CAP 4720 Final Project

Procedural Terrain Generation

Members: Jenna Busch (individual)

Description of Project:

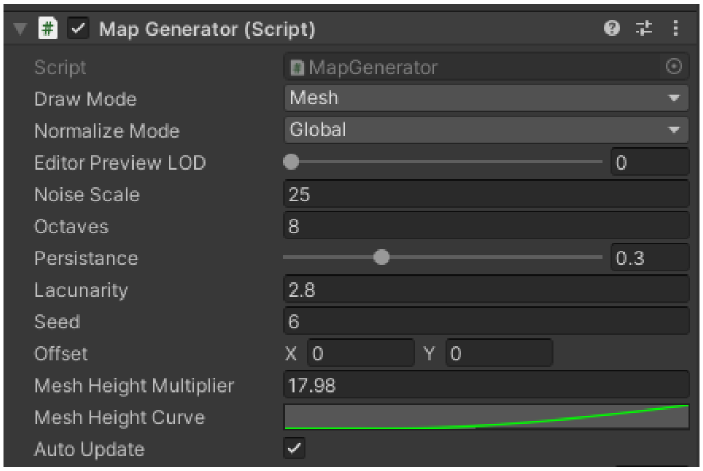
In my final project, I created a Procedural Terrain Generation system in Unity, employing computer algorithms and procedural techniques to generate versatile and interactive terrains. This system allows users to customize terrains by defining parameters for specific environmental features and desired aesthetics. Throughout this process, I learned how to navigate Unity's environment while developing algorithms to generate terrains and customize desired map features. The project provided insights into the fusion of theoretical algorithms with practical Unity implementation, refining scripting skills for terrain creation and offering an avenue to explore the intersection of creativity and technical expertise. The map generator has many features to make this terrain generation function and display desired maps for users. Overall, this project works with noise and algorithms to generate endless terrain systems.

Implemented Features:

I have created a terrain generator that you can customize to what you desire in a map.

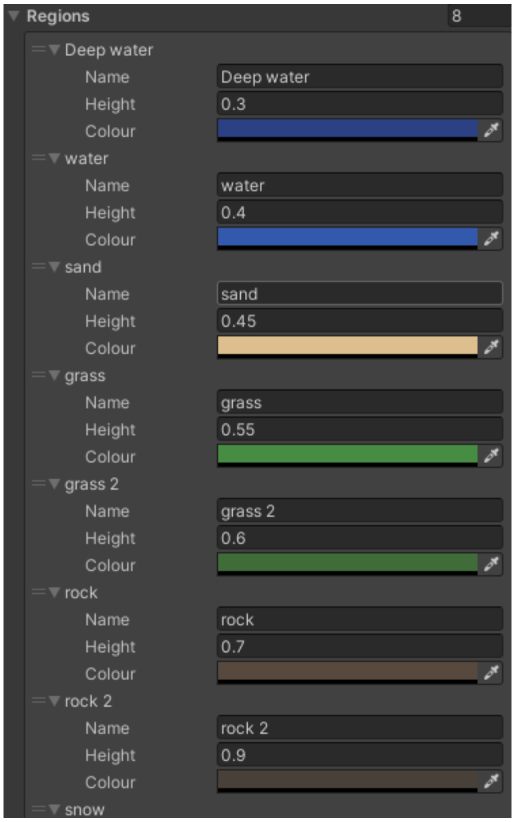
1. Customizable Terrain Size: Allow users to specify the dimensions of the generated terrain, such as width, length, and resolution. Also allows for local and global settings depending on map size.
2. Elevation Control: Enable users to define the minimum and maximum elevations of the terrain to create valleys, mountains, or flat landscapes.
3. Terrain Features: Incorporate options to generate various terrain features like mountains, hills and valleys.
4. Realistic Textures: Apply textures and materials to the terrain to simulate different surfaces like grass, rock, sand, and snow.
5. Water Bodies: Allow for the creation of lakes, rivers, and oceans within the terrain.
6. Realistic Features: Allows for change in level of detail, persistence of pixels, octaves, lacunarity to alter the visual features of the creation of the map. Also, inclusion of seed change to alter entire map.
7. Endless Map terrain: My generation accounts for player movements and generates as the player moves and is most realistic where they currently are.

All of these features are included in my terrain generation and I have included some pictures of the feature bar so you can see the actual sliders and values that are allowed to be changed and added to create the map.



Map Generator (Script)

Script	MapGenerator
Draw Mode	Mesh
Normalize Mode	Global
Editor Preview LOD	0
Noise Scale	25
Octaves	8
Persistance	0.3
Lacunarity	2.8
Seed	6
Offset	X 0 Y 0
Mesh Height Multiplier	17.98
Mesh Height Curve	
Auto Update	✓



Regions 8

Deep water	Name	Deep water
	Height	0.3
	Colour	🟦
water	Name	water
	Height	0.4
	Colour	🟦
sand	Name	sand
	Height	0.45
	Colour	🟨
grass	Name	grass
	Height	0.55
	Colour	🟩
grass 2	Name	grass 2
	Height	0.6
	Colour	🟩
rock	Name	rock
	Height	0.7
	Colour	🟫
rock 2	Name	rock 2
	Height	0.9
	Colour	🟫
snow		

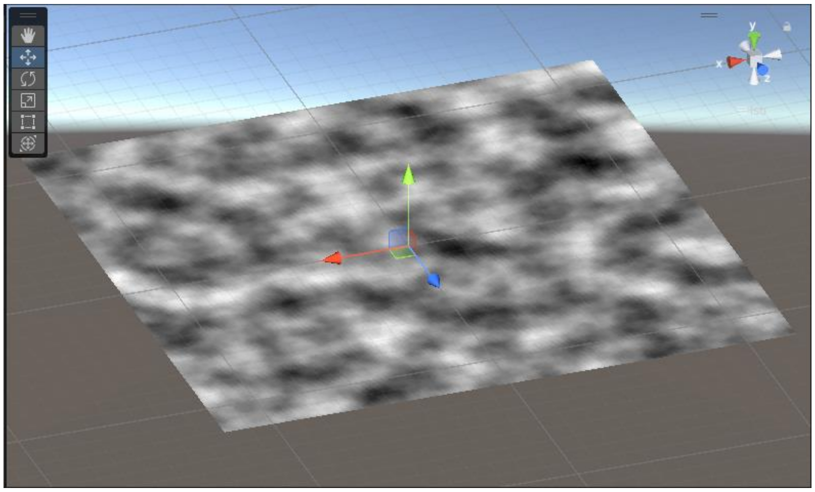
Individual Contributions:

I completed this project individually, so all created features and results were made by myself.

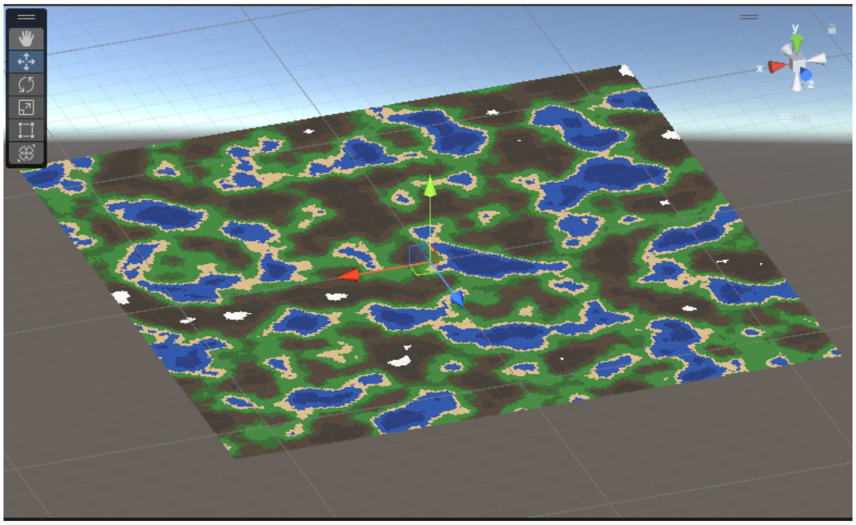
Results:

Throughout the process of completing my desired results from my project I had many results to showcase. In my terrain generation I created three separate scenes in my map generator: Noise Map, Color Map, and Mesh Map. These three layers built off of one another in detail and complexity and all serve a role in both creating the visual aspects of the map and understanding the overall concept of creation. I also have a local and global view for switching between editing a single mesh and going into play mode and seeing the entire map. The local is just a good way to edit one map as it takes in less parameters while when processing global it holds the more differing variables. I also created various parameters in order for the map to be customizable so each result may be different. Ultimately, the mesh map is my final and desired result.

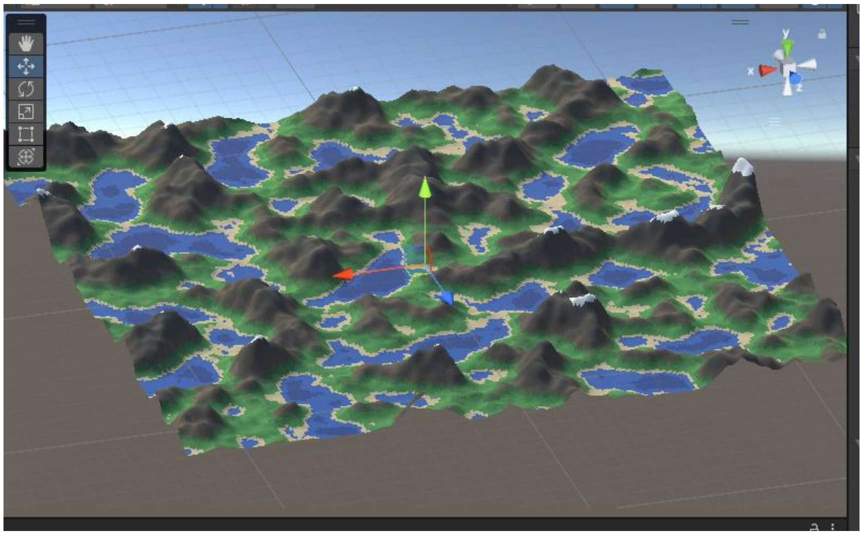
Noise Map:



Color Map:



Mesh Map:



Player View Multi-Mesh: