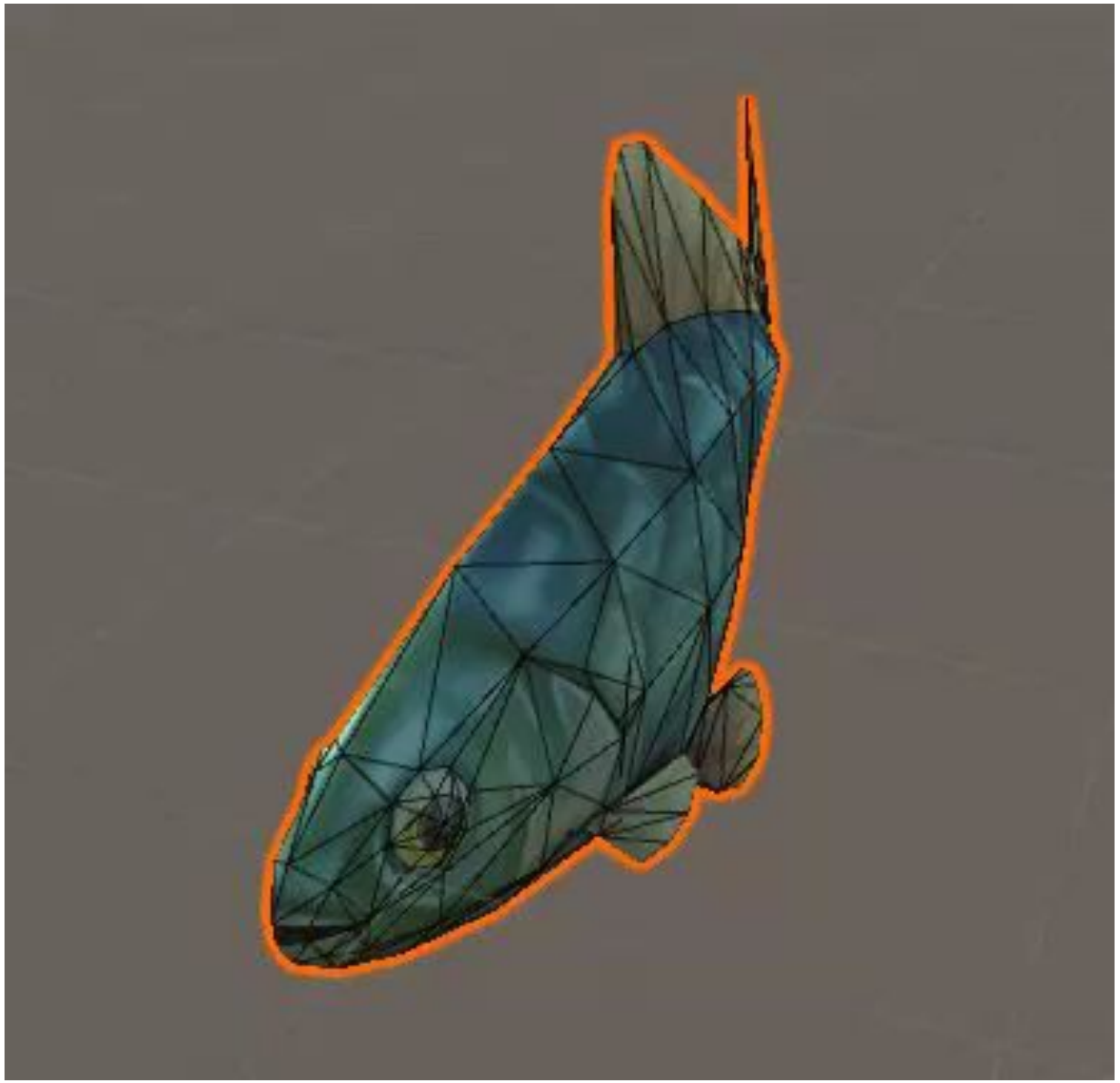
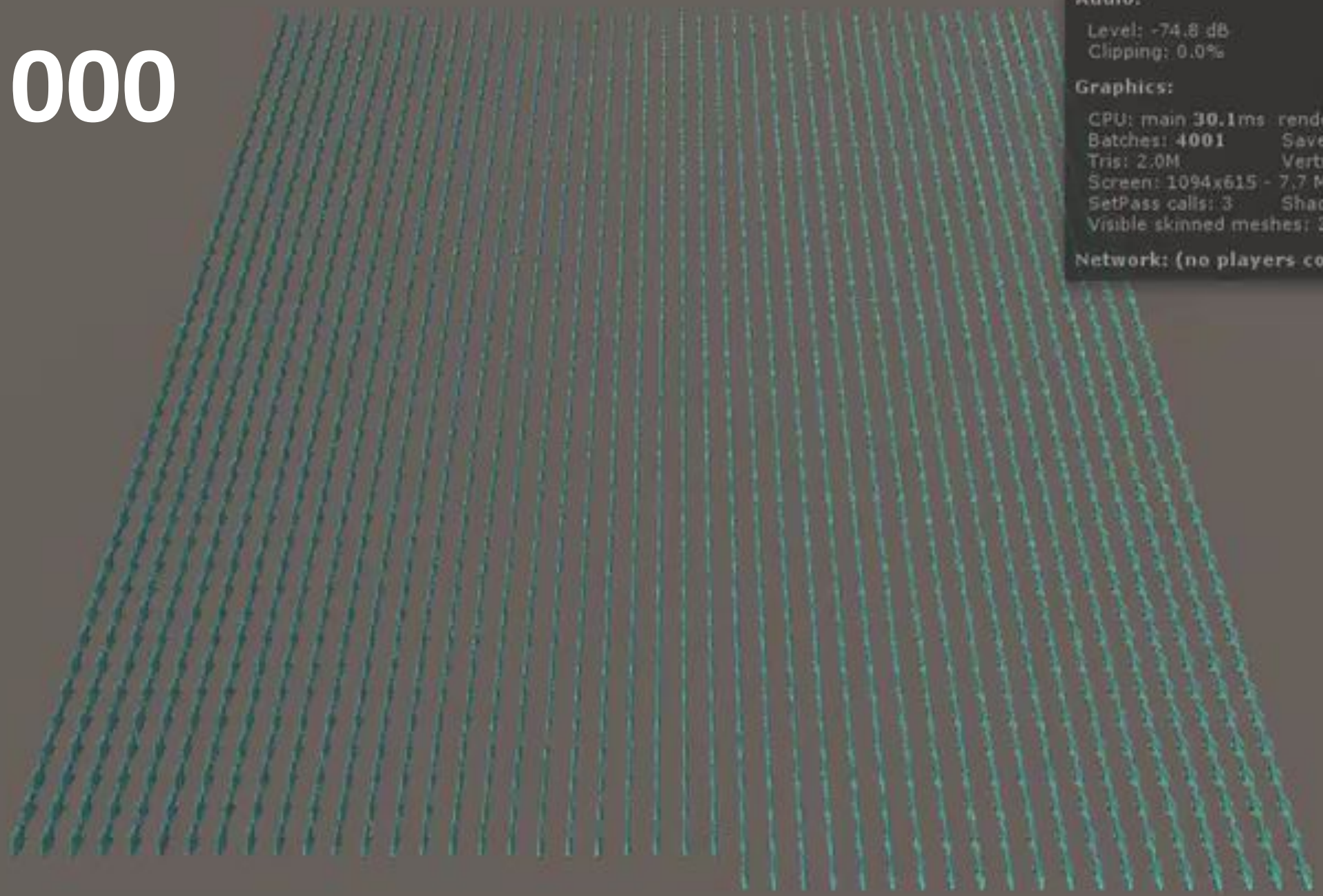
3. Вершинный шейдер

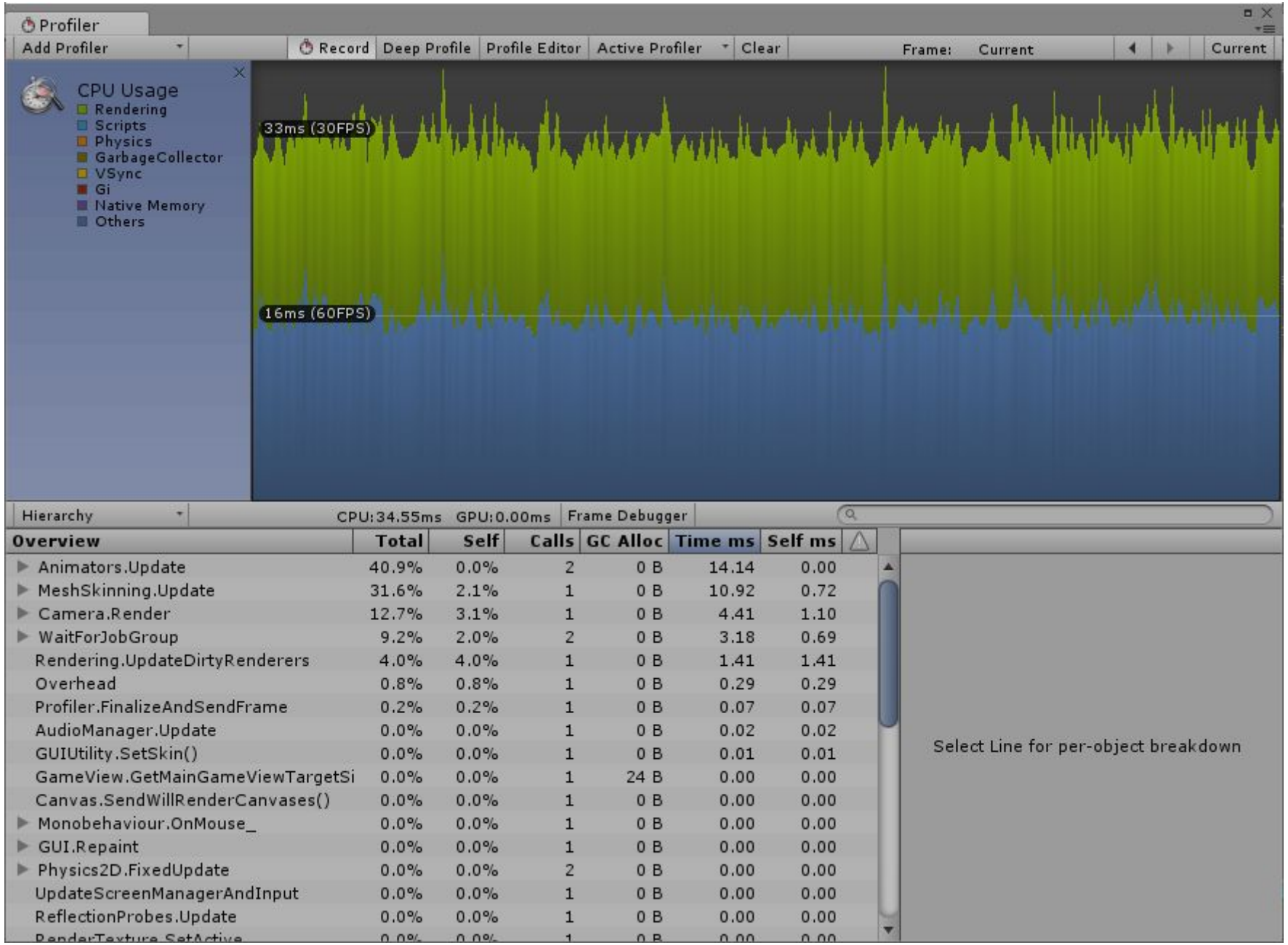
Графика в современных играх



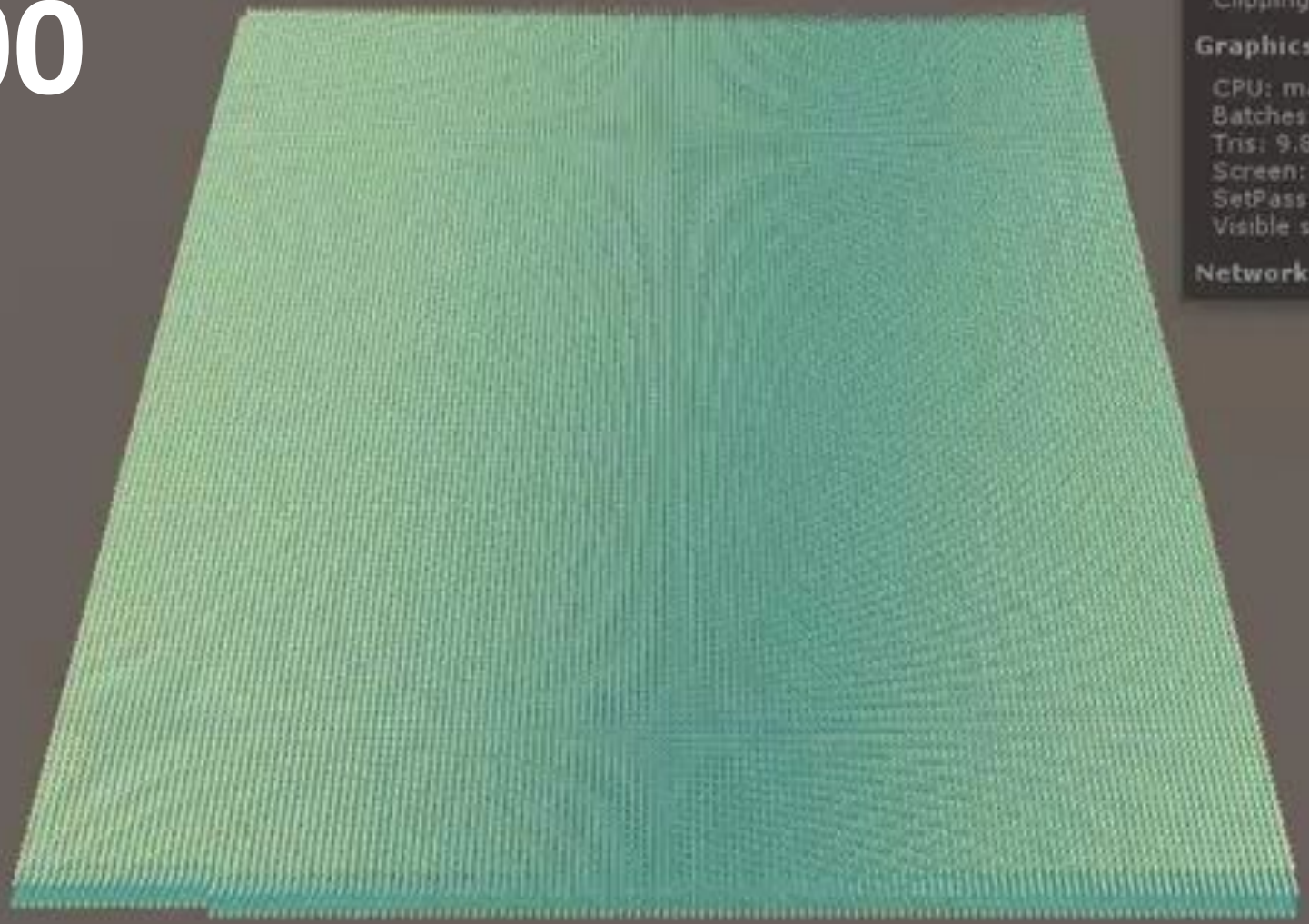
- cruscarp
  - cruscarp
  - cruscarp_skel
    - Bone
      - Bone.001
        - Bone.003
          - Bone.003_end
        - Bone.002_L.001
          - Bone.002_L.001_end
        - Bone.002_R.001
          - Bone.002_R.001_end
        - Bone_L.001
          - Bone_L.001_end
        - Bone_R.001
          - Bone_R.001_end
      - Bone.004
        - Bone.004_L.001
          - Bone.004_L.001_end
        - Bone.004_R.001
          - Bone.004_R.001_end
        - Bone.005
          - Bone.006
            - Bone.006_end
        - bubble
          - bubble_end
      - Bone.008
        - Bone.008_end
      - Bone.010
        - Bone.010_end
      - Bone.012
        - Bone.012_end

2 000


Statistics
Audio:
Level: -74.8 dB
DSP load: 0.2%
Clipping: 0.0%
Stream load: 0.0%
Graphics:
33.2 FPS (30.1ms)
CPU: main 30.1ms render thread 8.3ms
Batches: 4001
Saved by batching: 0
Tris: 2.0M
Verts: 1.6M
Screen: 1094x615 - 7.7 MB
SetPass calls: 3
Shadow casters: 0
Visible skinned meshes: 2000
Animations: 0
Network: (no players connected)


Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Active Profiler
Clear
Frame:
Current
Current
CPU Usage
Rendering
Scripts
Physics
GarbageCollector
VSync
Gi
Native Memory
Others
33ms (30FPS)
16ms (60FPS)
Hierarchy
CPU:34.55ms
GPU:0.00ms
Frame Debugger
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
Animators.Update 40.9% 0.0% 2 0 B 14.14 0.00
MeshSkinning.Update 31.6% 2.1% 1 0 B 10.92 0.72
Camera.Render 12.7% 3.1% 1 0 B 4.41 1.10
WaitForJobGroup 9.2% 2.0% 2 0 B 3.18 0.69
Rendering.UpdateDirtyRenderers 4.0% 4.0% 1 0 B 1.41 1.41
Overhead 0.8% 0.8% 1 0 B 0.29 0.29
Profiler.FinalizeAndSendFrame 0.2% 0.2% 1 0 B 0.07 0.07
AudioManager.Update 0.0% 0.0% 1 0 B 0.02 0.02
GUIUtility.SetSkin() 0.0% 0.0% 1 0 B 0.01 0.01
GameView.GetMainGameViewTargetSi 0.0% 0.0% 1 24 B 0.00 0.00
Canvas.SendWillRenderCanvases() 0.0% 0.0% 1 0 B 0.00 0.00
Monobehaviour.OnMouse_ 0.0% 0.0% 1 0 B 0.00 0.00
GUI.Repaint 0.0% 0.0% 1 0 B 0.00 0.00
Physics2D.FixedUpdate 0.0% 0.0% 2 0 B 0.00 0.00
UpdateScreenManagerAndInput 0.0% 0.0% 1 0 B 0.00 0.00
ReflectionProbes.Update 0.0% 0.0% 1 0 B 0.00 0.00
Select Line for per-object breakdown

20 000



Statistics

Audio:

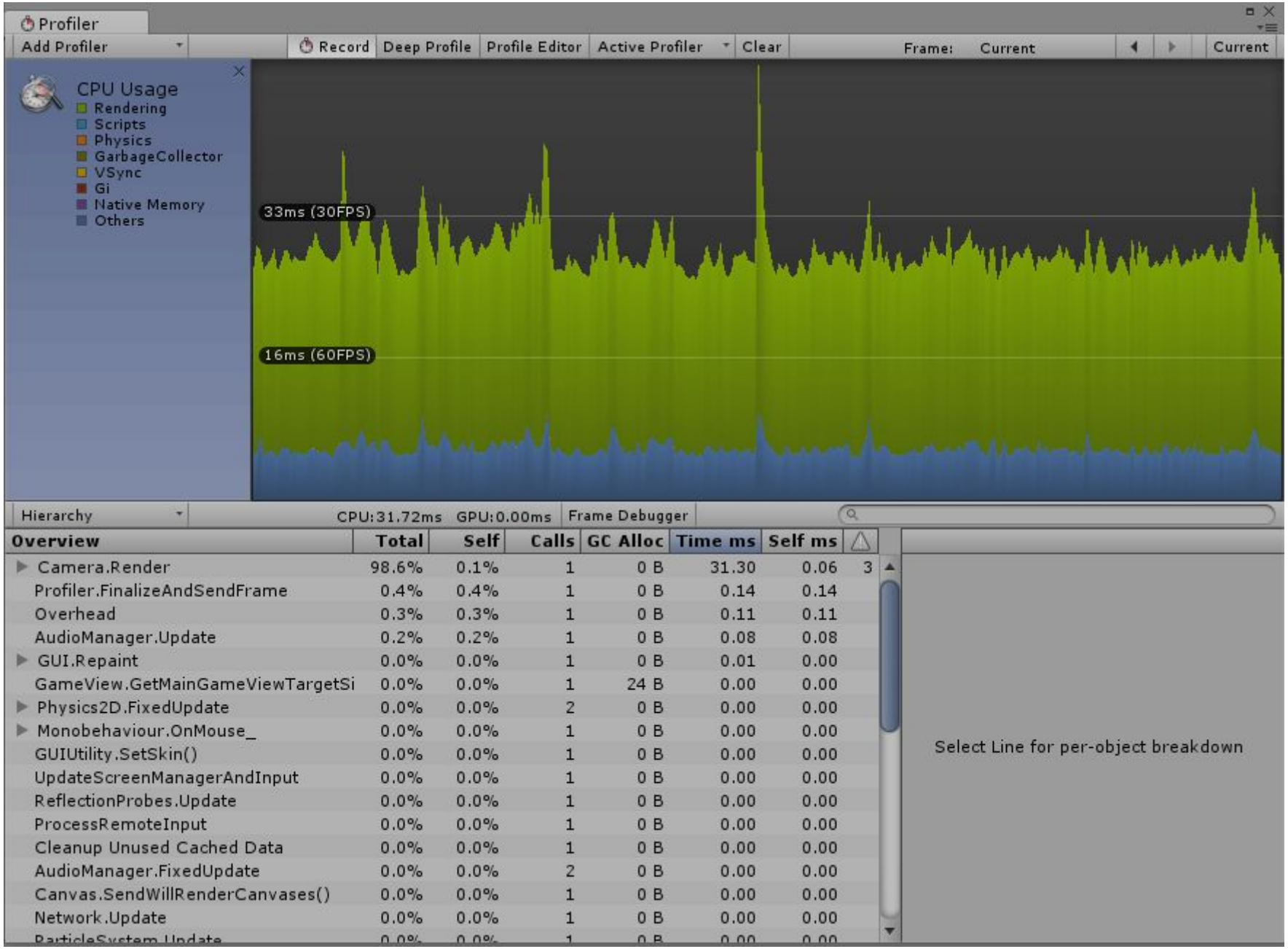
Level: -74.8 dB
Clipping: 0.0%
DSP load: 0.2%
Stream load: 0.0%

Graphics:

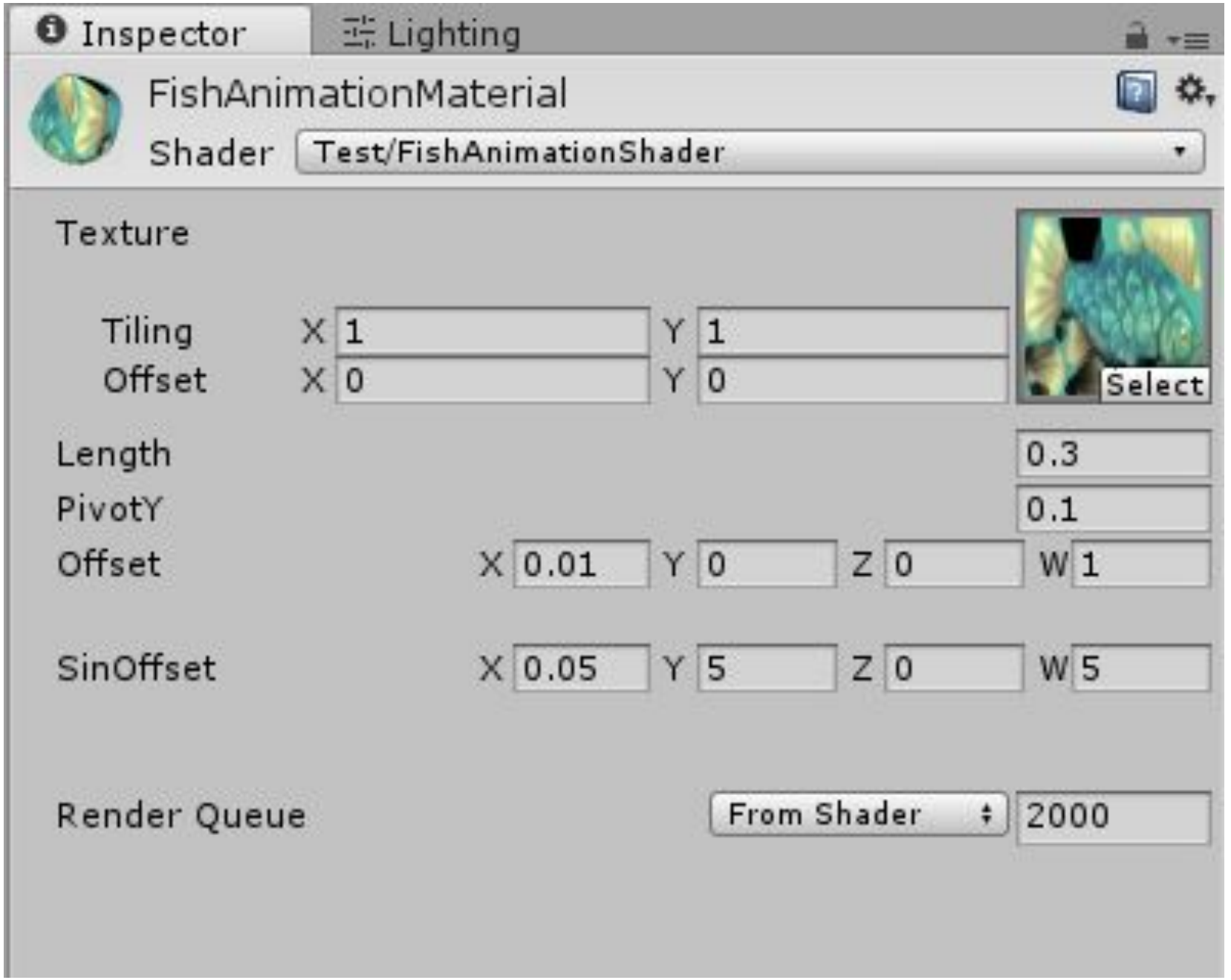
38.5 FPS (26.0ms)

CPU: main **26.0**ms render thread 9.3ms
Batches: **20001** Saved by batching: 0
Tris: 9.8M Verts: 8.2M
Screen: 1094x615 - 7.7 MB
SetPass calls: 2 Shadow casters: 0
Visible skinned meshes: 0 Animations: 0

Network: (no players connected)


Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Active Profiler
Clear
Frame: Current
Current
CPU Usage
Rendering
Scripts
Physics
GarbageCollector
VSync
Gi
Native Memory
Others
33ms (30FPS)
16ms (60FPS)
Hierarchy
CPU:31.72ms GPU:0.00ms
Frame Debugger
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
Camera.Render 98.6% 0.1% 1 0 B 31.30 0.06 3
Profiler.FinalizeAndSendFrame 0.4% 0.4% 1 0 B 0.14 0.14
Overhead 0.3% 0.3% 1 0 B 0.11 0.11
AudioManager.Update 0.2% 0.2% 1 0 B 0.08 0.08
GUI.Repaint 0.0% 0.0% 1 0 B 0.01 0.00
GameView.GetMainGameViewTargetSi 0.0% 0.0% 1 24 B 0.00 0.00
Physics2D.FixedUpdate 0.0% 0.0% 2 0 B 0.00 0.00
Monobehaviour.OnMouse_ 0.0% 0.0% 1 0 B 0.00 0.00
GUIUtility.SetSkin() 0.0% 0.0% 1 0 B 0.00 0.00
UpdateScreenManagerAndInput 0.0% 0.0% 1 0 B 0.00 0.00
ReflectionProbes.Update 0.0% 0.0% 1 0 B 0.00 0.00
ProcessRemoteInput 0.0% 0.0% 1 0 B 0.00 0.00
Cleanup Unused Cached Data 0.0% 0.0% 1 0 B 0.00 0.00
AudioManager.FixedUpdate 0.0% 0.0% 2 0 B 0.00 0.00
Canvas.SendWillRenderCanvases() 0.0% 0.0% 1 0 B 0.00 0.00
Network.Update 0.0% 0.0% 1 0 B 0.00 0.00
Select Line for per-object breakdown

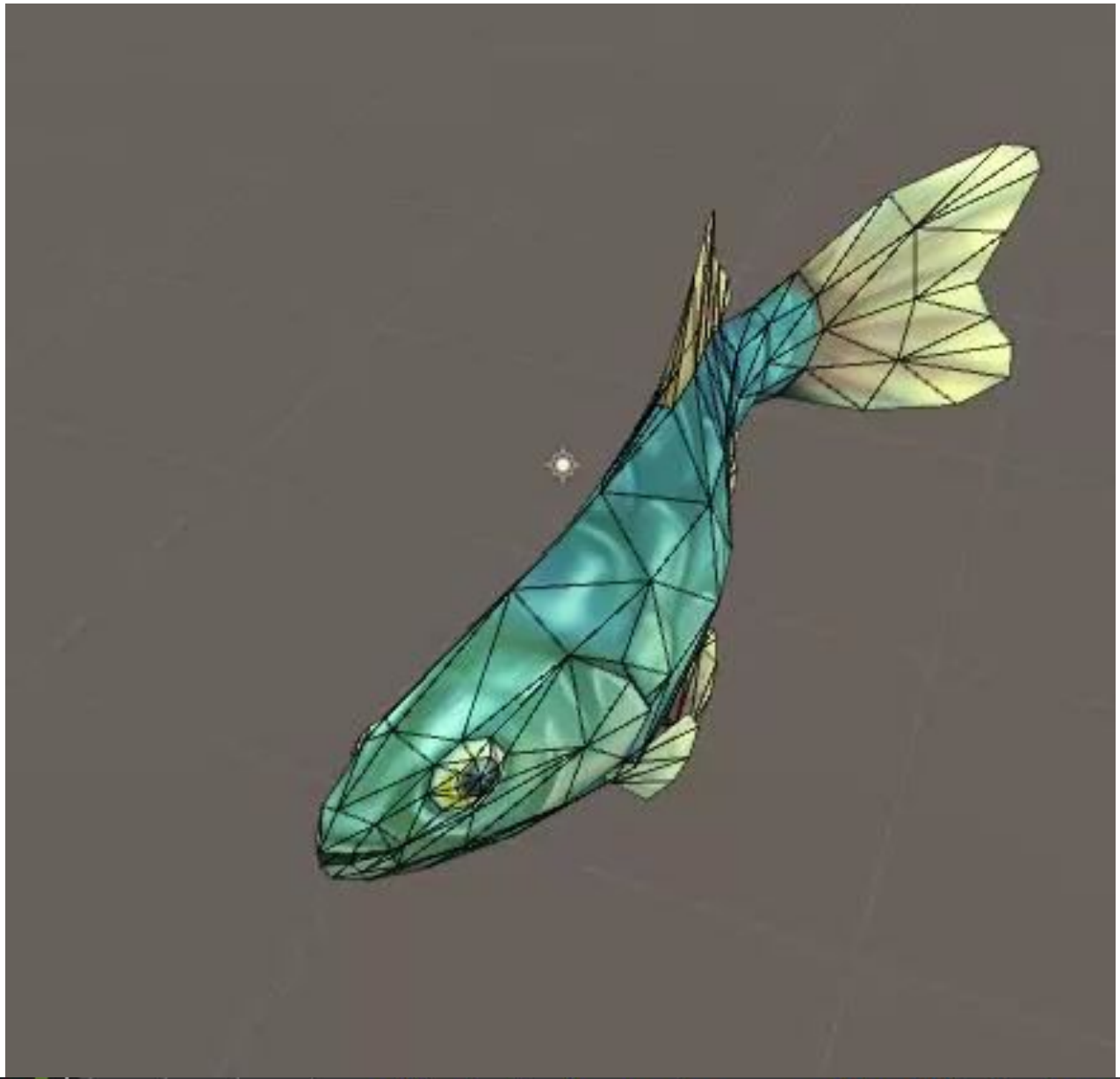
```
Shader "Test/FishAnimationShader" {

    Properties {

        _MainTex ("Texture", 2D) = "white" {}
        _Length ("Length", float) = 1.0
        _PivotY ("PivotY", float) = 1.0
        _Offset ("Offset", Vector) = (0.0, 0.0, 0.0)
        _SinOffset ("SinOffset", Vector) = (0.0, 0.0, 0.0)
    }

    SubShader {

        Pass {...
        }
    }
}
```


Inspector
Lighting
FishAnimationMaterial
Shader
Test/FishAnimationShader
Texture
Tiling X 1 Y 1
Offset X 0 Y 0
Select
Length 0.3
PivotY 0.1
Offset X 0.01 Y 0 Z 0 W 1
SinOffset X 0.05 Y 5 Z 0 W 5
Render Queue
From Shader
2000

```
47          vertOutput vert(appdata v)
48          {
49              vertOutput o;
50
51              fixed4 offset = _Offset * cos(_Time.y * _Offset.w);
52              offset.x += _SinOffset.x * sin(_Time.y * _SinOffset.w + (v.vertex.y + _PivotY) * _SinOffset.y);
53              offset *= (v.vertex.y + _PivotY) / _Length;
54
55              v.vertex += offset;
56
57
58              o.vertex = UnityObjectToClipPos(v.vertex);
59              o.uv = TRANSFORM_TEX(v.uv, _MainTex);
60              return o;
61          }
```

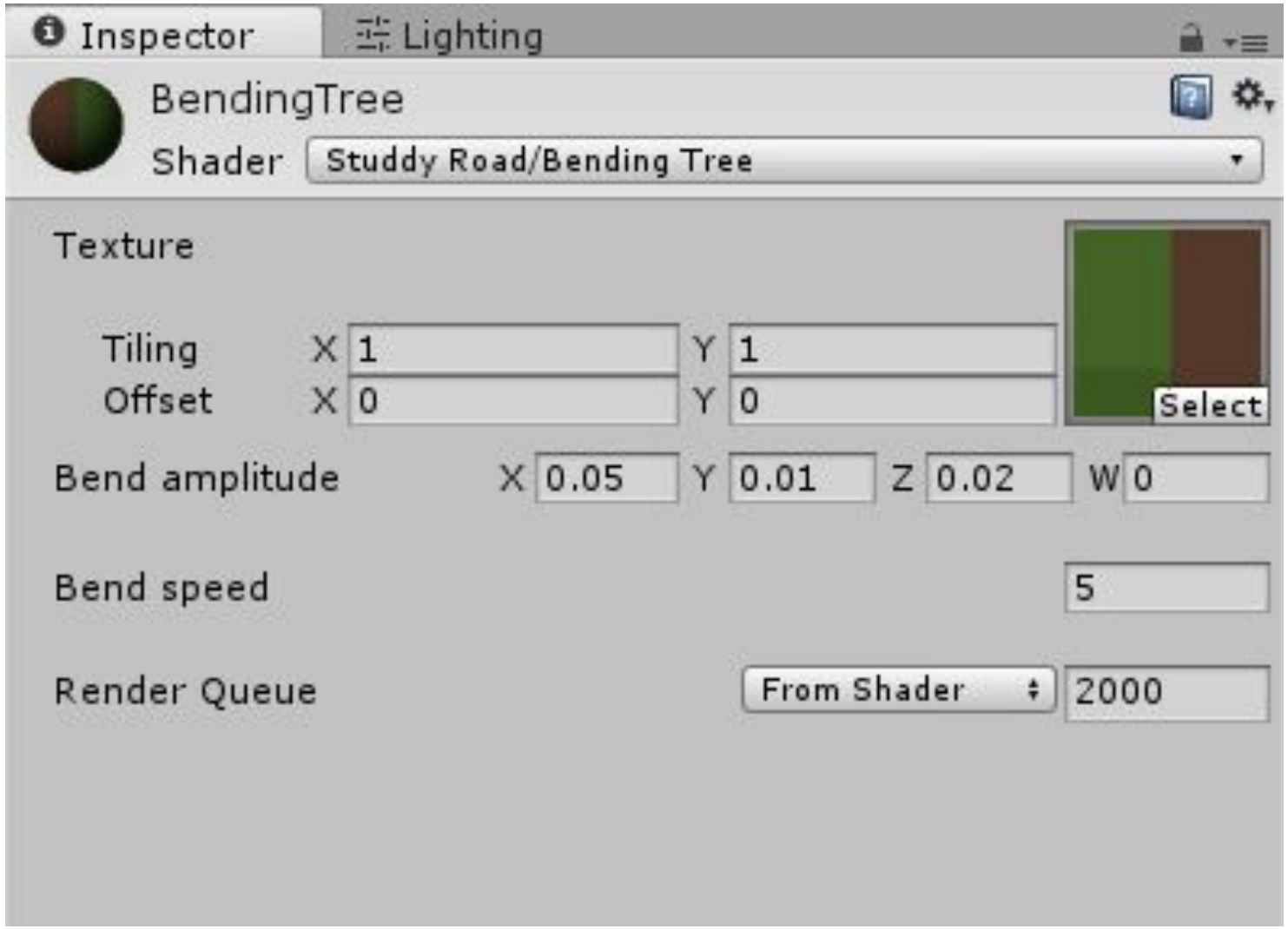
```
51                fixed4 offset = _Offset * cos(_Time.y * _Offset.w);
```

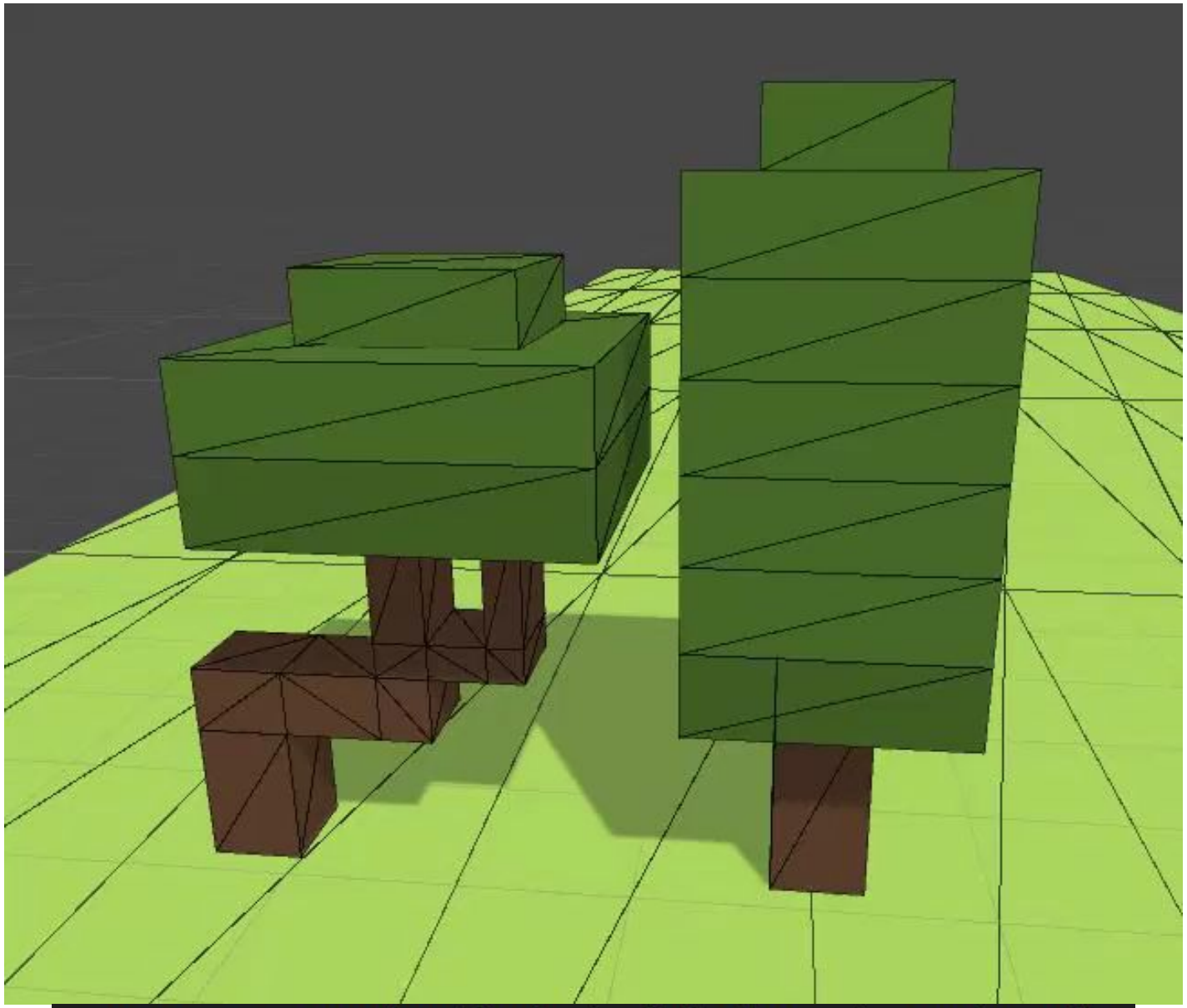
```
52                offset.x = _SinOffset.x * sin(_Time.y * _SinOffset.w + (v.vertex.y + _PivotY) * _SinOffset.y);
```



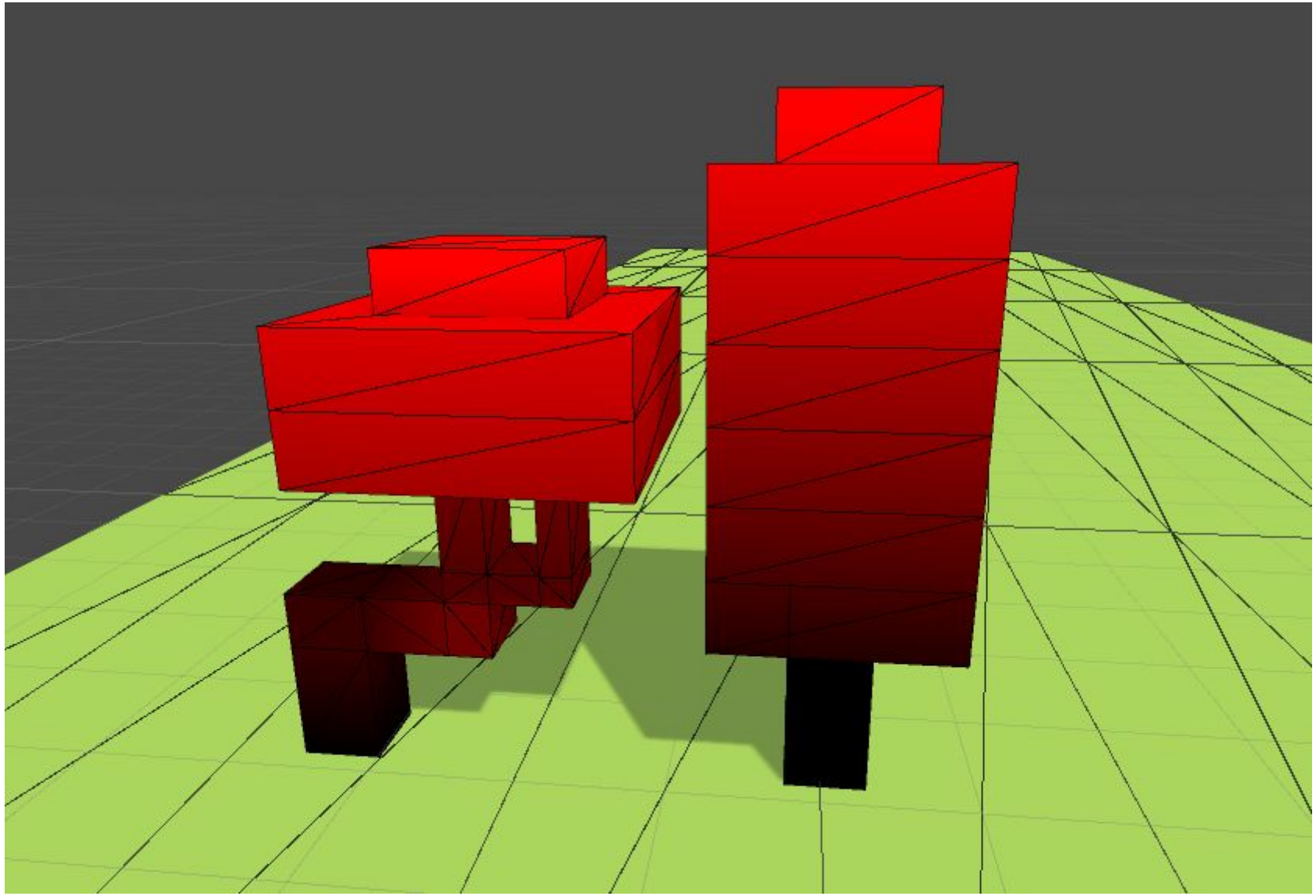
```
53                offset *= (v.vertex.y + _PivotY) / _Length;
```

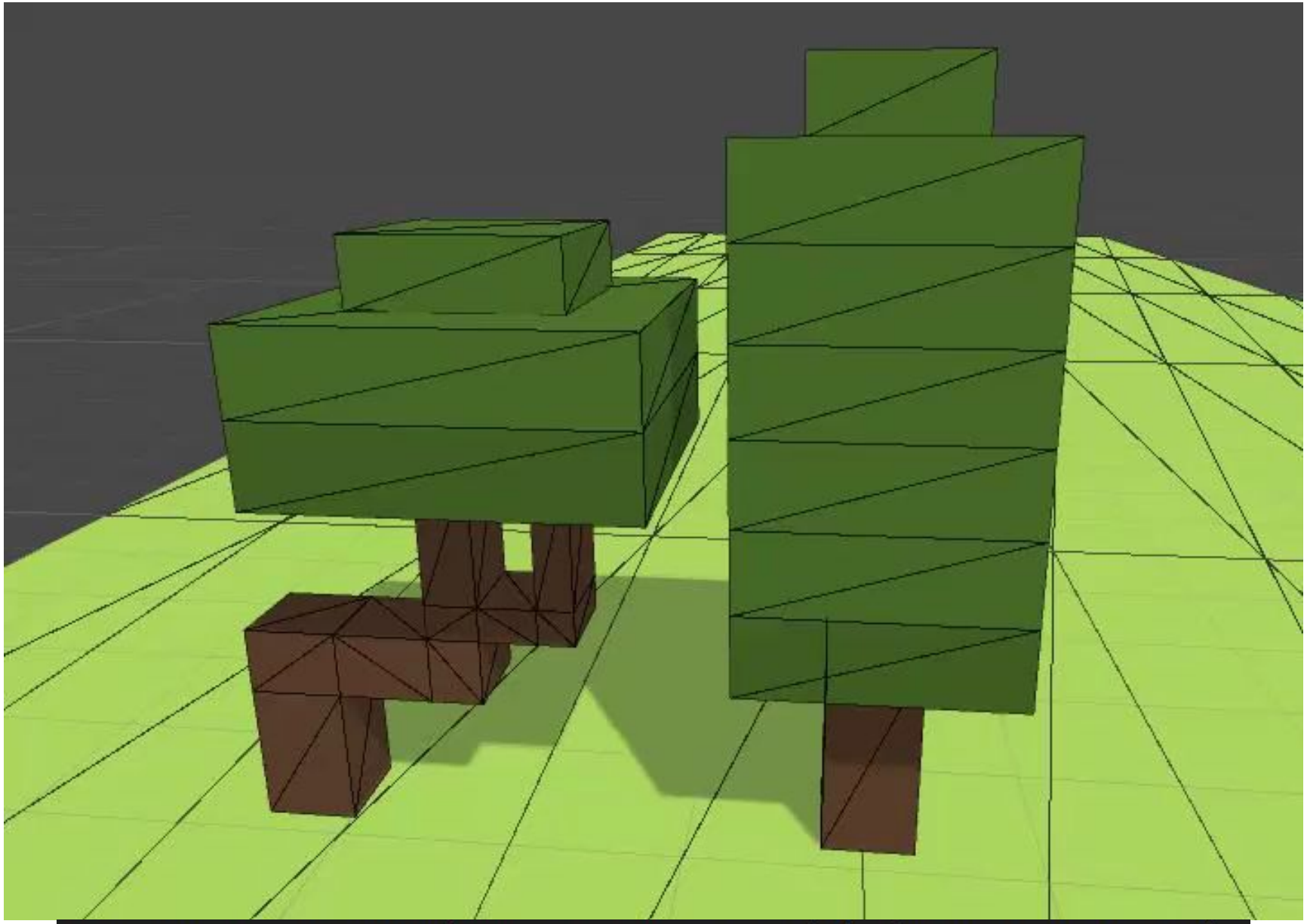
```
1  Shader "Studdy Road/Bending Tree" {
2
3      Properties {
4          _MainTex("Texture", 2D) = "white" {}
5          _BendAmplitude("Bend amplitude", Vector) = (0.0, 0.0, 0.0, 0.0)
6          _BendSpeed("Bend speed", float) = 1.0
7      }
8
9      SubShader {...
36     }
37
38     Fallback "Diffuse"
39 }
```


Inspector
Lighting
BendingTree
Shader
Studdy Road/Bending Tree
Texture
Tiling X 1 Y 1
Offset X 0 Y 0
Select
Bend amplitude X 0.05 Y 0.01 Z 0.02 W 0
Bend speed 5
Render Queue From Shader 2000

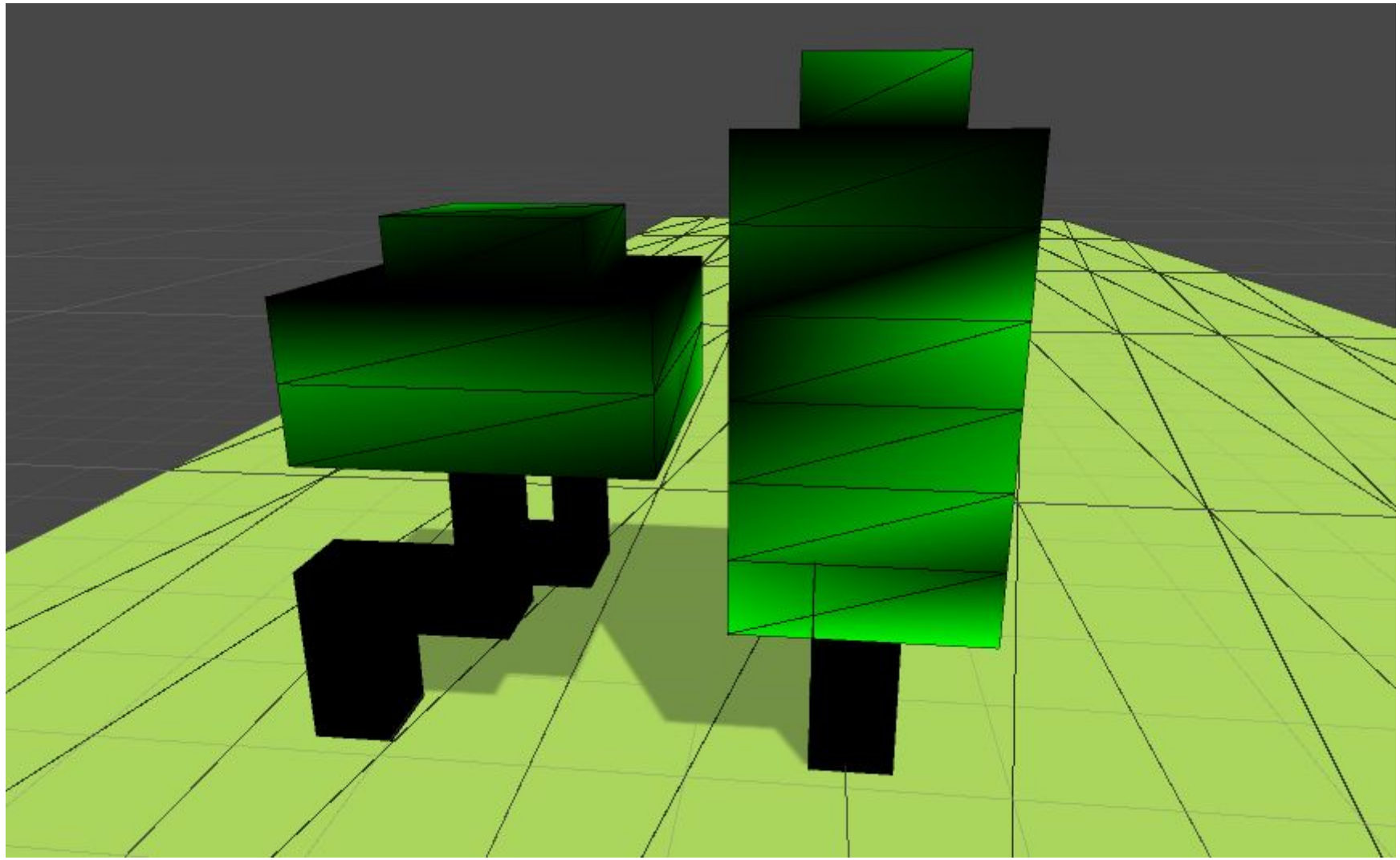


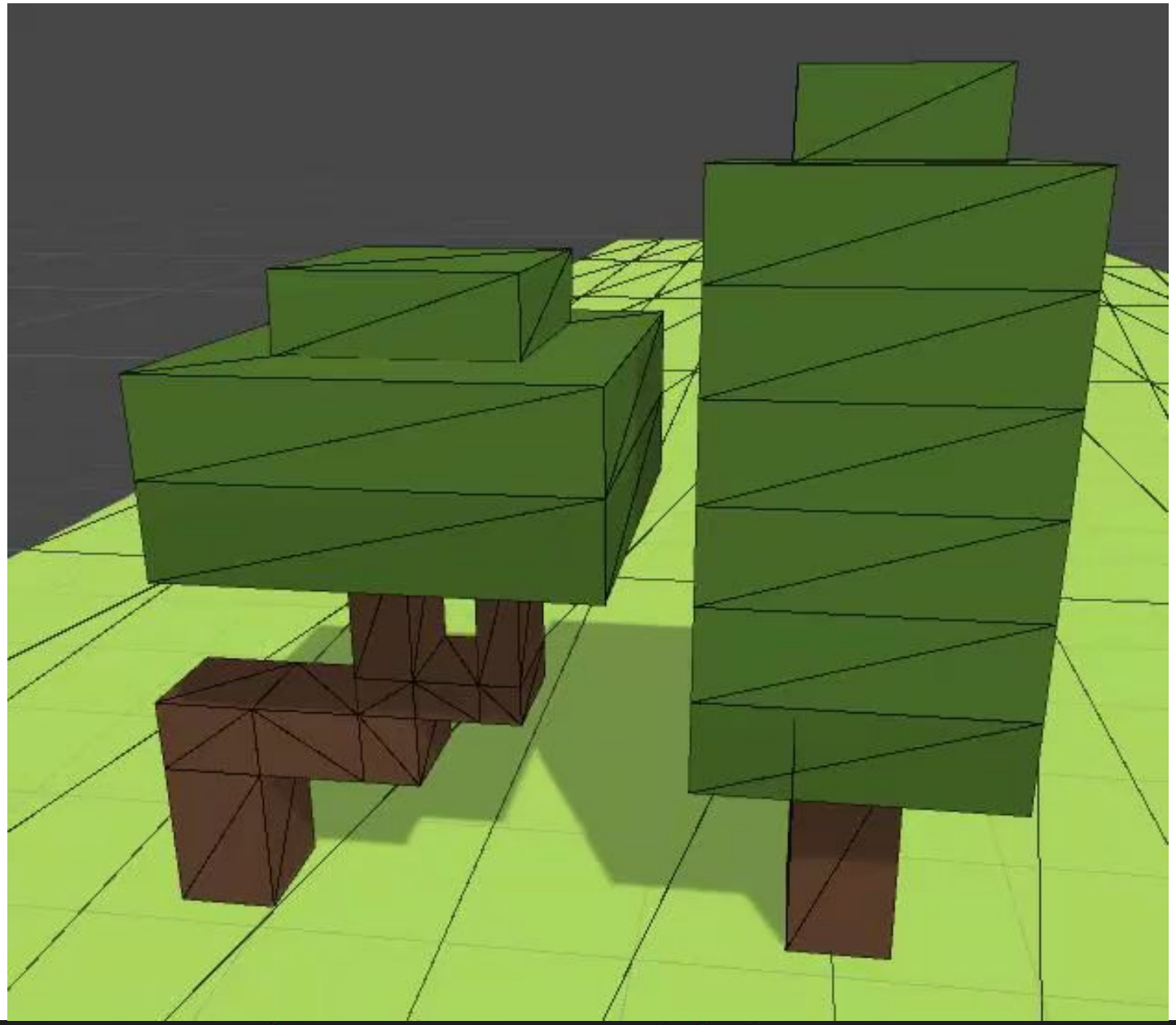
```
v.vertex += _BendAmplitude * sin(_Time.y * _BendSpeed);
```





```
v.vertex += _BendAmplitude * v.color.r * sin(_Time.y * _BendSpeed);
```





```
v.vertex += _BendAmplitude * v.color.r * sin(_Time.y * _BendSpeed + v.color.g);
```

```
CGPROGRAM
#pragma surface surf Lambert vertex:vert addshadow

struct Input {
    float2 uv_MainTex;
};
sampler2D _MainTex;
float4 _BendAmplitude;
float _BendSpeed;

void vert (inout appdata_full v, out Input o) {
    UNITY_INITIALIZE_OUTPUT(Input, o);
    v.vertex += _BendAmplitude * v.color.r * sin(_Time.y * _BendSpeed + v.color.g);
}

void surf (Input IN, inout SurfaceOutput o) {
    o.Albedo = tex2D(_MainTex, IN.uv_MainTex).rgb;
}
ENDCG
```