Daniel Liu

Spatial Systems - Supplementary Information

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projects

DiscourseVR : Multiplayer VR Debate

github | devpost | video demo

ChatSpaceVR : Student Mental Wellness Chatspace

github | devpost | video demo

LegoStudioVR : Interactive Lego Sandbox

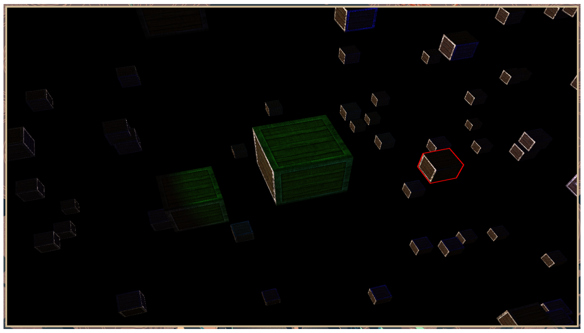
github | devpost

experiments / simulations

I also did a bunch of experimentation and simulations in Unity that did not amount to a full project - here are some highlights.

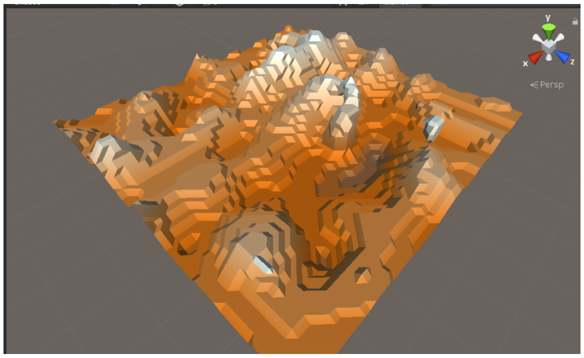
OpenGL Experimentation

Learning some low level rendering basics by playing around with OpenGL in C++. Did some abstraction on things like VAOs, vertex buffers and index buffers to make using them easier. Also played around with writing some simple shaders for lights types (directional, spotlight, pointlight) that featured effects like specular reflection and attenuation. Also wrote a simple camera using model view projection matrices.



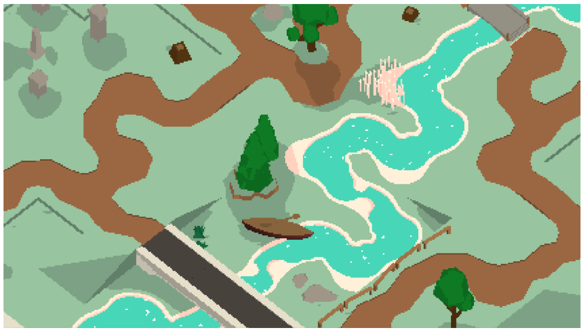
Procedural Terrain Generation

Procedural terrain has always been something that fascinated me. I started with some basic Perlin Noise layering to create some simple heightmap terrain. However this technique only applies noise in 2D, meaning that complex structures like cliffs and overhangs were not possible. So later I made use of a 3D Perlin Noise function along with Cube Marching to generate some more interesting terrain.



Pixel Rendering

Inspired by the art style of the game 'A Short Hike', I tried emulating the art style for one of my game jam submissions. The pixelated effect was accomplished by taking the camera and using it as a render texture and then shrinking down the resolution (the effect is a bit subtle so might need to zoom in on image to see). This game also featured a pedestrian and traffic network system.



Portals

Illusion of portals by using a second camera and a render texture onto a plane. Video demo can be found here.

Wave Function Collapse Procedural Generation

Wave function collapse is a particularly neat technique that can be used to generate more systemic structures like villages and buildings. So far I have only implemented this algorithm for 2D sprites using Typescript, but it should be simple to extend this to 3D structures.