CMPM 163 S2019
Game Graphics & Real-time Rendering

Homework 3 (100 pts) – Due Sunday, 5/27 at 11:59pm

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. Assignment A should either run from a website or have a clear link to the executable available via your GitHub repo's ReadMe. Assignment B should be a single PDF file, which could contain text, links, sketches, images, etc., to introduce the topic you want to explore for your final project.

You are encouraged to help each other, but you must submit the homework individually to the TA of your lab— either Manu Mathew Thomas for Lab A (mthomas6@ucsc.edu) or David Abramov for Lab B and C (dabramov@ucsc.edu)— with "CMPM 163: Homework 3" as the subject line. Please use this exact subject line.

A. Abstract scene using particles and noise - (60 pts for completion + 10 pts for creativity)

Using Unity's Particle System and HLSL shaders, create a scene that lasts for 30 seconds (or longer) and that uses the following elements:

— A particle system that mimics some naturalistic phenomenon or game effect– fire, electricity, clouds, smoke, etc.– that changes or animates over time.

— A noise function that provides realistic features of natural phenomena. You can use the library at https://github.com/keijiro/NoiseShader, the built in C# noise commands, the noise module in the particle system, or you are welcome to find another approach of your own.

— Include properties that control some parameters of the scene.

— Have elements of the scene respond to audio.

B. Begin Planning Your Final Project - (30 pts)

For the final project, you will work together with 2, 3, or 4 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, you will choose a 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 visual effect works. How might you implement this using Unity and HLSL shaders? Summarize the technique in your own words and include images of the effect and sketches of how your initial ideas of how the technique works. In the final project, you can use the Shader Graph, Particle System, or even the VFX Graph for GPU particles, but in the write-up for the final project you will need to explain how everything works.

— Indirect illumination
— Ambient occlusion
— Caustics

— Smoothed-particle hydrodynamics
— Cloud simulations
— Crepuscular rays
— Bidirectional reflectance distribution functions
— Subsurface scattering
— Explosions
— 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. (But it will probably save you some time if it does!)

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.