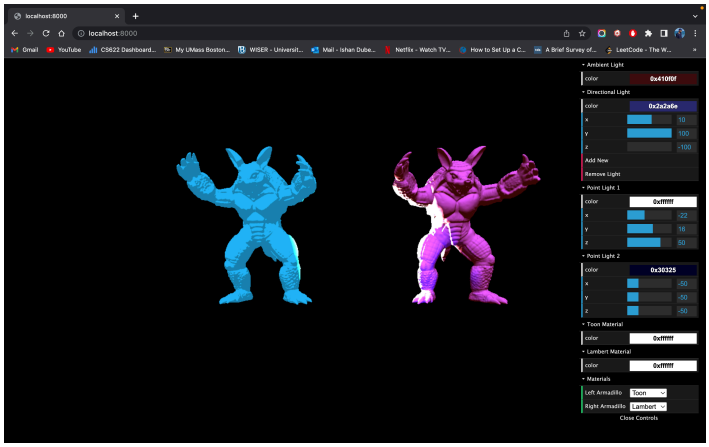
Due Date: 11/28/2022

Assignment 9: Geometry, Materials, and Lighting!

We will load our favorite mesh from a file, try out different materials, and play around with light settings.



Starter code for assignment 9. After pulling from upstream, there is the folder `09` in your fork. If you run a webserver and access the file, you will see a sad single armadillo in the scene.

Part 1 (14 points): The armadillo needs a friend! Please load a second mesh from a file using a THREE.js loader. This could be any mesh you find online in any format THREE.js supports - or you could load the armadillo again. Please modify the positions so that the meshes do not overlap.

Part 2 (15 points): Please configure the second mesh from above with a different material of your choice (not MeshToonMaterial again!).

Part 3 (10 points): Please add two point light sources to the scene.

Part 4 (15 points): The starter code includes the following snippet to control the color and position of the directional light.

```
var directionalFolder = gui.addFolder('Directional Light');
directionalFolder.addColor(controller, 'color').onChange( function(value) {
  directionalLight.color.setHex(value);
});
directionalFolder.add(directionalLight.position, 'x', -100, 100);
directionalFolder.add(directionalLight.position, 'y', -100, 100);
directionalFolder.add(directionalLight.position, 'z', -100, 100);
directionalFolder.open();
```

Please setup dat.GUI to control position and color of the two point lights with similar code.

Part 5 (15 points): Please setup dat.GUI to control the color of both materials.

Part 6 (20 points): Please play around with the lights and try to understand why the toon material seems to work *sometimes*. What are your observations?

Ans: The toon material behaves differently under different light conditions. Starting with the point light sources, when the toon armadillo comes directly in front of them, it takes the form of a shadow with the same color as of the point light. With the directional light and ambient light, it retain its features when the light is dark but shows the similar behaviour as with the point light when the light is lighter in color.

The lambert material behaves well under all lightning conditions. The lambert armadillo retain its features under every color of ambient, directional and point light. The color of the material changes slightly according to the color of light but it never completely becomes a shadow.

Part 9 (1 points): Please update the screenshot above with your own and then post the github pages url here:

`https://idubey-code.github.io/cs460student/09/index.html`

Part 10 (10 points): Choose a final project—either an existing one from `https://cs460.org/assignments/final/` or a new one. Please list the project here and in the link. If working as a team, assemble your team and list the team members below and in the link.

Ans: For the final project I will be working on creating a **Rubik's cube** in Three.Js. The cube will have rotation functionality similar to a physical cube and I will also work on creating a auto-solver for it so that we can learn how to solve by observing rotations required along the various axis. The project will be done **individually**.

Bonus (33 points):

Part 1 (11 points): Please add dat.GUI elements that allow to switch the material for the two meshes. Here is an example of a combobox in dat.GUI:

```
// Choose from accepted values
gui.add(controller, 'material', [ 'toon', 'standard', 'phong' ] ).onChange( function(value) {

  if (value == 'phong') {
    // TODO
  }

});
```

Ans: Created a new material folder which allows to change material for both armadillos. Please look for the code under **//Bonus Part 1**.

Part 2 (22 points): Please make adding lights to the scene dynamic: Add dat.GUI buttons to add new directional lights that then also add a dat.GUI folder to the menu that allows to control (color and position), and remove the light.

Ans: Added two new buttons in Directional Light folder which implements the given functionality. Please look for the code under **//Bonus Part 2**.