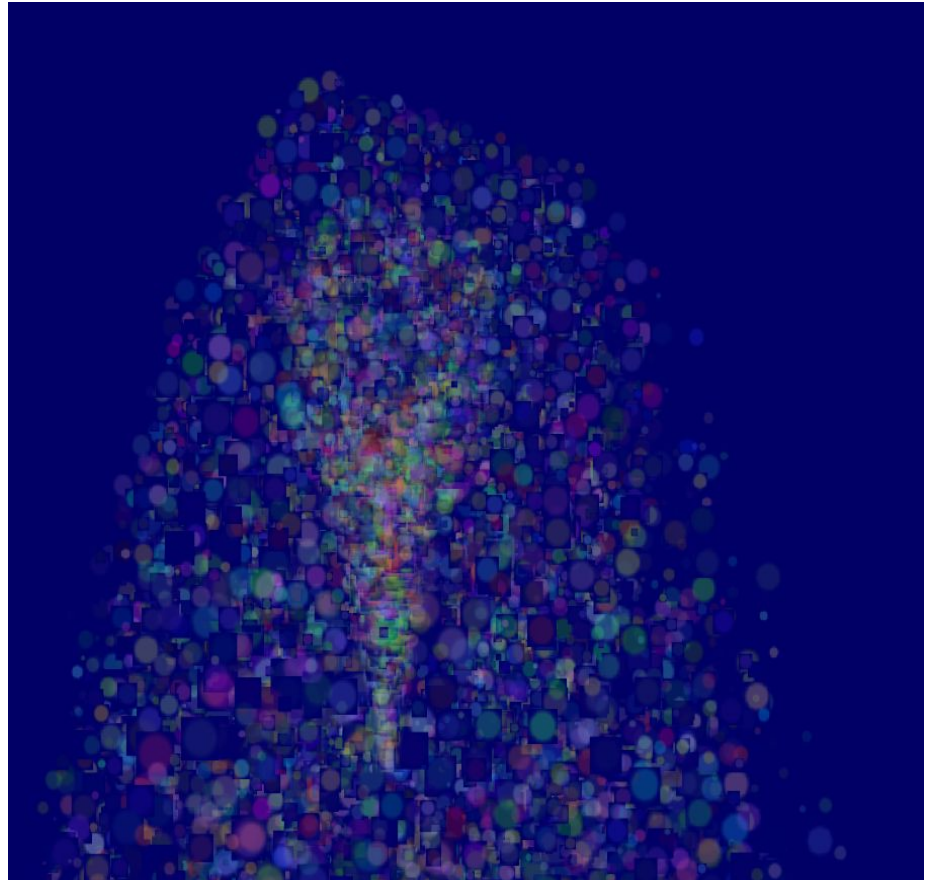


Part 1

I am interested in the ways to simulate real-life natural effects, such as rain. Say, for example, I wanted to simulate a rainy day in London, where the puddles ripple as the raindrops fall onto the streets. A lot of the environments I enjoy are simplistic and capture a scene really well, and rainy scenes have a strong aesthetic quality to them that I've always liked.

Making this kind of scene with GLSL shaders is actually rather rudimentary in practice, but

perfecting the look is another matter. One of the main principles of computer graphics that is involved here is the use of a particle system, whereby particles are created in a scene at random. To make a particle system, there is a method called instancing where the scene mesh is split into two triangles and buffers are applied to the triangles to simulate particles. These buffers can be things like particle size, color, and illumination, if any.



Example of Particle Instancing

Instancing in this manner avoids the cost of rendering a giant mesh every frame and instead cuts it down to only needing to update a small base buffer, making rendering the scene every frame much faster. Once the buffers are applied, particles can be created in a large particles “container”, where particles are stored and new ones are instantiated based on what particles have not been used. The particles container also assigns values to particles upon creation.

This method usually creates choppy particle scenes that are artifacted and messy, so to fix this, a test can be made. Checking to see if particles are near to the Z-buffer (the buffer that stores the Z-axis data) and fading them out will create a smooth

particle system. Sampling the Z-buffer is not normally possible, however, so either the scene must be rendered to a texture using render target methods or using `glBlitFramebuffer` to copy the Z-buffer from one frame buffer to another will help make smooth particles work.

There are plenty of different methods to create particle systems and ones that look good. I just happened to have learned about this method outside of class and wanted to write about it. Particle systems are easy, fun ways to make scenes look that much cooler, and I hope the use of one in my final project will serve to make the overall project that much neater.

Part 2

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