CMPM 163 W2018
Game Graphics & Real-time Rendering

Homework 3 (100 pts) – Due Sunday, 3/4 at 12noon

All code will be uploaded to GitHub (or another repo), it should include a short "ReadMe" describing the project, along with one or more screenshots of the project. Assignments A and B should run from a website. Assignment C should be submitted as a PDF (or make sure it's included in your git repo). Submit your homework via Canvas.

A. Creative Text Animation - (30 pts)

Using Three.js and GLSL shaders, create a scene with at least the following elements:

— Nicely rendered text using a SDF Font Atlas. You should use at least three different typefaces in the project.

— Using the values of the SDF for the text, add a texture, an outline, or some color to the text.

— Make the scene animated and interactive, e.g., so that the text changes size, color, texture, etc, and so that the user can use the keyboard or mouse to add text or move the camera.

B. Shadertoy-Style Scene - (50 pts)

Using Three.js and GLSL shaders, create a "shadertoy style" scene:

— The entirety of the scene will be rendered using a GLSL fragment shader. The only geometry will be the "full screen quad" that covers the entirety of the window. That is, your fragment shader will be responsible for rendering every pixel in your browser window.

— Use 3D SDFs to generate the objects in the scene. Use constructive solid geometry (CSG) operators to create complex shapes. Emulate Phong lighting in the fragment shader.

— Have at least one of the shapes morph into another shape over a short period of time (~10 seconds or so is fine).

Extra credit (10 pts):

— Add textures to the SDF objects in the scene.

C. <u>Begin Planning Your Final Project</u> - (20 pts)

You will work together with 2 or 3 of your classmates to design a 3D scene that incorporates a range of different effects that build off the concepts you've been introduced to in this class. Further details about your final project will be announced next week.

Part 1: For now, choose one topic from the following list (or find a topic of your own) and explain as best you can in a few paragraphs how you think the technique works. How might you implement this using GLSL shaders? Include images of the effect and sketches of how your initial ideas of how the technique works.

— Indirect illumination
— Ambient occlusion
— Caustics
— Smoothed-particle hydrodynamics
— Cloud simulations
— Crepuscular rays
— Bidirectional reflectance distribution functions
— Subsurface scattering
— Deferred shading
— Smoke simulation
— Volume rendering

You also might be inspired by other real-world phenomena or objects: Stained glass, gems, lasers, plasma, rust, lightning, raindrops, mirrors, snowflakes, frost, etc. The topic you choose for Homework 3 does *not* have to be the topic you end up using for your final project.

(Looking ahead, part of your final project will involve reading previous work— e.g., a thorough blog post or a research article— on the topic of your choice. You can often find ideas by looking through academic proceedings and journals for computer graphics research.)

Part 2: You will also need to decide who you your team members are for the final project. We will use part of class next week to find collaborators, or please talk outside of class or through Slack.

Extra credit (10 pts):

You will get extra credit if you choose a topic that no one else has chosen.