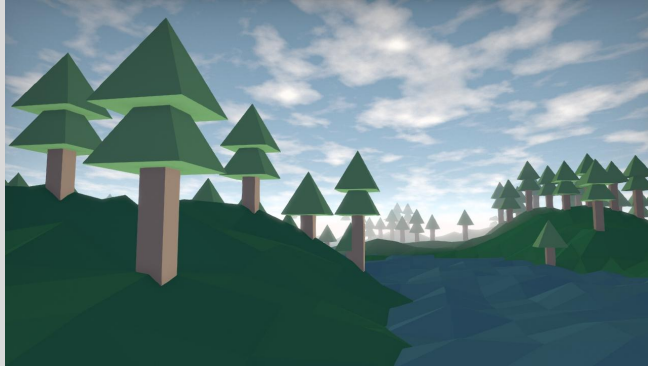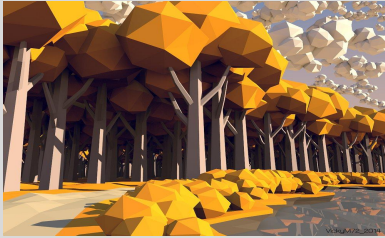# Procedural Low-Poly
Map Generation

MAP
DUO

Sam Donow and Nigel Munoz
CS371 F2014 Midterm
Williams College

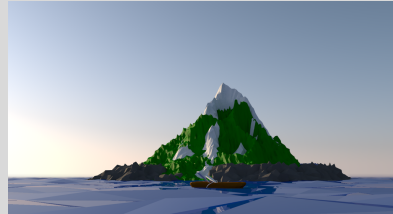# Goals: Low Poly, Infinite, Procedural

Autumn Low Poly by Vikym72 at DeviantArt.com

Cersei Turns to Ash by Duncanbdewar at DeviantArt.com

Mountain Landscape by Krisnarocks at DeviantArt.com

Low Poly Island by Vcmotiongraphics at DeviantArt.com

--All Algorithm inputs are random.

--Someone within the world cannot notice seams in an infinite world

--Low-poly art style; A low-density heightfield

Random Terrain is made with Noise

5 +- 0.5	4 +- 0.4	13 +- 1.3	(0, 20)=h +- (0, h/10)

Random seeds are coordinates at lattice points

Perlin Noise
G3D::Noise

PERLIN, K. 2002. Improving noise. ACM SIGGRAPH, 681-682.

--Two separate noise terms used explicitly instead of octaves to give more control over distribution.
--Diagram: Higher order terms in large boxes, lower in small boxes
--The seed to the noise function is the normalized coordinates of lattice points, which allows for consistency between regenerations

"Infinite" Terrain

- Moves with camera while remaining consistent

World ○

Camera
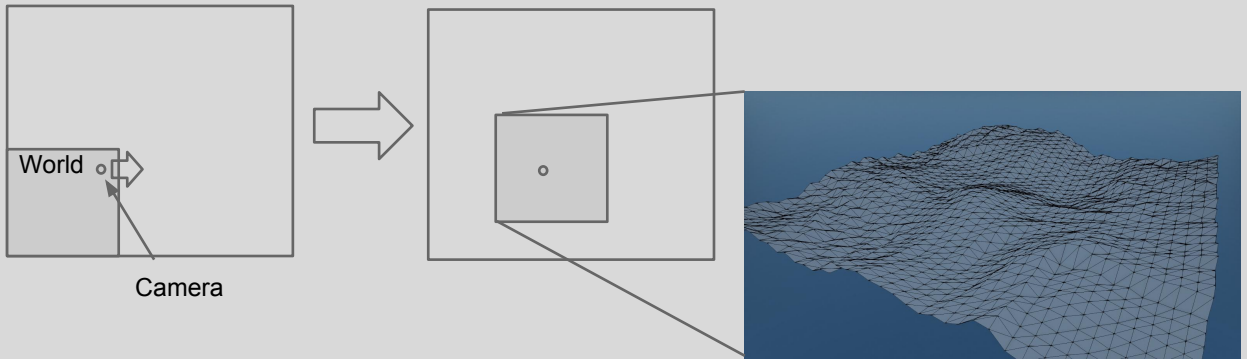
When the player reaches the end of the world, we regenerate terrain with them at the center, so that they cannot see the end of the world; also, we make the latice point nearest them as the center, allowing consistency between regeneration
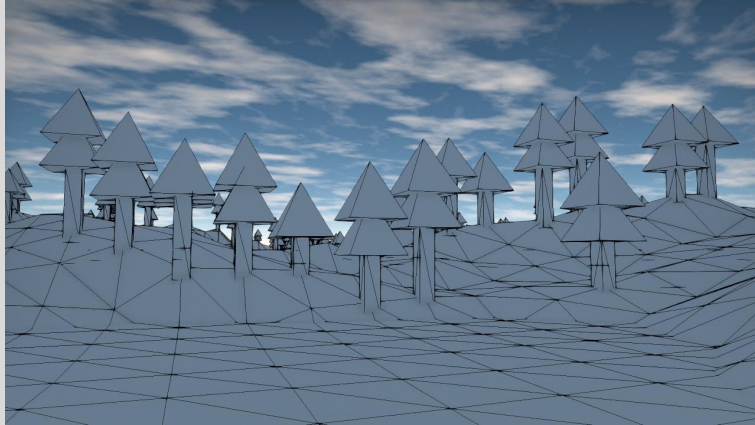
Water Fills in valleys and has Waves

--Waves movement created in vertex shader
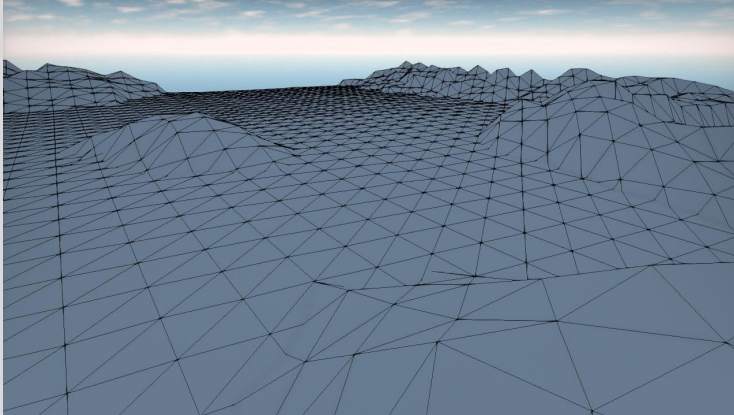
The vertex shader has a complex chain of sines and cosines dependent on time and position in order to compute the motion of water

Trees with Random Height and Design
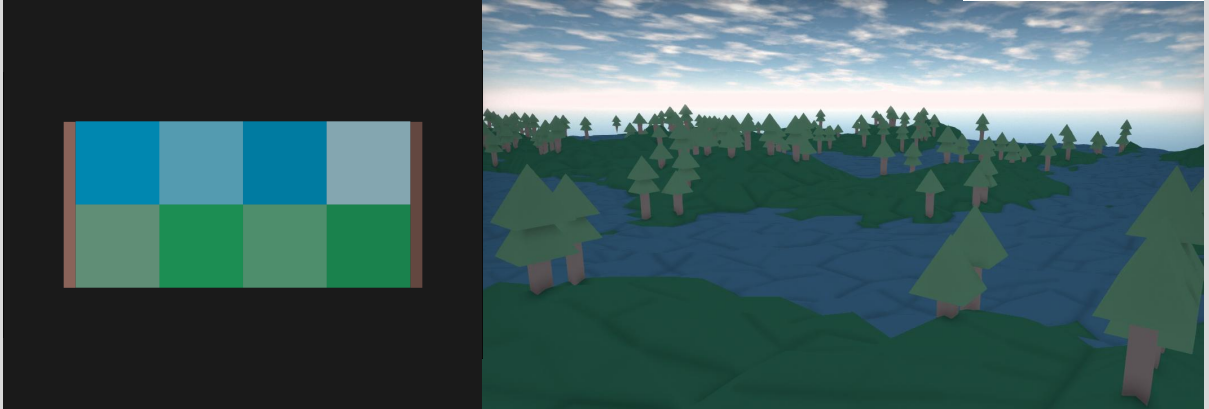
--Trees only grow from land

--Consistent with terrain

Random height for trees within bounds
Random whether trees have one or two pyramids at the top

Coloring

-Analogous Colors

Analogous colors are good. needed varying shades of green and blue for the color palette. this is because when low-poly flat shading is implementing, we need various colors to display, to make differences between adjacent faces clear.

Fog: Fading Reduces Seams

-A pixel shader lerps between scene and skybox or a solid color, weighted by depth.
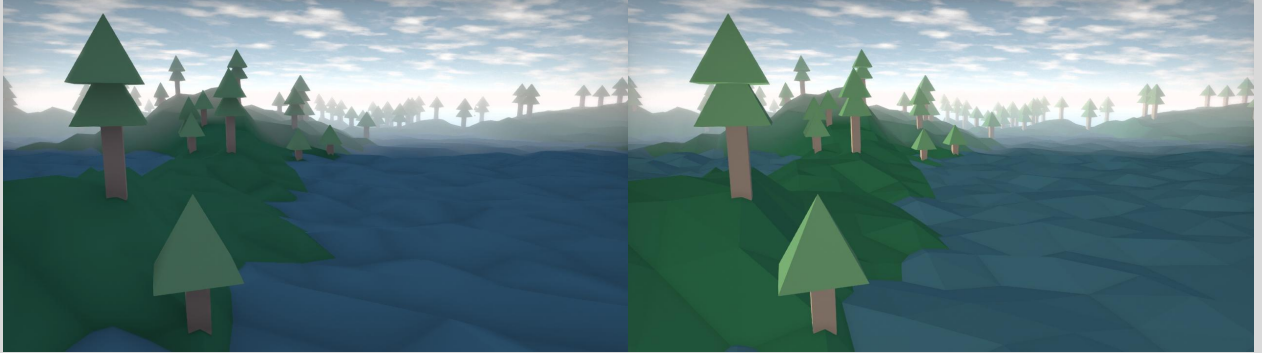

Fog makes it harder to see past the edges of the world to our shader
Depth is obtain from the depth buffer rendered by G3D
We lerp to a solid color on scenes where the skybox is too varied for lerping to it to appear as fog (e.g a night sky with stars)

Flat Shading Reveals Polygons

-Smooth Shading: interpolate normals over tri

-Flat shading: hold normal constant on tri

Flat shading is just a matter of adding a single line to a shdaer, it is a very simple feature

But, as the above images show, they greatly improve the quality of an image, especially relativde to the art style

Interactivity: Basic Physics

Player with Bounding Sphere

v

n
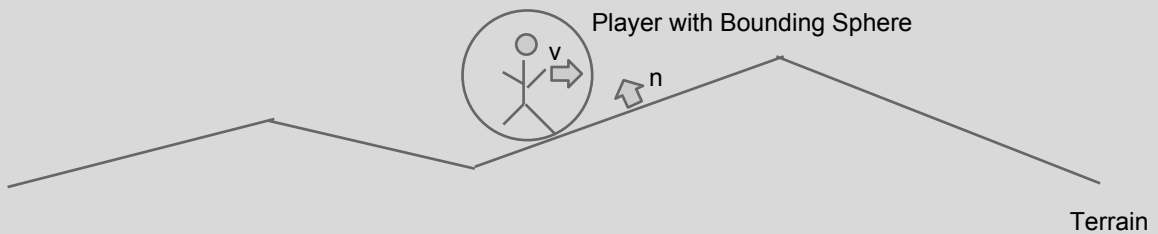
Terrain

Basic Physics added to the world in order to ensure compatability with making a game, which is likely the eventual use of our Terrain Generator

The only Collision detection necessary is sphere-mesh, with the meshes stored in a collision hierarchy to make collision detection as efficient as possible: as we are doing nothing fancy, a bounding sphere is more than adequate for calculating interesections as someone moves around the scene.

Demo

A real time demo will be shown during the presentation, it shows off our results graphically, while also showing that the basic physics engine does, in fact, work

Final Video

At this point, we showed our finalized video which is on display in the same gallery as this pdf