Bald Eagle Village

A Computer Graphics Project

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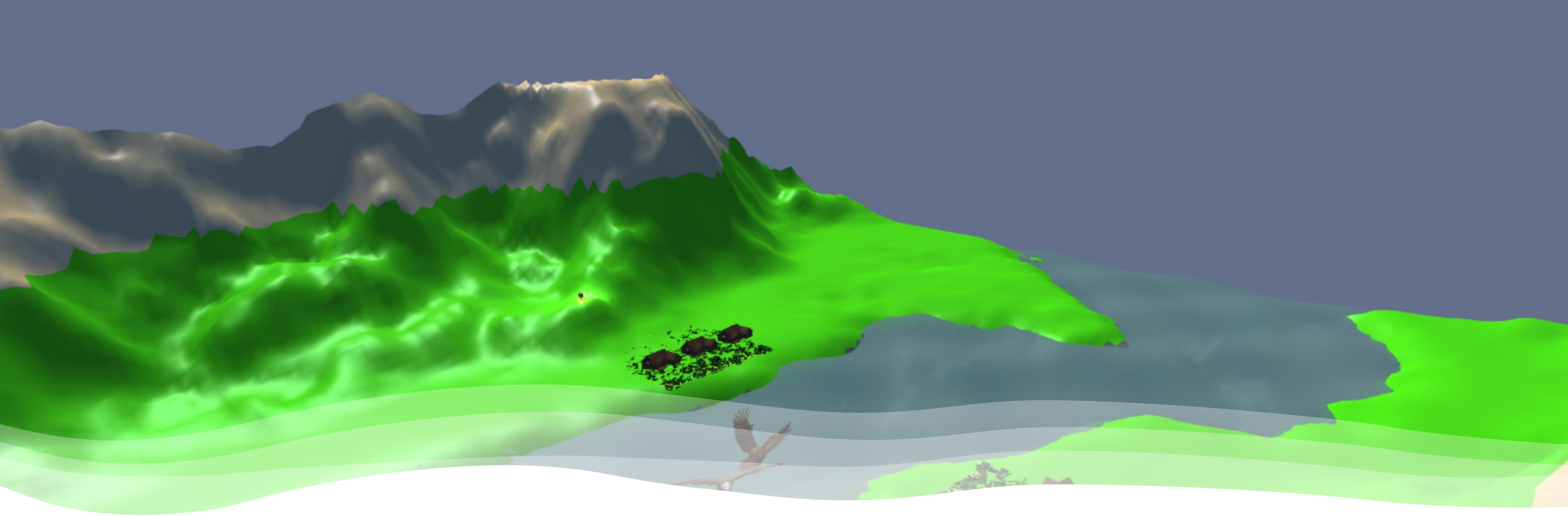
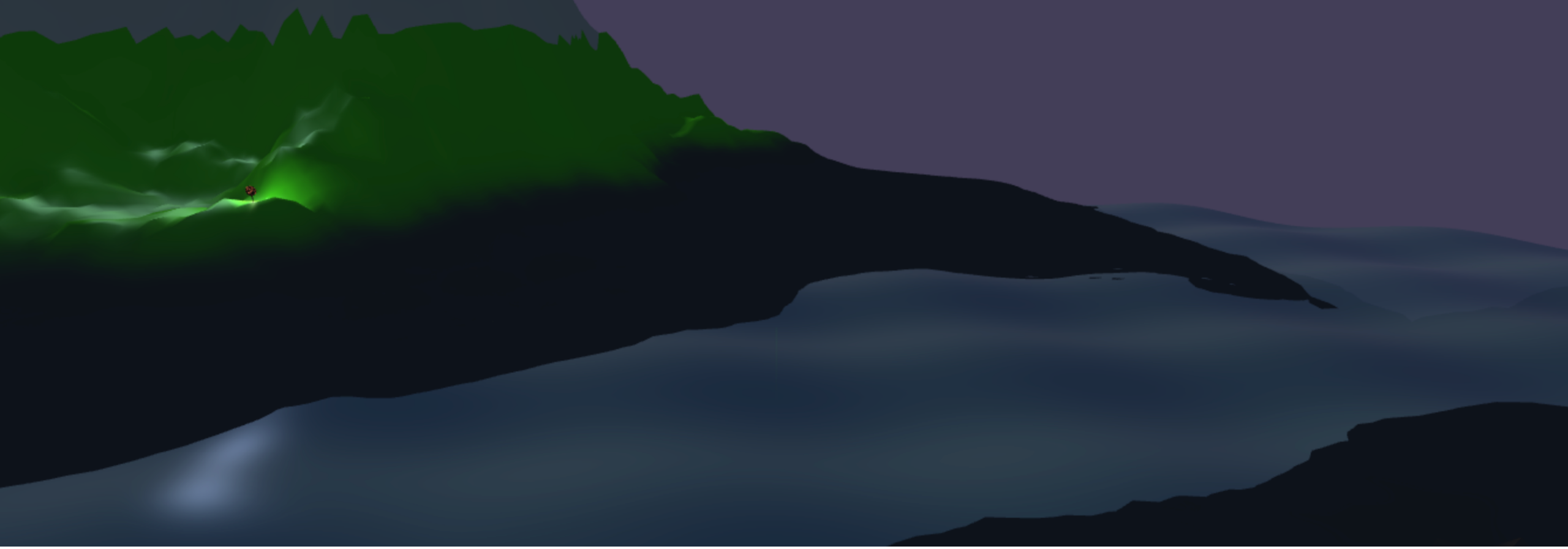
Basic Requirements



Basic Scene Setup
Implement a ground plane or environmental base

- Our ground plane is the terrain.

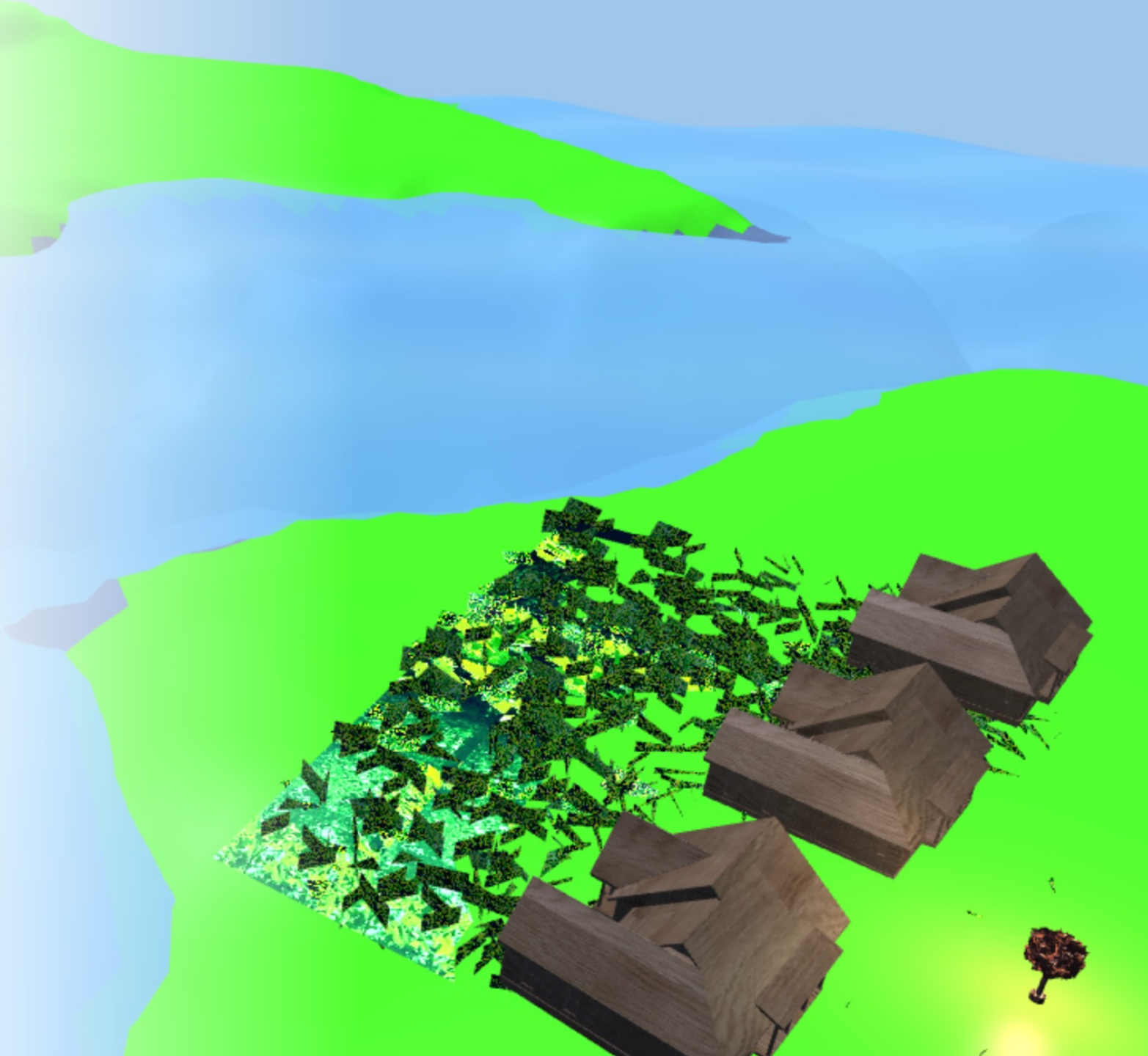


Basic Scene Setup
Add background elements

- Dynamic sky color change (sunrise animation)
- Fog

Basic Scene Setup
Position objects thoughtfully to compose the scene

We designed an Alaska Village with Houses, Grass Lawns, and Street Lamps (*Lamptrees*)

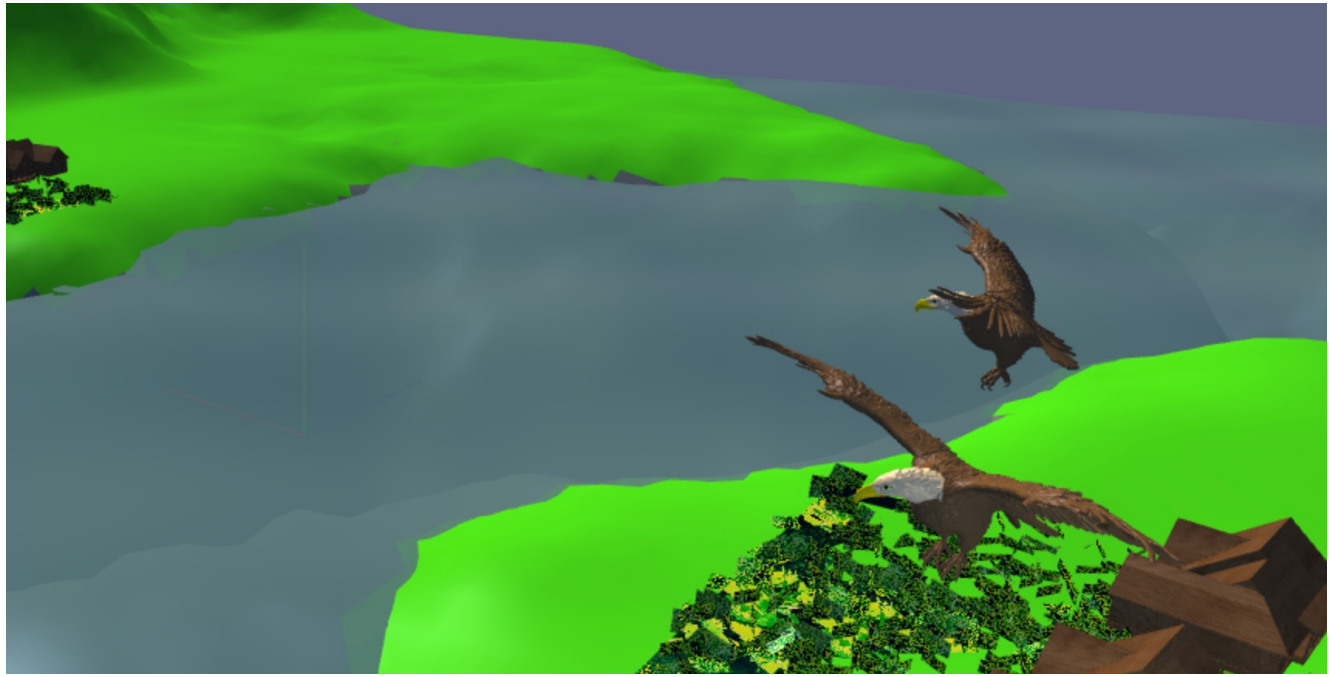


Basic Animation
Translation (moving objects through space)

Two bald eagles glide in the fog.

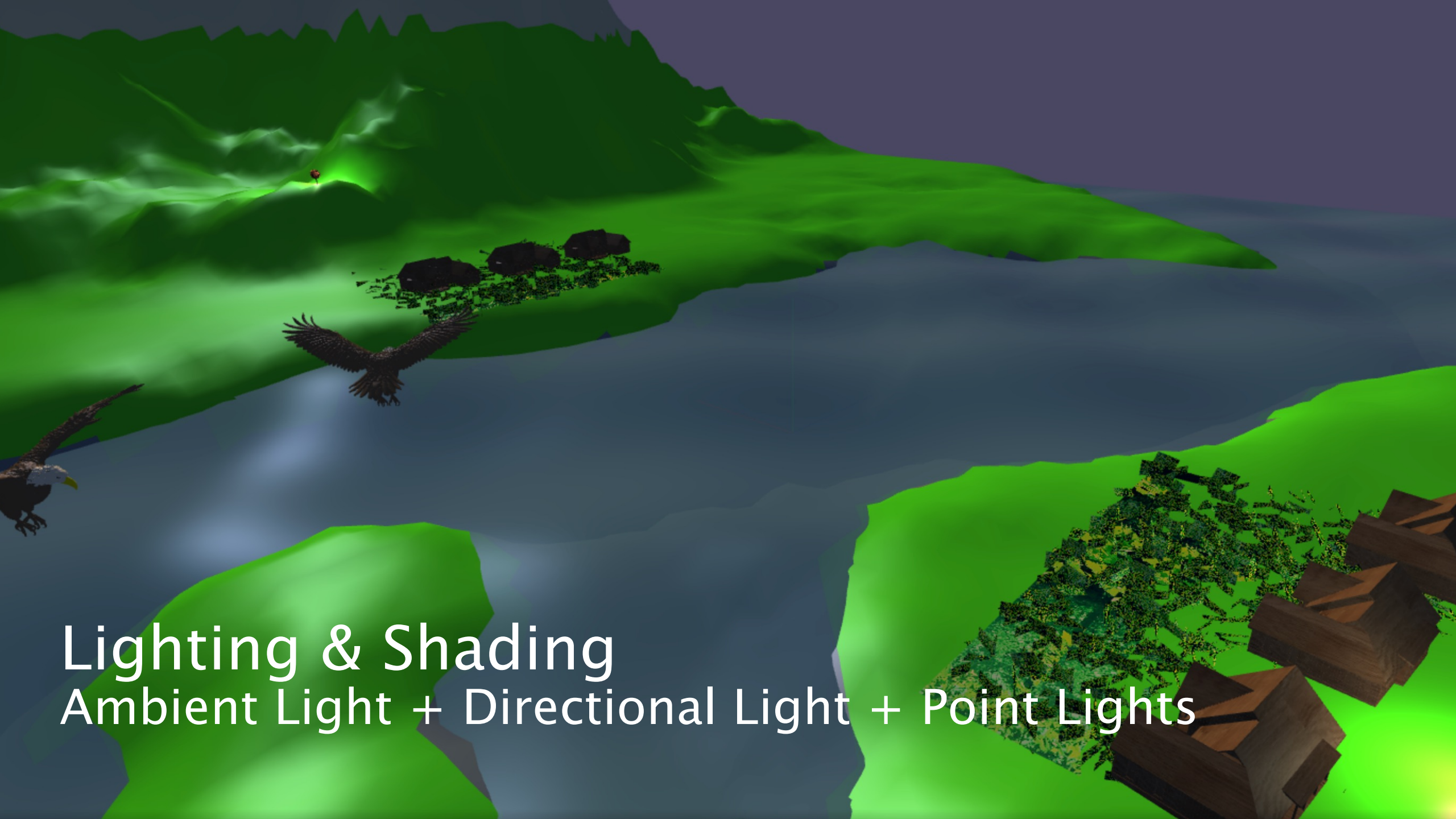
Basic Animation
Rotation (spinning, orbiting, or turning objects)

- The bald eagles circle around the center of the scene, chasing each other.



Basic Animation
Scaling (growing, shrinking, or pulsating objects)

- We scale the bald eagle wings along the *X*–axis.
- In the code, we use the variable `xCompressRatio` ∈ [0, 1] to represent the amount of *X*–axis compression applied to both wings.
- **When the wings flap,** their positions are scaled according to `xCompressRatio`, which naturally moves the wings closer to the center and thus closer to the body, making gaps less likely to appear.



Lighting & Shading

Ambient Light + Directional Light + Point Lights

Textures

grass-or-plain.jpeg

grass-or-plain.jpg

snow-mountain.jpeg

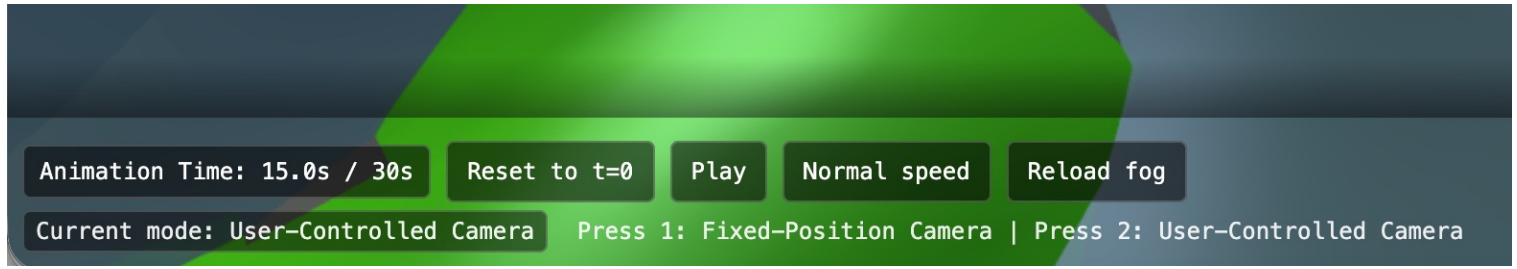
snow-mountain.jpg

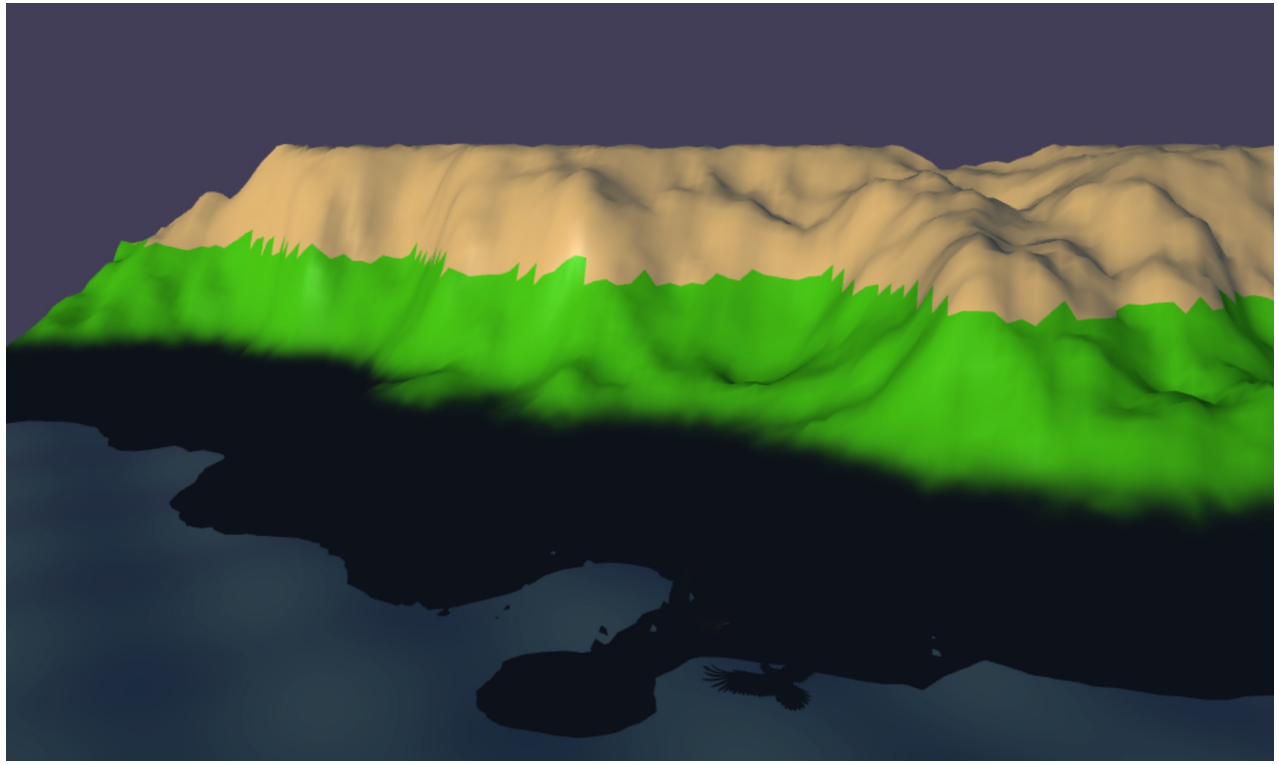
tree.jpg

water-or-cloud.jpeg

wood.jpg

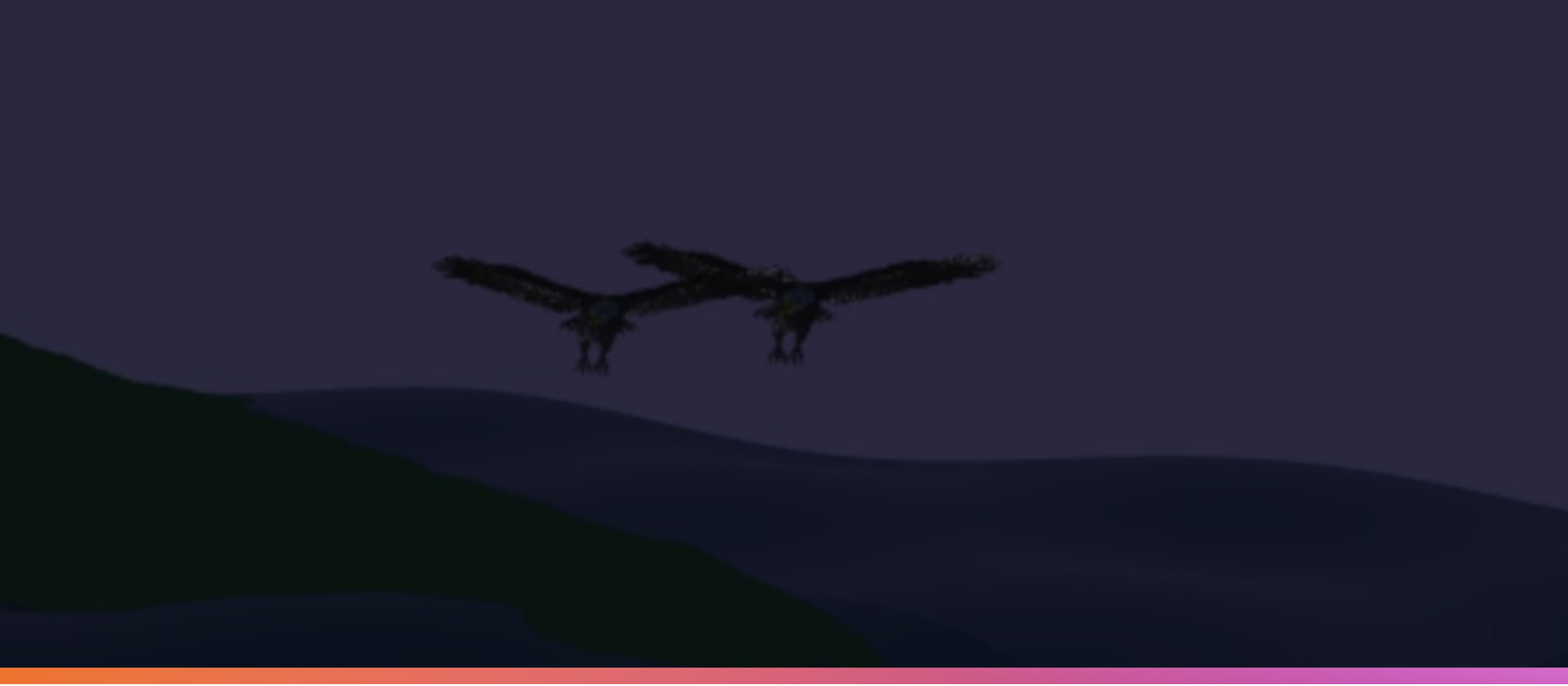
Camera Controls
Fixed Control + User Free Control





Middle Level Requirements

Object Interaction Animation
Objects responding to other objects' movements: **Bald Eagles Chase Each Other**



Object Interaction Animation

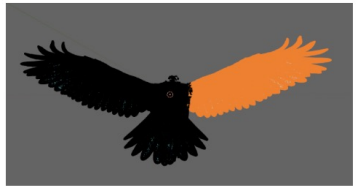
Synchronized movements showing relationships

Object Interaction Animation

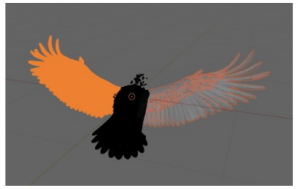
Sequential animations creating cause-and-effect narratives

Hierarchical Transformations

- Parent
  - Base Matrix
- Chilren
  - Body
  - Left Wing
  - Right Wing



(a) Bald eagle's selected right wing



(b) Bald eagle's selected left wing

```
// Parent: root/body transform
var parentM : Float32Array | Float32Array<...>  = Mat4.create();
Mat4.identity(parentM);
```

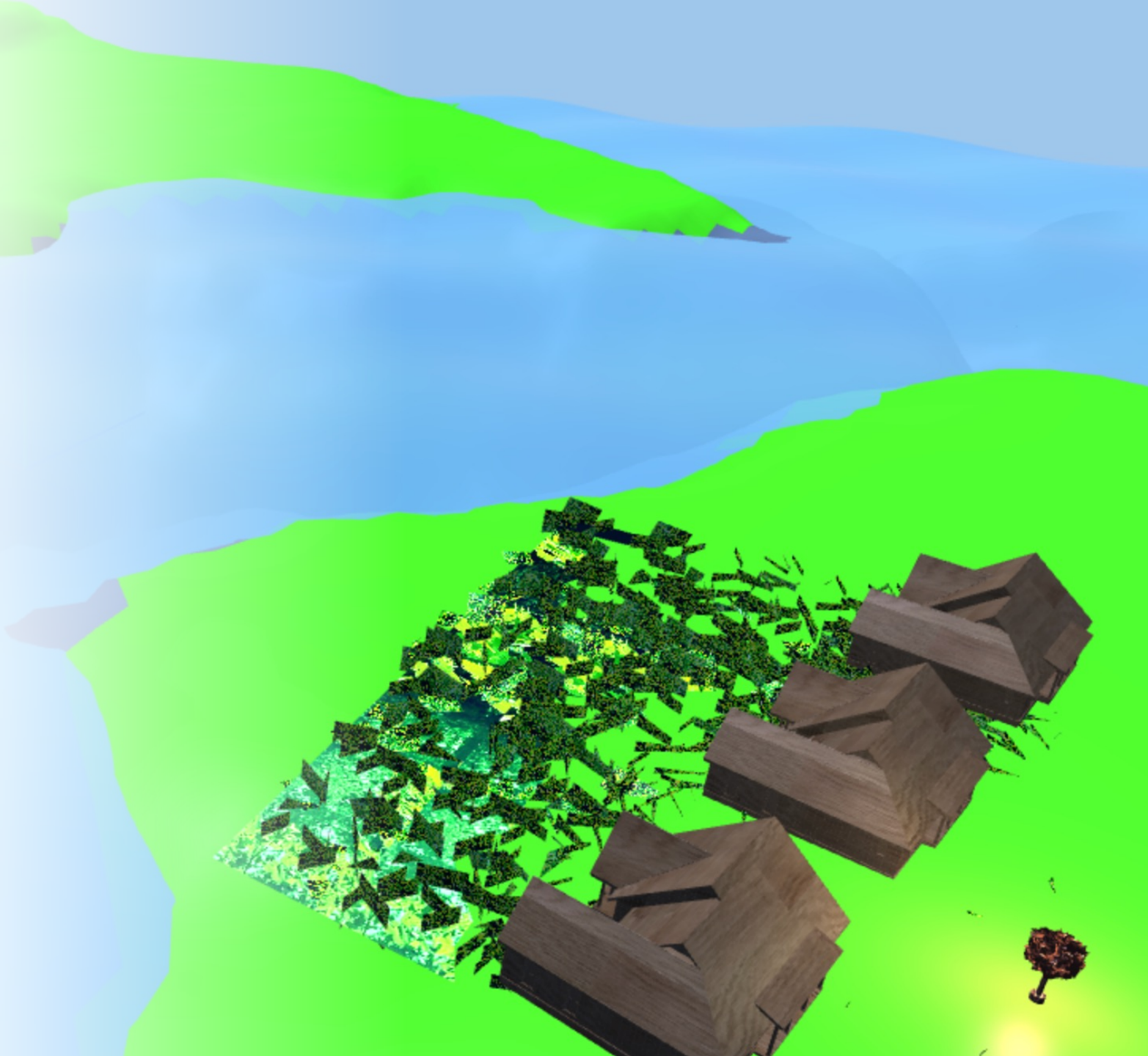
```
// Child: fixed parts under parent (body/face), no local transform
var childFixedParts : any[]  = [];
for (var i : number  = 0; i < this.fixedParts.length; i++) {
  var name : string  = this.fixedParts[i];
  if (Object.prototype.hasOwnProperty.call(this.model.meshes, name)) {
    childFixedParts.push(name);
  }
}
if (childFixedParts.length > 0) {
  this.model.renderOnly(shaderProgram, parentM, new Float32Array(this.color), childFixedParts);
}

// Child: left wing (inherits parent), local flap
var leftWingChildM : Float32Array<ArrayBuffer>  = new Float32Array(parentM);
if (angle !== 0) Mat4.rotateZ(leftWingChildM, leftWingChildM, +angle);
if (xCompress !== 1) Mat4.scale(leftWingChildM, leftWingChildM,  v: [xCompress, 1, 1]);
this.model.renderOnly(shaderProgram, leftWingChildM, new Float32Array(this.color), this.parts.left);

// Child: right wing (inherits parent), local flap
var rightWingChildM : Float32Array<ArrayBuffer>  = new Float32Array(parentM);
if (angle !== 0) Mat4.rotateZ(rightWingChildM, rightWingChildM, -angle);
if (xCompress !== 1) Mat4.scale(rightWingChildM, rightWingChildM,  v: [xCompress, 1, 1]);
this.model.renderOnly(shaderProgram, rightWingChildM, new Float32Array(this.color), this.parts.right);
```

Enhanced Lighting

- Ambient Light + Directional Light + Point Lights
- Material Lights (Terrain, Water)
- Sunrise Dynamic Lights

Visual Coherence

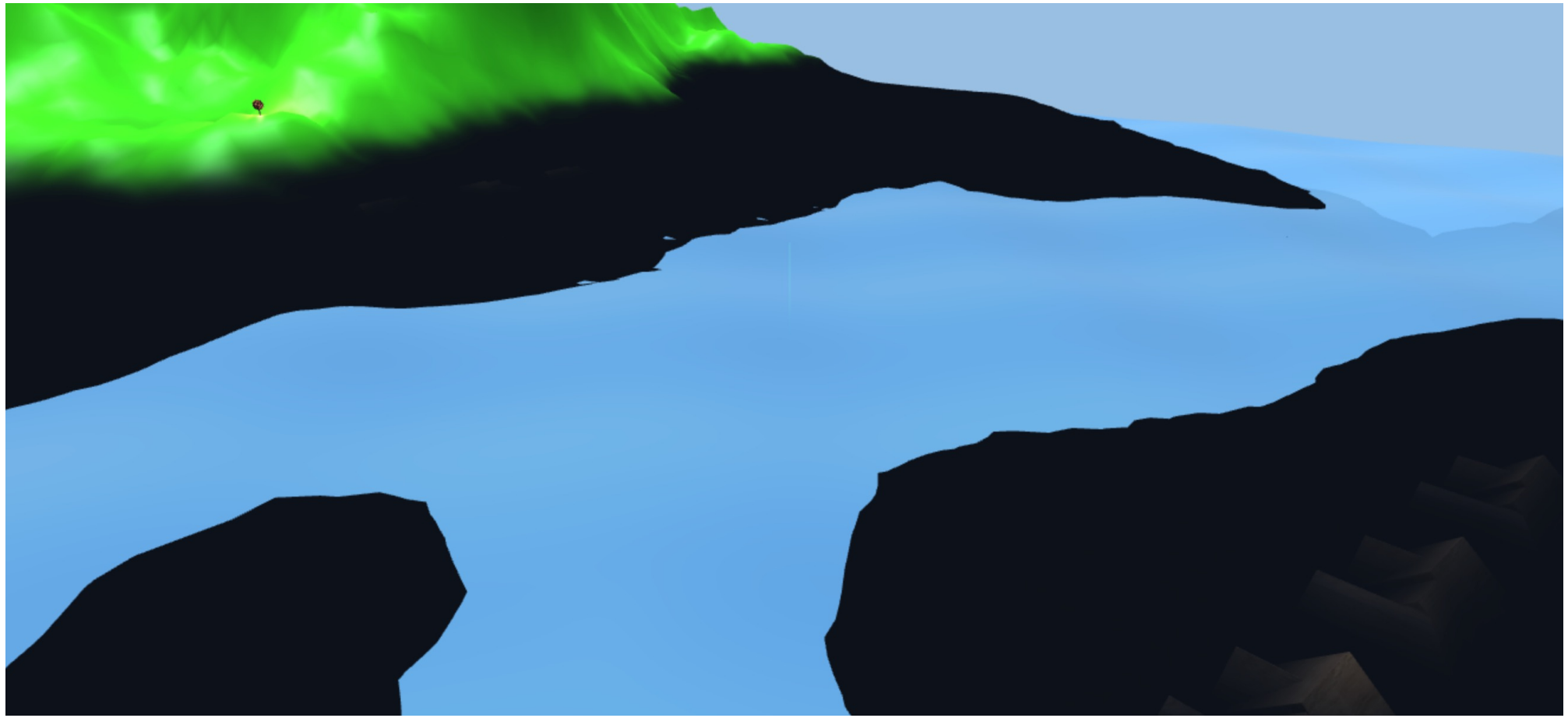
- The Alaska Village



Advanced Level Requirements

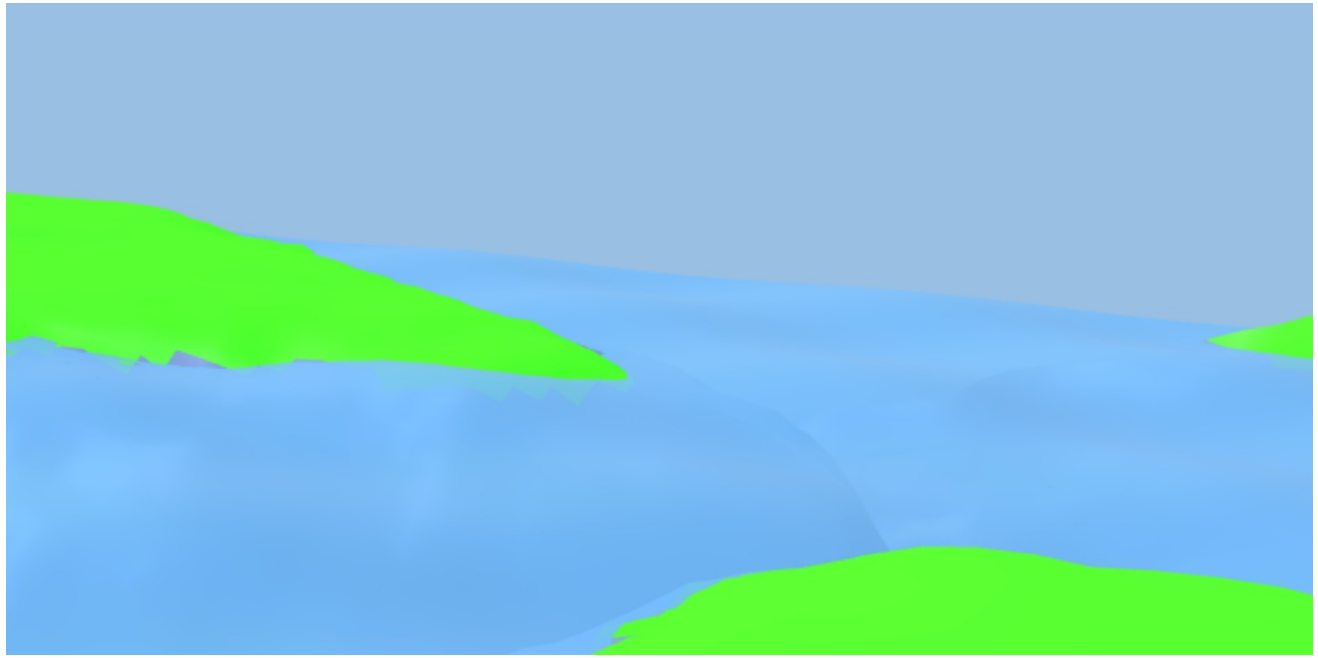
Advanced Visual Effects (Any 2)

Fog and atmospheric effects



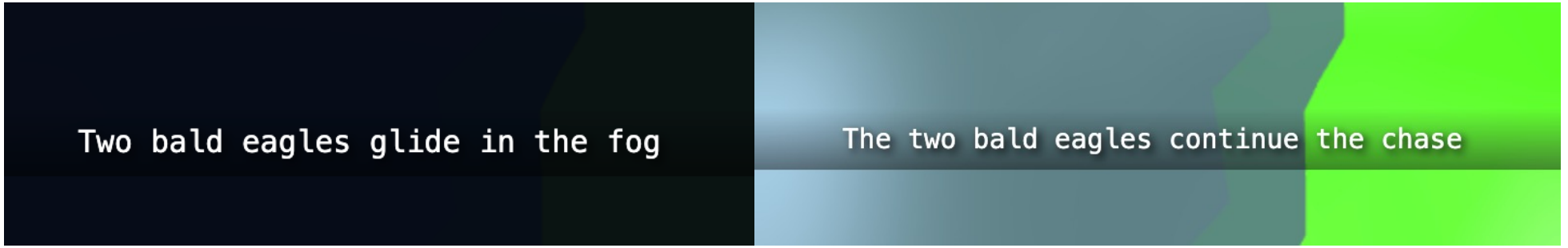
Advanced Visual Effects (Any 2)

Water Reflection



Storytelling Excellence

Clear narrative arc with beginning, middle, and end

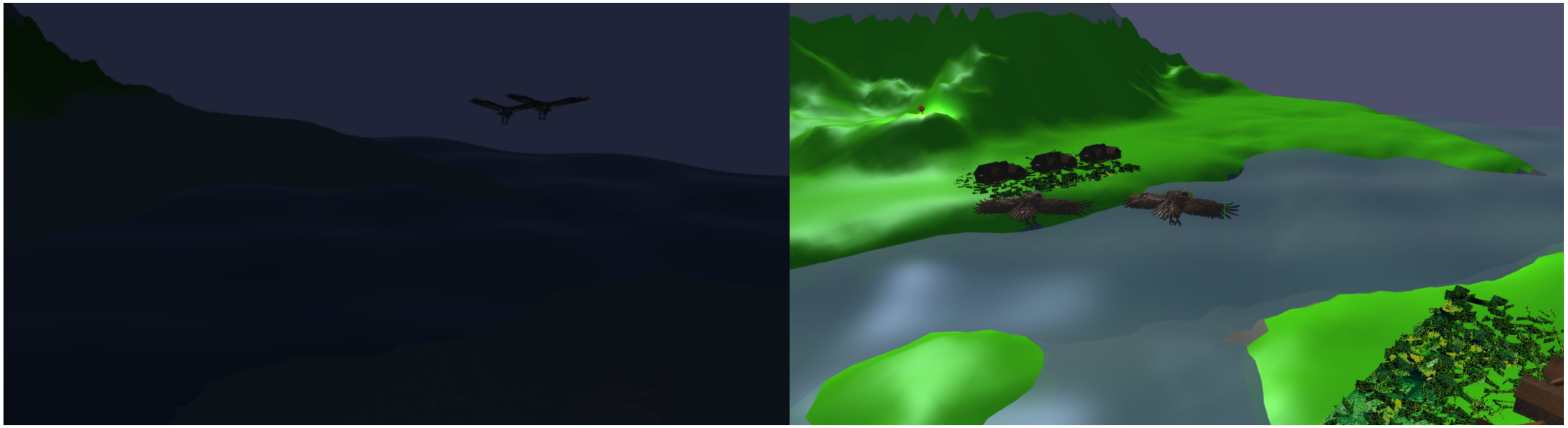


Storytelling Excellence

Visual storytelling through object behavior and interaction

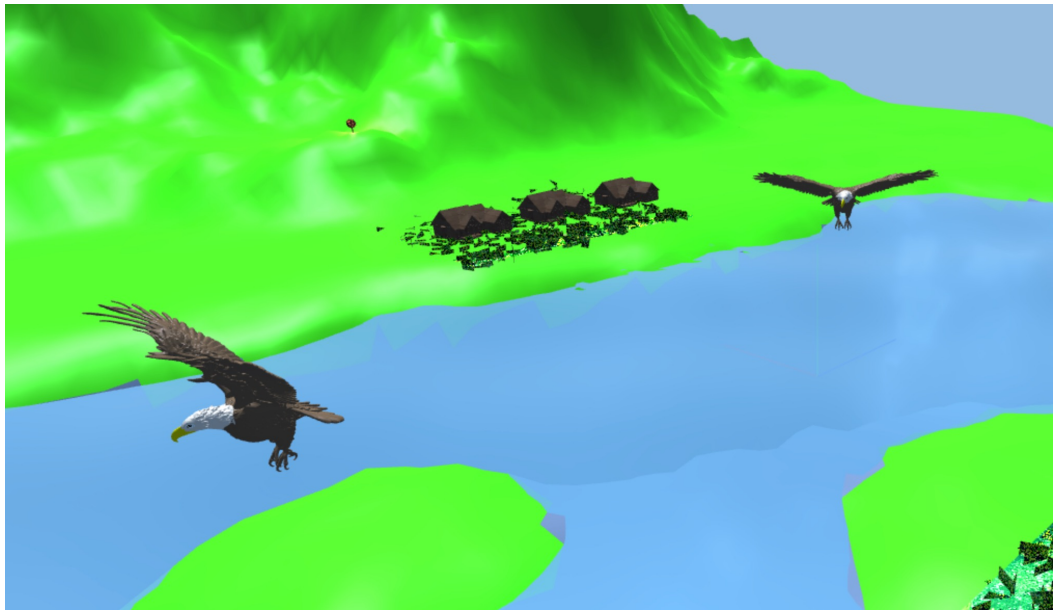
Storytelling Excellence

Effective use of pacing, timing, and dramatic moments



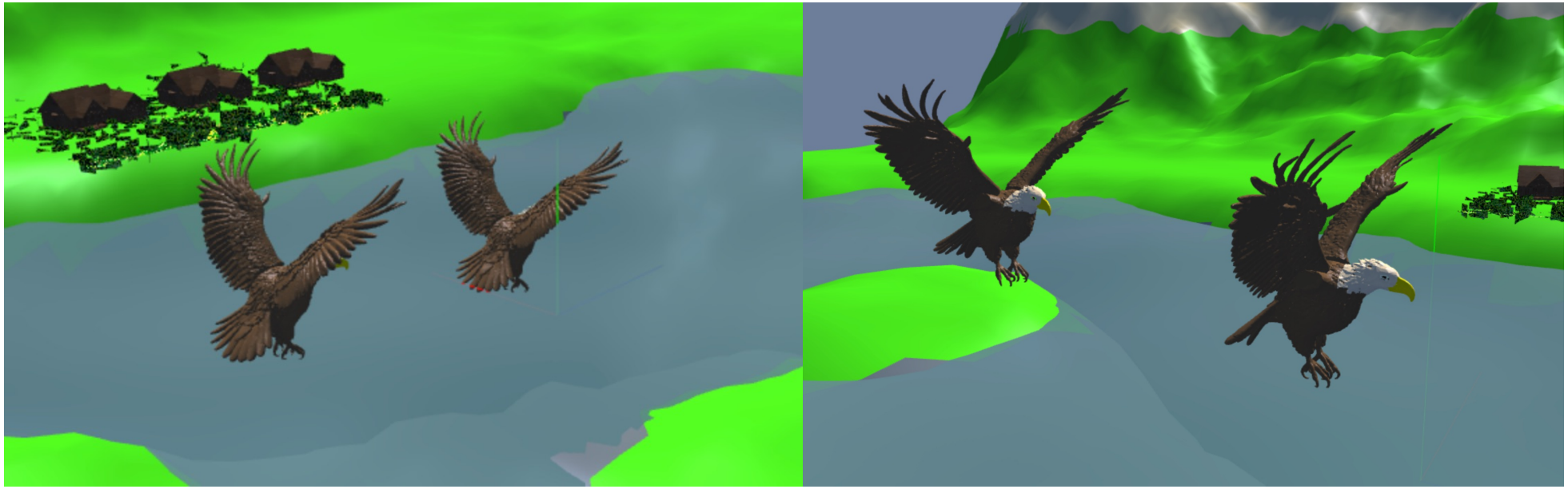
Storytelling Excellence

Emotional impact or viewer engagement through visual composition



Interactivity (Any 2)

Interactive camera controls (fly-through, object focus)



Interactivity (Any 2)

Time control (pause, speed adjustment, rewind)

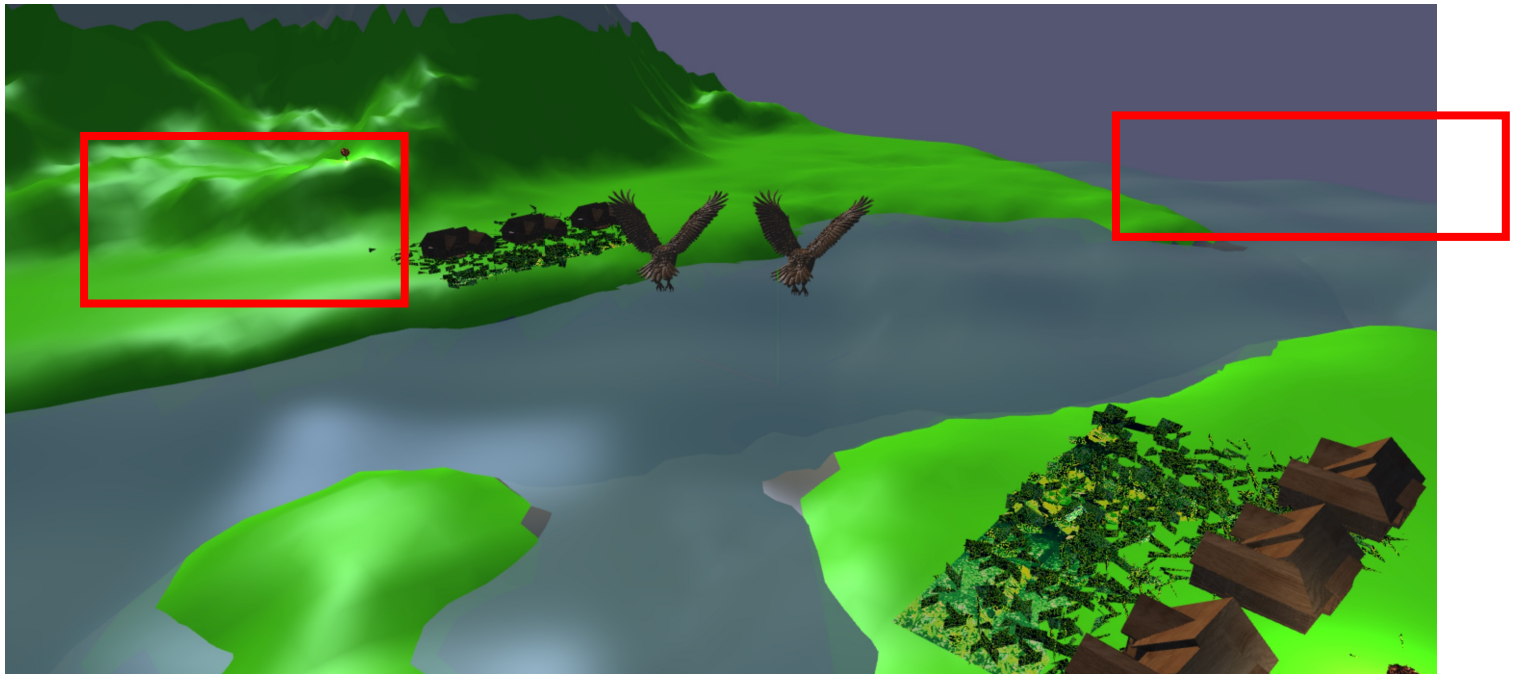
Bonus Mark Requirements

3D Character Animation
3D Bald Eagle

- Articulated body parts: Body, Left Wing, Right Wing
- Hierarchical skeletal structure
  - Parent (Base) → Children (Body parts)
- 2 distinct character animations
  - Gliding, Flapping flight
- Our story is about two bald eagles
- Original model generated by AI → manually refine / split / post-processing

Advanced Techniques

- Shadow effect
- Water ripple



Thanks