3D shapes and lighting

In this homework you will explore and combine three.js tutorials. Specifically you will be working from the following ones:

- Shapes: starting code
- Color Explorer: lighting code to integrate
- Materials Solid: appearance of the light
- Shader Glow: enhanced menu with a checkbox

Setup

You can download the tutorial repository from GitHub, which is the entire code and dependencies, i.e., more than you need. The tutorials of interest are in the Three.js folder, which is ~50 MB. You may consider to trim it down to the dependencies and images you really need or you can keep track of what you really need to submit on Moodle: maybe only the userNameShapes.html file.

But first you have to fix your web-browser permissions to be able to run the code locally, which is required for you to change the code and see its effect.

Follow the instructions for the browser you use and make sure it works when you open Shapes.html from your local disk using the browser you just gave permissions to read texture files.

Shapes

Using the Shapes.html starting code do the modifications (mostly erase: comment and then delete; your code should be submitted clean, i.e. not a mess/difficult to read and follow) so that you have

- Five shapes with the following restriction: one shape should have a few triangles and one should have many triangles.
- Keep them aligned or arranged in a symmetric pattern: you may use diagonals, rows or columns you choose.
  The shapes should not be placed in random positions on and above the floor, i.e., keep equal distance between them and relative to the floor (they are either above it at a same height above or directly on it).
  The goal is to control positions not do be satisfied by wild guess: code what you want, not just happy accidents.

Adding a Light and Different Shading Models

Once you have your five shapes, run and read the Color-Explorer demo.

Understand the code structure and the interactions provided by the controls of the light and the sphere. Next you have to borrow from that tutorial so at to integrate the lighting effects to your five shapes code.

Specifically you have to add a light and its controls (as in the Color Explorer tutorial).
• You should not include for the sphere
  – the position control for the \( x, y, z \) coordinates and
  – the reset sphere position (as the shapes aren’t moving in your case).
  **Comment that code and do not erase** as it will be useful below when you are working on modifying the light.

• The light controls should be connected to your scene and change the rendering provided by the surface materials you have set.
  – Keep the drop-down menu with Basic, Lambert, Phong and Wireframe, each selecting the surface rendering and lighting computation.
  – Lambert and Phong are the interesting shading models, which influence you can observe when you change Shininess and Color (Emissive and Diffuse) values.

**Changing the Light: appearance and position**

Finally do the following two modifications for the light.

1. Change the rendering to look like in the **Materials-Solid** tutorial.
2. Add the UI controls to be able to translate the light \( (x, y, z) \) position: use the code you commented to work on the light rather than the sphere as in the **Color-Explorer** tutorial.
3. Add the reset control to reload to initial values for the light position, color and material values.

**Extra feature**

Add an extra feature with a checkbox control (see Shader - Glow Effect for the UI code) inspired from the tutorial. Explore something you want to learn and does not compromise the style of your scene and add it to your code.

**Advices**

• You may be allowed to work in pair if you talk to me beforehand. The earlier the more likely you will be permitted.
• Start early.
• Work incrementally.
• Do not paste use piece of code without understanding.
• Understand the connections first.
• Use search in the code you are borrowing from to figure out the implications throughout the code in between
  – the UI,
    * the shaders,
    * the geometry and
    * the rendering/update
Submission

Submit a plain-text Readme with your name(s) at the top of the file and answer the following questions:

1. Describe how Phong and Lambert lighting models have a different effect? You are encouraged to read the textbook.
2. What do you think about your extra feature? Why did you decide to integrate this particular one?
3. What did you learn? and what satisfied you the most in the process?
4. What was the biggest challenge?
5. What are you thinking in term of the course project and three.js? I want to know what you are thinking about, i.e., will you be working on a game, a simulation or anything else you encountered; what is the theme/inspiration that you have? I want to start some conversations.

Grading

- 60% for correctness
- 20% for code design: use of functions, array/list to minimize repeated code and have a few global variables
- 10% for the extra feature
- 10% for your readme

This homework is due Friday, 19th of February at 5:00 p.m. on Moodle.