University of Massachusetts Boston

CS460

CS460 Fall 2019
Name: Frank Novak
Student ID: YOURID
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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 (30 points): Please play around with the lights and try to understand why the toon material seems to work *sometimes*. What are your observations?

In my time playing around with the lights I have come across some things that were known already and some new things I was not aware of. As we have learned in class the color of the light and material determine what a mesh looks like on the screen. The toon material sometimes seems to work and other times does not. Something that I observed was the fact that the position of the lights has a lot to do with the material working as intended or not. The intensity of the light and its color also play a big role. Some colors and how bright they are under the light lead to the material sometimes not working correctly. Another thing that seems to determine if it works or not are the normals of the armadillo. Since there is a texture to the armadillo because of its normals sometimes the light hits the mesh and there are bumps on the mesh that the light shines on in a different way since parts of the armadillo are raised or lowered. The way the light interacts with this texture also has to do with the material working or not. This can be seen very clearly when moving the point lights in different ways around the armadillos.

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

`https://fnovak02.github.io/cs460student/09`

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
  }

});
```

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.