Absolute Beginners Unity Book

Chapter – III

FRACTALS

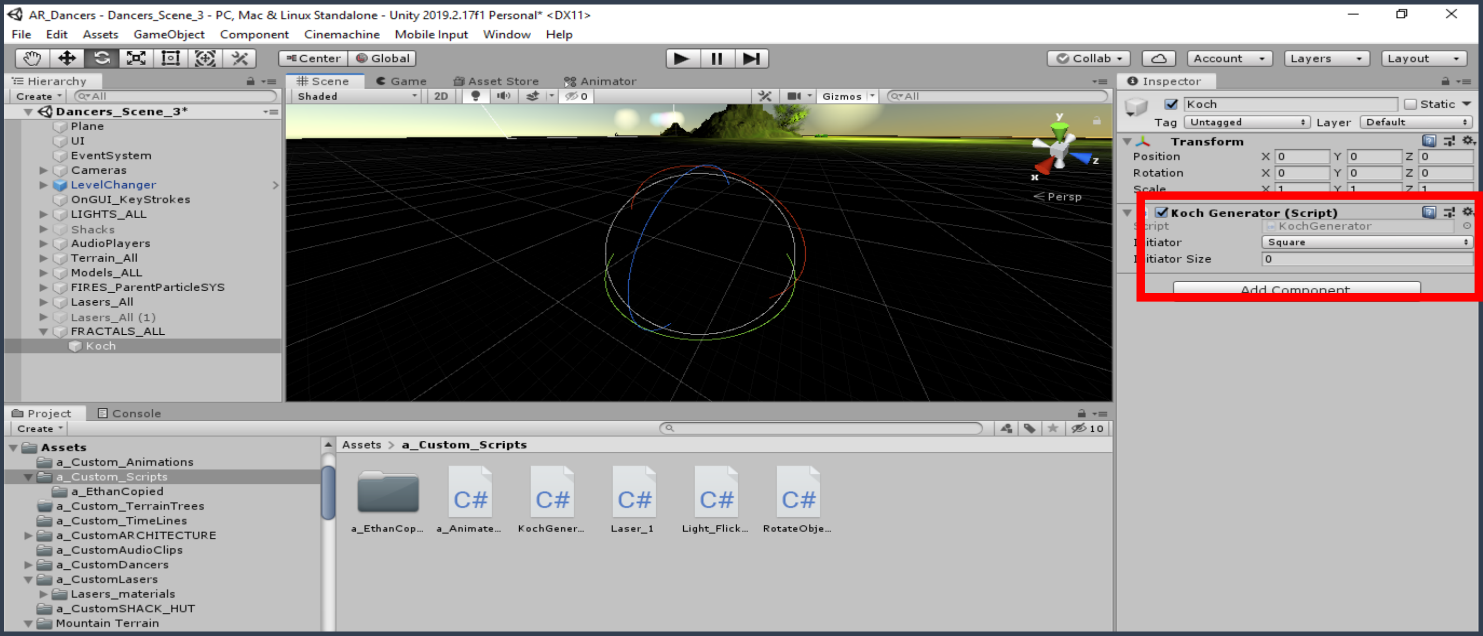
So what exactly are fractals and how are these utilized in game Environments and Animation . o most readers or general case viewers of fractals , fractals are synonymous with Fractal Art . While mathematicians may not have a very strict definition of fractals , the academic definition of fractals on Wikipedia itself is quiet verbose. I quote what I found relevant as below –

"Fractals **exhibit similar patterns at increasingly small scales** called self similarity,[5] also known as expanding symmetry or unfolding symmetry; if this replication is exactly the same at every scale, as in the Menger sponge,[6] it is called affine self-similar. Fractal geometry lies within the mathematical branch of topology." Source WikiPedia - https://en.wikipedia.org/wiki/Fractal

KOCH FRACTALS , the code in this Chapter is derived as is from the Series of Video's of the YouTuber – PEER PLAY --- Code Source and YouTube Video link -- https://www.youtube.com/watch?v=pdOEM7hgGX4

I have extensively commented the C# scripts and have written some scanty commentary / comments in this PDF document . The C# code will be shared on Github https://github.com/RohitDhankar/Unity3D_2020_UnrealGamelabs_Dancers

Its is the same Old Repository being used as is for this entire project as on date . I may split up this repo at a later stage and end up refactoring / reorg , of the code later.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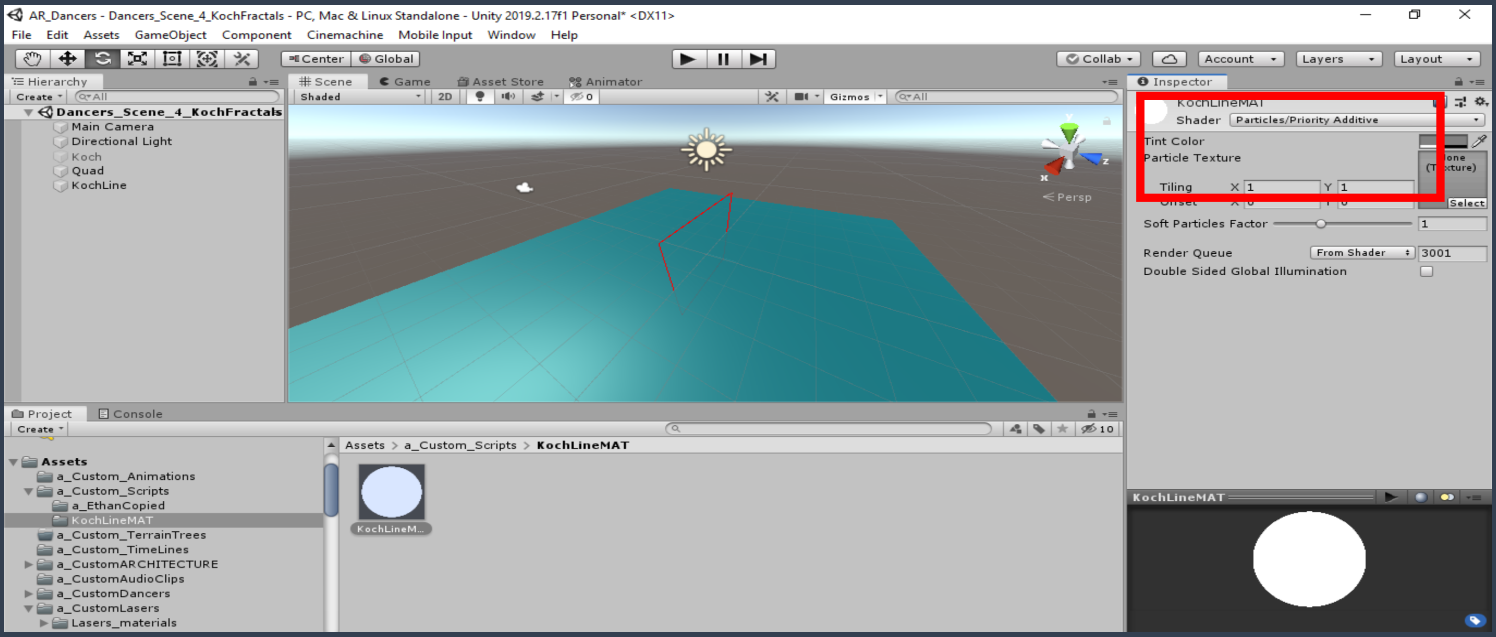
Koch Generator (Script)
Script KochGenerator
Initiator Square
Initiator Size 0

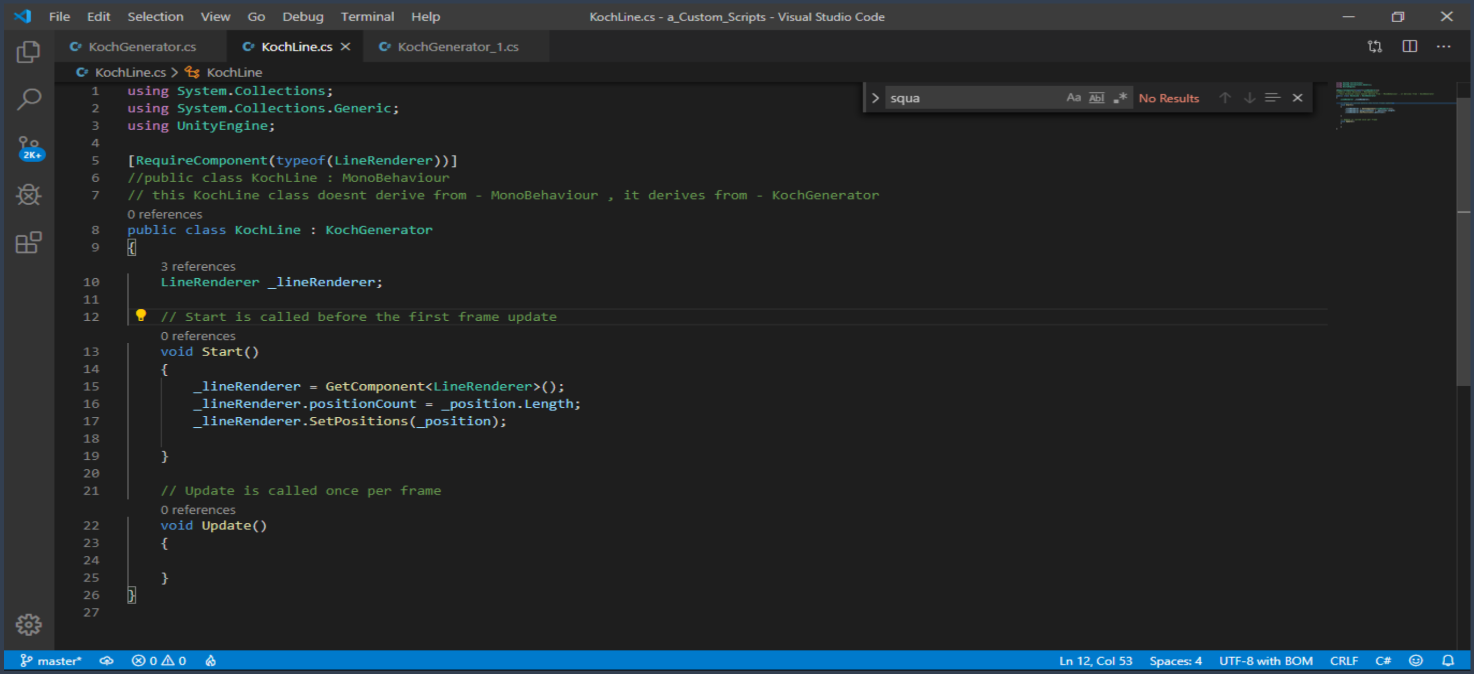

AR_Dancers - Dancers_Scene_4_KochFractals - PC, Mac & Linux Standalone - Unity 2019.2.17f1 Personal* <DX11>

KochLineMAT
Shader Particles/Priority Additive
Tint Color
Particle Texture
Tiling X 1 Y 1
Offset X 0 Y 0
Soft Particles Factor 1
Render Queue From Shader 3001
Double Sided Global Illumination

Hierarchy
Dancers_Scene_4_KochFractals
Main Camera
Directional Light
Koch
Quad
KochLine
Assets > a_Custom_Scripts > KochLineMAT
KochLineM...

KochLine material –named – KochLinemAT , shader changed from STANDARD to – **Particles/Priority Additive**

The C# script at this stage is as seen below , will keep adding C# script screencaptures as and when there are substantial updates to this code . Also the final C# scripts shall be pushed to my Github Repo == https://github.com/RohitDhankar/Unity3D_2020_UnrealGamelabs_Dancers

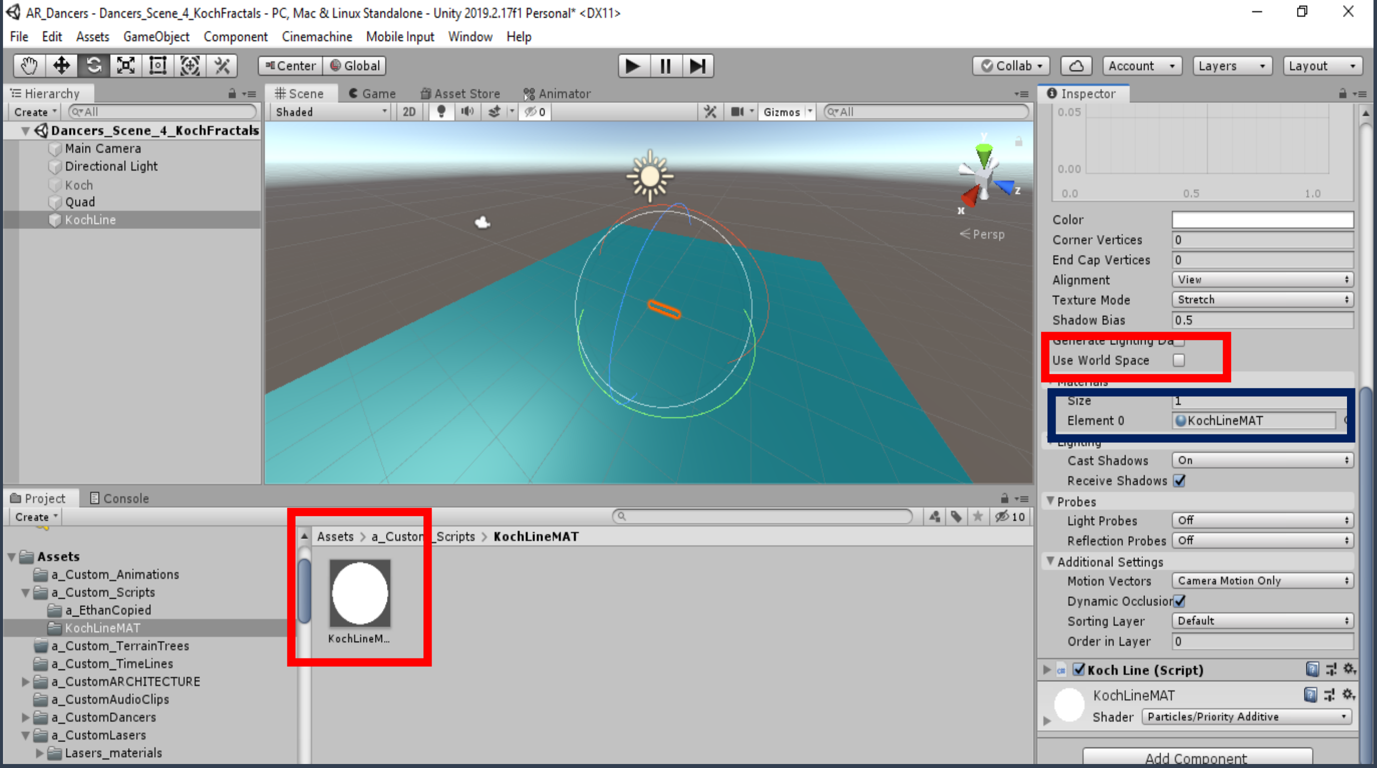

File Edit Selection View Go Debug Terminal Help
KochLine.cs - a_Custom_Scripts - Visual Studio Code
KochGenerator.cs
KochLine.cs
KochGenerator_1.cs
KochLine.cs > KochLine
squa
No Results
master*
Ln 12, Col 53 Spaces: 4 UTF-8 with BOM CRLF C#

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

[RequireComponent(typeof(LineRenderer))]
//public class KochLine : MonoBehaviour
// this KochLine class doesnt derive from - MonoBehaviour , it derives from - KochGenerator
0 references
public class KochLine : KochGenerator
{
    3 references
    LineRenderer _lineRenderer;

    // Start is called before the first frame update
    0 references
    void Start()
    {
        _lineRenderer = GetComponent<LineRenderer>();
        _lineRenderer.positionCount = _position.Length;
        _lineRenderer.SetPositions(_position);

    }

    // Update is called once per frame
    0 references
    void Update()
    {

    }
}

```

a. Add Material to the KochLine renderer

b. Also UNCHECK UseWordSpace – we will Not use World Space

c.


AR_Dancers - Dancers_Scene_4_KochFractals - PC, Mac & Linux Standalone - Unity 2019.2.17f1 Personal* <DX11>
File Edit Assets GameObject Component Cinemachine Mobile Input Window Help
Center Global
Collab Account Layers Layout
Hierarchy
Scene Game Asset Store Animator
Shaded 2D Gizmos
Persp
Inspector
Project Console
Create
Add Component

Dancers_Scene_4_KochFractals
- Main Camera
- Directional Light
- Koch
- Quad
- KochLine

Color	
Corner Vertices	0
End Cap Vertices	0
Alignment	View
Texture Mode	Stretch
Shadow Bias	0.5
Generate Lighting Da	□
Use World Space	□
Materials	
Size	1
Element 0	KochLineMAT
Lighting	
Cast Shadows	On
Receive Shadows	☑
Probes	
Light Probes	Off
Reflection Probes	Off
Additional Settings	
Motion Vectors	Camera Motion Only
Dynamic Occlusion	☑
Sorting Layer	Default
Order in Layer	0

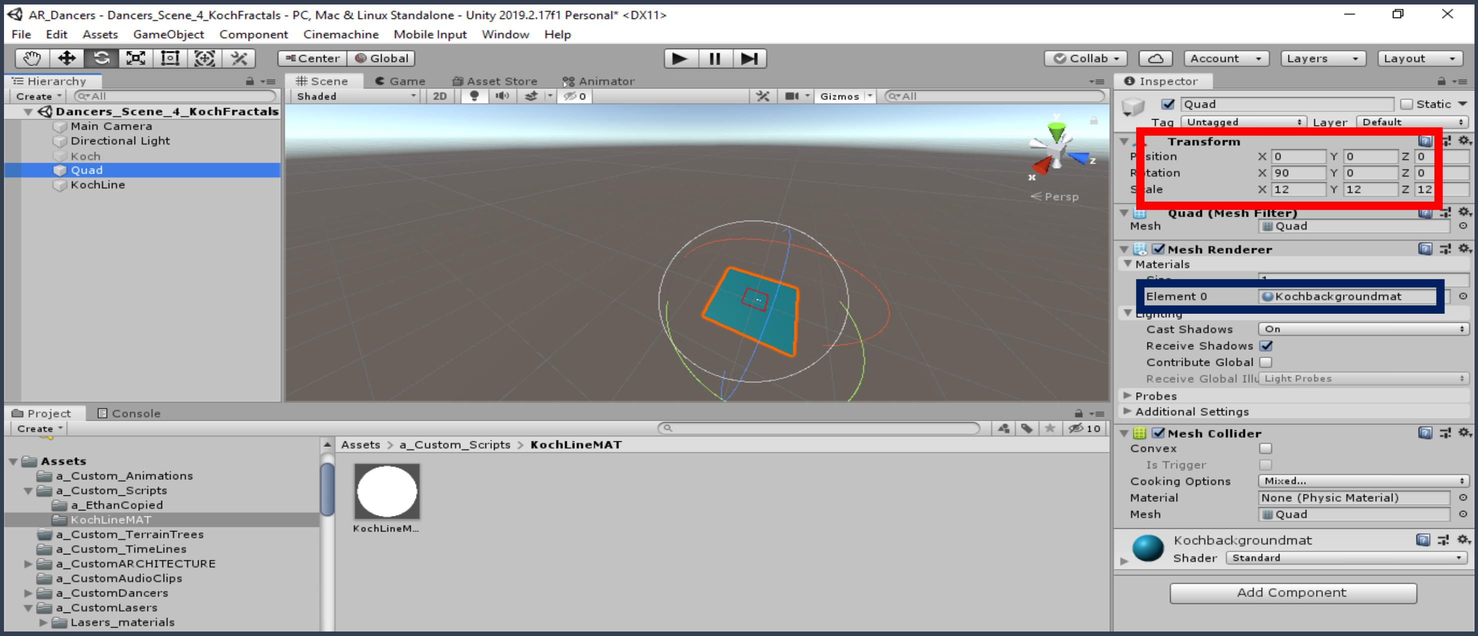
☑ Koch Line (Script)

KochLineMAT
Shader Particles/Priority Additive

Assets > a_Custom_Scripts > KochLineMAT

KochLineM...

- Assets
  - a_Custom_Animations
  - a_Custom_Scripts
    - a_EthanCopied
    - KochLineMAT
  - a_Custom_TerrainTrees
  - a_Custom_TimeLines
  - a_CustomARCHITECTURE
  - a_CustomAudioClips
  - a_CustomDancers
  - a_CustomLasers
    - Lasers_materials


File Edit Assets GameObject Component Cinemachine Mobile Input Window Help
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Static
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Hierarchy:
- Dancers_Scene_4_KochFractals
  - Main Camera
  - Directional Light
  - Koch
  - Quad
  - KochLine

Project:
- Assets
  - a_Custom_Animations
  - a_Custom_Scripts
    - a_EthanCopied
    - KochLineMAT
  - a_Custom_TerrainTrees
  - a_Custom_TimeLines
  - a_CustomARCHITECTURE
  - a_CustomAudioClips
  - a_CustomDancers
  - a_CustomLasers
    - Lasers_materials

Assets > a_Custom_Scripts > KochLineMAT

KochLineM...

Inspector: Quad

Tag Untagged Layer Default

Transform

	X	Y	Z
Position	0	0	0
Rotation	90	0	0
Scale	12	12	12

Quad (Mesh Filter)
Mesh: Quad

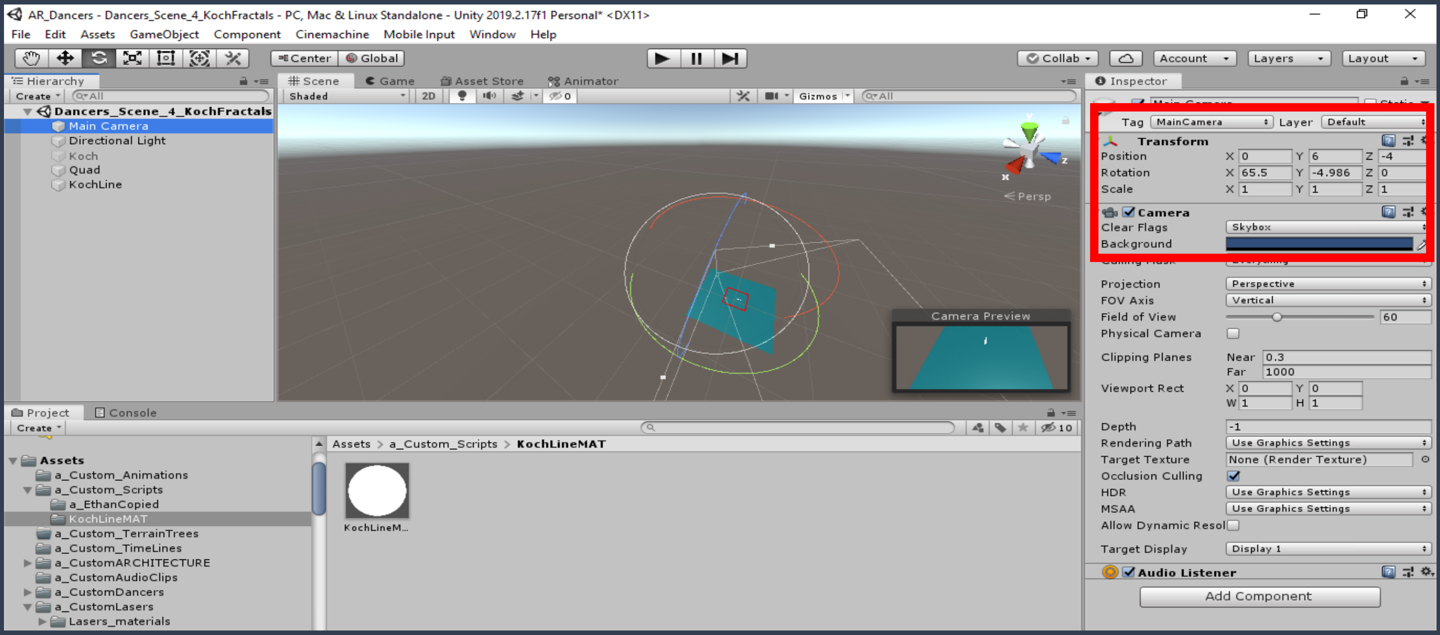
Mesh Renderer
Materials
Size: 1
Element 0: Kochbackgroundmat
Lighting
Cast Shadows: On
Receive Shadows: ☑
Contribute Global: □
Receive Global Illu: Light Probes
Probes
Additional Settings

Mesh Collider
Convex: □
Is Trigger: □
Cooking Options: Mixed...
Material: None (Physic Material)
Mesh: Quad

Kochbackgroundmat
Shader: Standard

a. Seen below - MainCamera transforms and Angle of Rotation – otherwise LineRenderer wont be visible

b. Also the LINE_Renderer – transform , needs to have Y as 1 … cant be as same level as QUAD … otherwise Not visible


File Edit Assets GameObject Component Cinemachine Mobile Input Window Help
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Persp
Camera Preview
Project Console
Inspector
Add Component

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Hierarchy:
- Dancers_Scene_4_KochFractals
  - Main Camera
  - Directional Light
  - Koch
  - Quad
  - KochLine

Project:
- Assets
  - a_Custom_Animations
  - a_Custom_Scripts
    - a_EthanCopied
    - KochLineMAT
  - a_Custom_TerrainTrees
  - a_Custom_TimeLines
  - a_CustomARCHITECTURE
  - a_CustomAudioClips
  - a_CustomDancers
  - a_CustomLasers
    - Lasers_materials

Assets > a_Custom_Scripts > KochLineMAT

KochLineM...

Inspector: Main Camera

Tag MainCamera Layer Default

Transform

	X	Y	Z
Position	0	6	-4
Rotation	65.5	-4.986	0
Scale	1	1	1

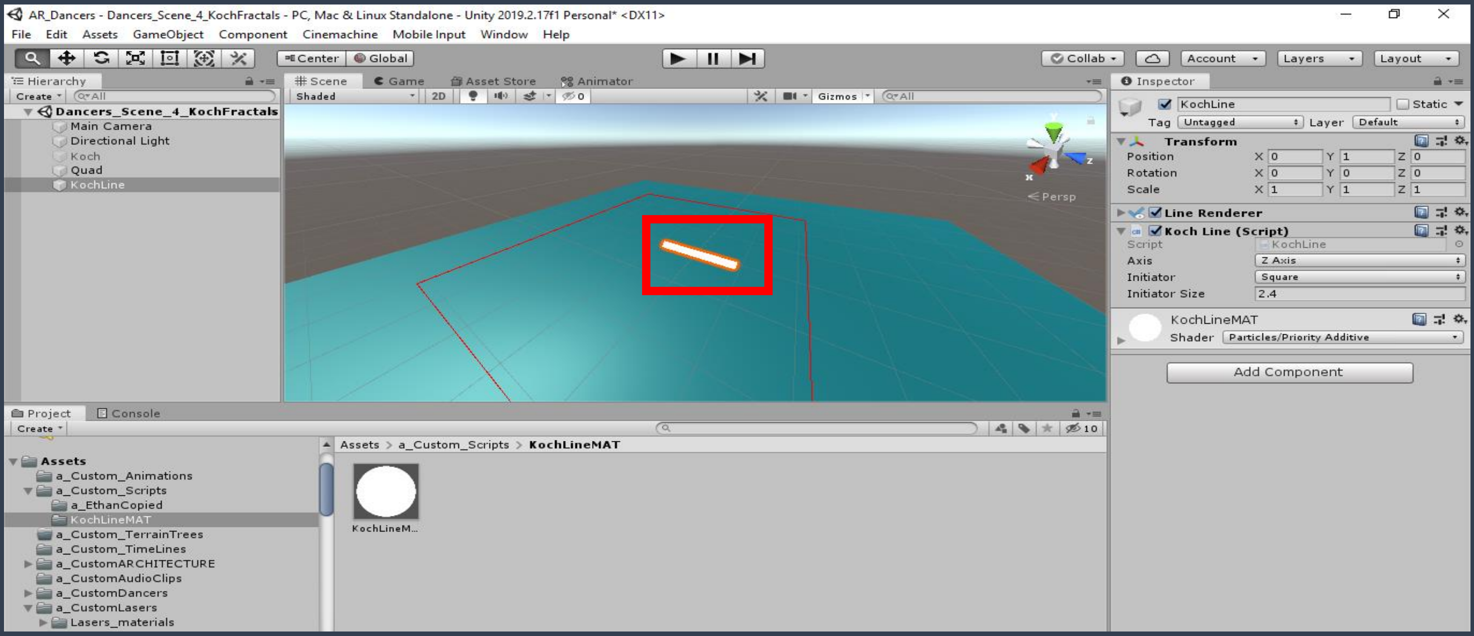
Camera
Clear Flags: Skybox
Background
Culling Mask: Everything
Projection: Perspective
FOV Axis: Vertical
Field of View: 60
Physical Camera: □
Clipping Planes: Near 0.3, Far 1000
Viewport Rect: X 0, Y 0, W 1, H 1
Depth: -1
Rendering Path: Use Graphics Settings
Target Texture: None (Render Texture)
Occlusion Culling: ☑
HDR: Use Graphics Settings
MSAA: Use Graphics Settings
Allow Dynamic Resol: □
Target Display: Display 1

Audio Listener

a. As seen below – three Objects seen in the SCENE , the KOCH_Line is the White thingie in the middle.

b. The QUAD outer Blue

c. The Actual KOCH FRACTAL - SQUARE Figure , is just seen as a RED LINED Square in the SCENE Mode , this in the GAME Mode becomes a BRIGHTER white Lined SQUARE



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Dancers_Scene_4_KochFractals
- Main Camera
- Directional Light
- Koch
- Quad
- KochLine

KochLine
Tag Untagged Layer Default

Transform

	X	Y	Z
Position	0	1	0
Rotation	0	0	0
Scale	1	1	1

Line Renderer

Koch Line (Script)

Script	KochLine
Axis	Z Axis
Initiator	Square
Initiator Size	2.4

KochLineMAT
Shader Particles/Priority Additive

Assets > a_Custom_Scripts > KochLineMAT

Assets
- a_Custom_Animations
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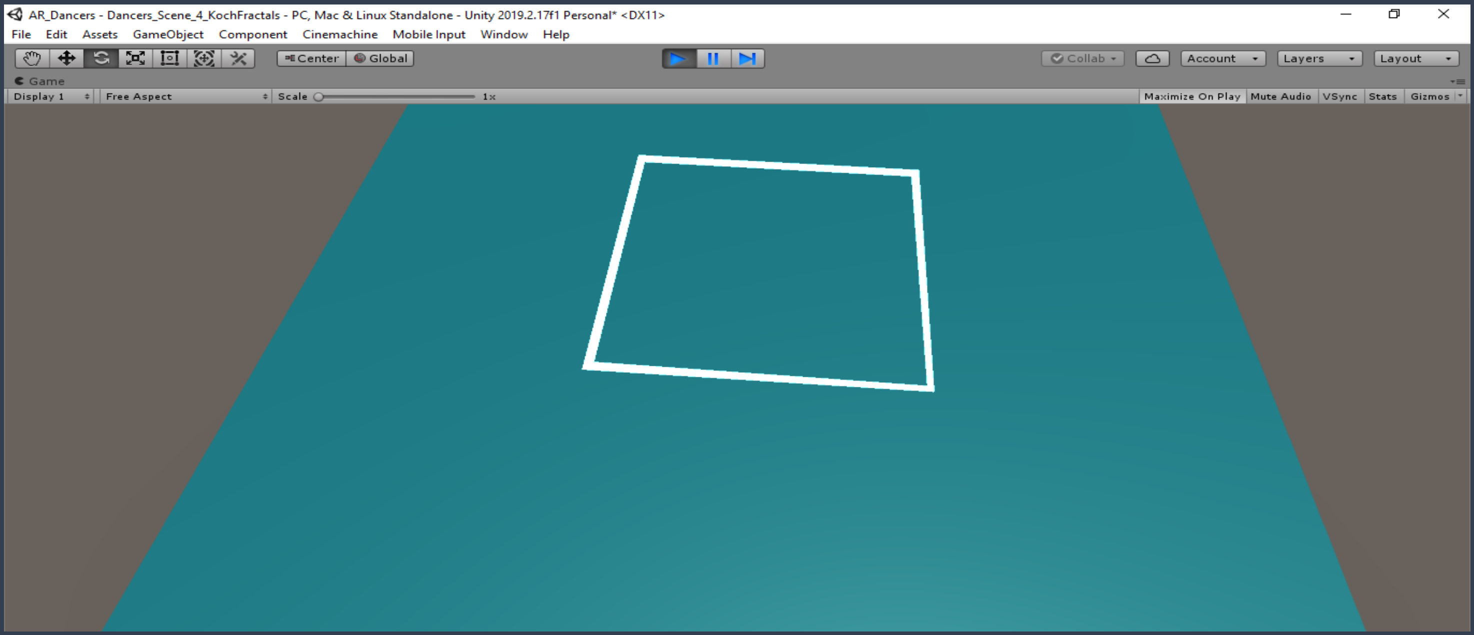
  - Lasers_materials

KochLineM...



AR_Dancers - Dancers_Scene_4_KochFractals - PC, Mac & Linux Standalone - Unity 2019.2.17f1 Personal* <DX11>

Display 1 Free Aspect Scale 1x