BROKEN HORIZONS

INDIVIDUAL CONTRIBUTION

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MSc CAVE

ABOUT OUR PROJECT

Introduction

We aimed to recreate a real-world environment in Unreal Engine 5, exploring innovative and efficient workflows in technical art.

Approach

We visited Tout Quarry Sculpture Park to capture photographic references.

Using PCG workflows and various DCC tools, we reconstructed the environment in Unreal Engine..

Outcome

Recreation of the "Circle of Stones" area with a high level of detail — a 1,500 square meter environment featuring ancient sculptures, stone structures, and natural foliage.

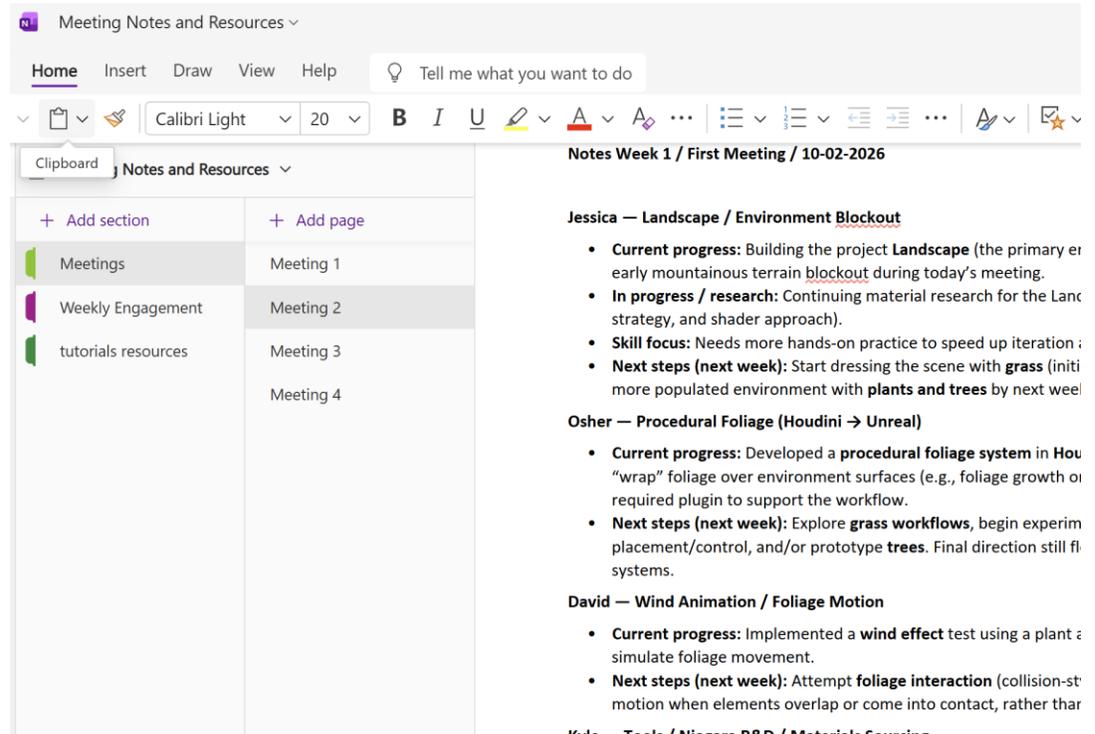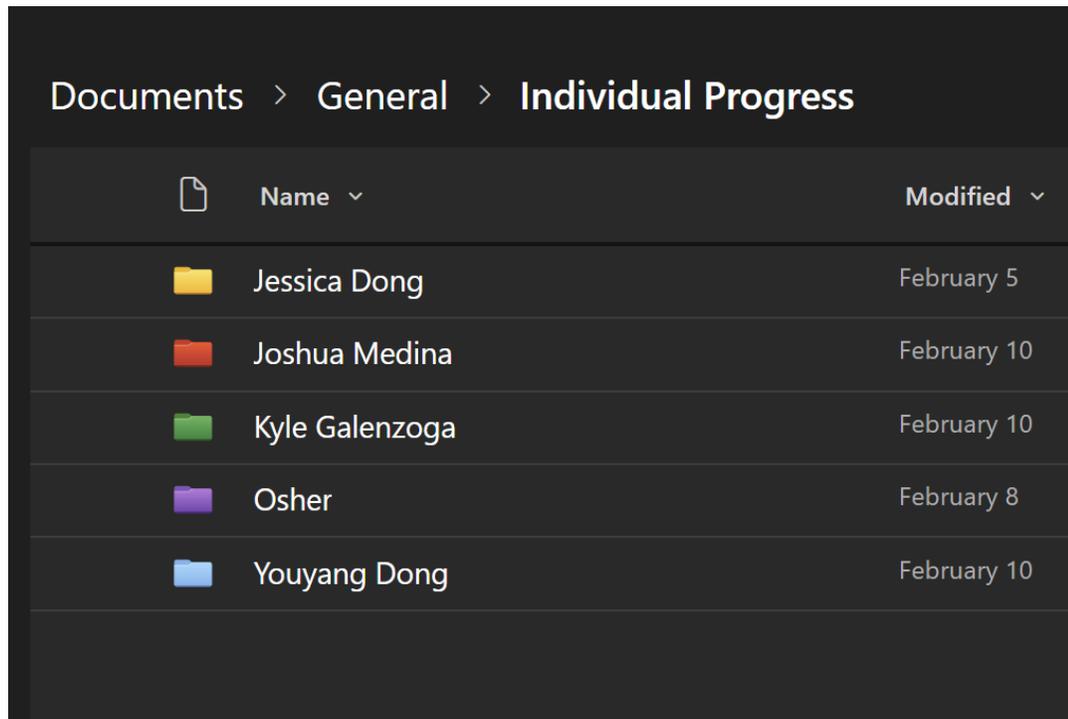A 1.5-minute cinematic video to showcase the final result.
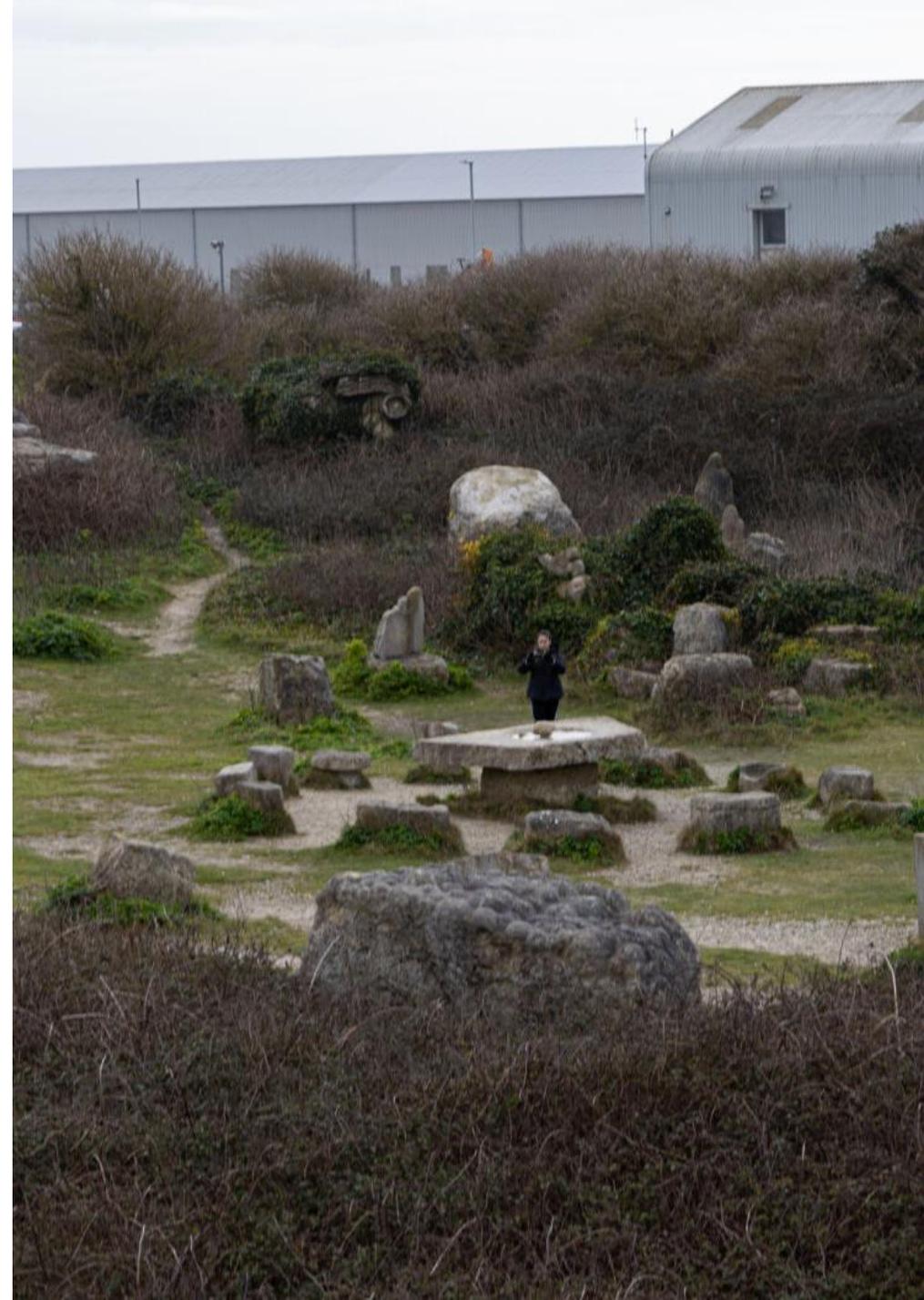
MY ROLE AND RESPONSIBILITIES

Director (Environment & Pipeline)

- Pipeline and Workflow

- Environment Work

- Tool Development

PIPELINE AND WORKFLOW

I set up folder structure and notebook for the team to update their weekly progress. We meet weekly and have debrief meetings
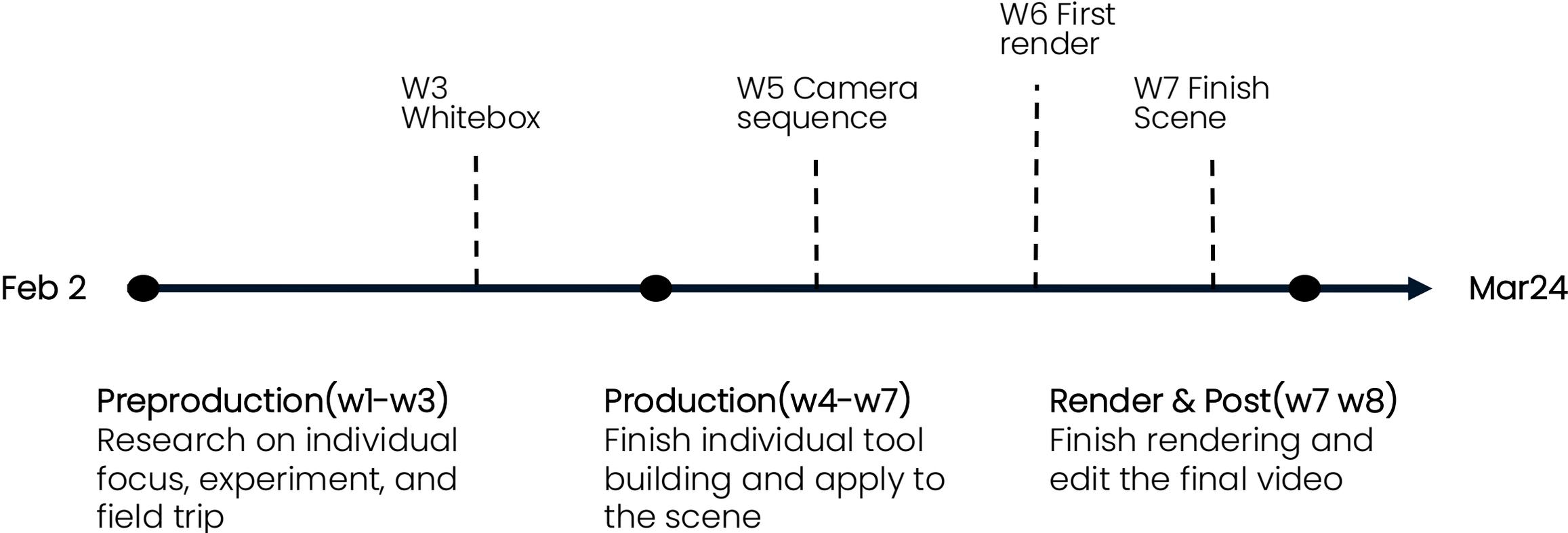
PIPELINE AND WORKFLOW

- Me and the producer design and set up engagement form so that every member document their weekly tasks and share together.

- We also set our weekly milestones in advance

WC February 2nd

|	Weekly Tasks	Notes	Place to share what we did
Jessica	Create a procedural Landscape in UE	Created landscape with Gaea, a professional landscape tool that can export heightmap, rivermap, snow map etc. Set Gaea plug-in to Unreal. Created landscape master material and paint material to layers. Problem to be solved: Texture size unmatching	GaeaLandscapeToUnreal.mp4
Osher	Look at the foliage tutorial and try to see what's achievable to do in our time frame.	Created the procedural foliage tool in houdini, set the houdini plugin in Unreal and then uploaded the had to Unreal. After uploading to Unreal, set an imput for the tool (can be any object) and the foliage will apply on it (the asset will be covered in foliage). User can change size of leaves, amount of branches, layout on the object, can change leaves model. Seems quite feasible to do.	foliage_test_1.mov
Josh	Basic Lighting	I did some tutorial of basic Lighting and applied some techniques of Visual Effects on an environment	Exponential Height Fog.mp4 Sky Atmosphere Basic Overview.mp4
Youyang	Watch some blueprints and a simple HLSL tutorial, try to make the foliage sway in the wind.	Created a wind field effect for foliage by writing an HLSL noise shader (assisted by Gemini) and integrating it with Blueprints to drive vertex displacement.	week1_windgrass.mp4

PIPELINE AND WORKFLOW |
TIMELINE

W6 First
render

W3
Whitebox

W5 Camera
sequence

W7 Finish
Scene

Feb 2   Mar24

Preproduction(w1-w3)
Research on individual
focus, experiment, and
field trip

Production(w4-w7)
Finish individual tool
building and apply to
the scene

Render & Post(w7 w8)
Finish rendering and
edit the final video

PIPELINE AND WORKFLOW | UNREAL

Working on the same project

Since the university doesn't provide any version control tool, we use **named folder** and **migration** to import individual works to the project

I check everyone's work by the end of the working day and integrate them together
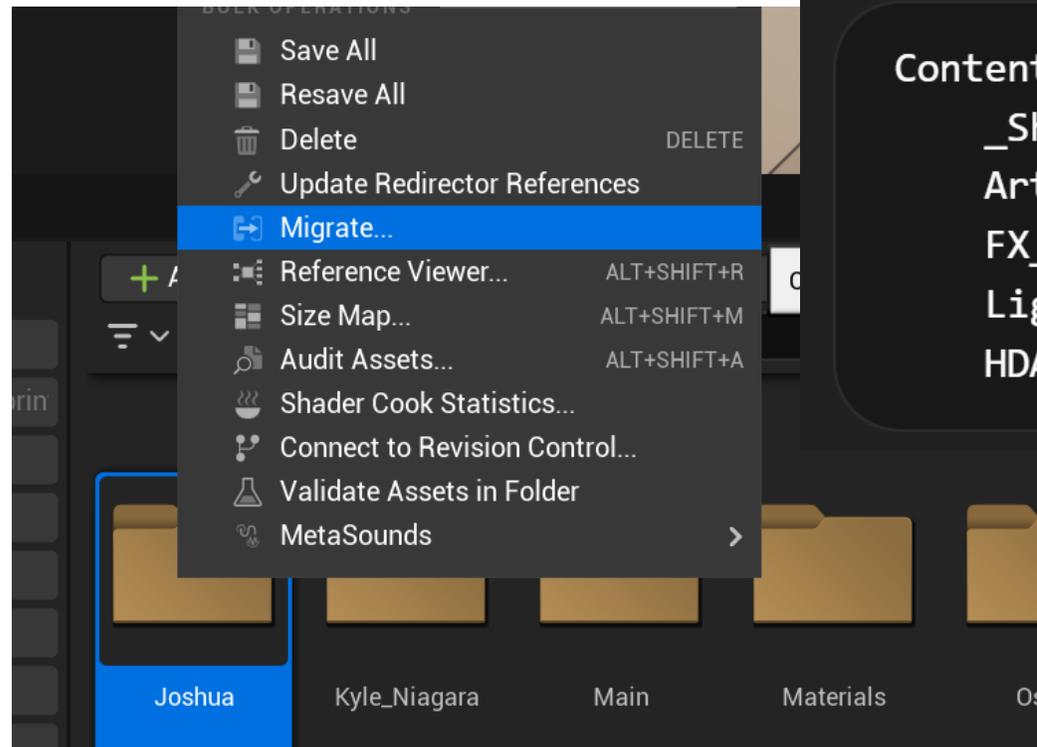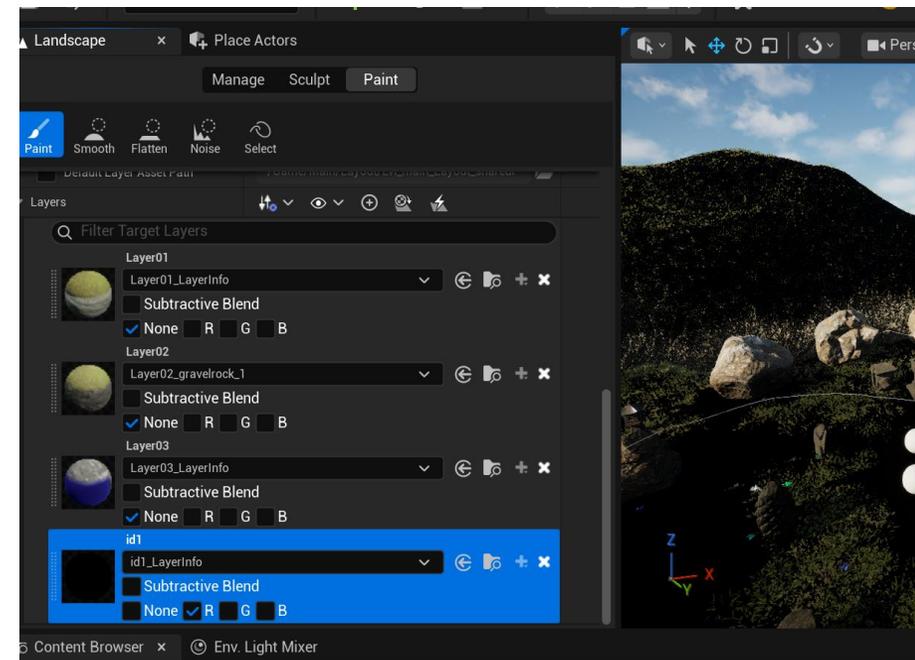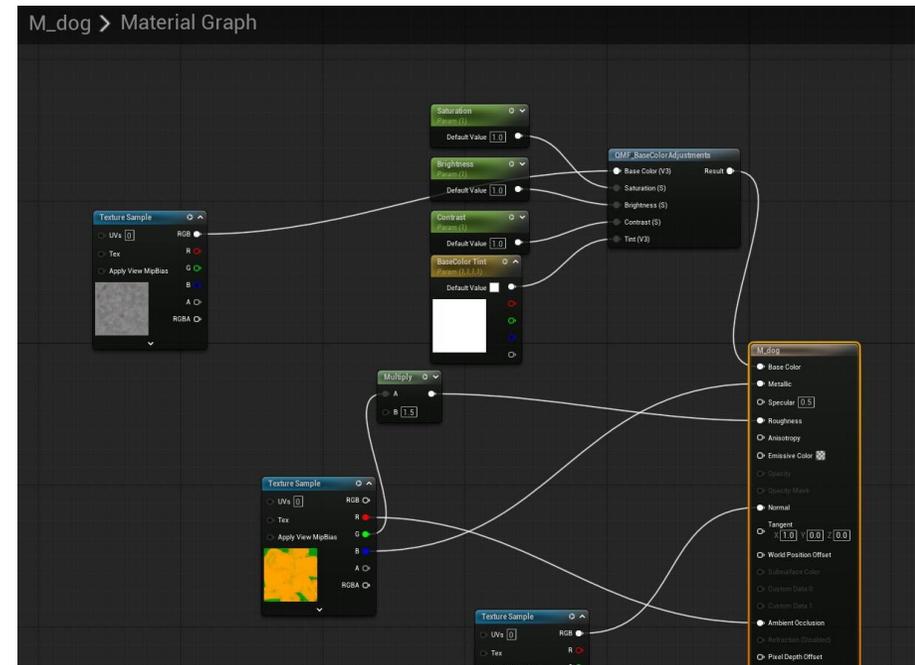
PIPELINE AND WORKFLOW | UNREAL

Custom Problem Solving

When team members submitted their tools or assets, they were not always directly usable in Unreal Engine.
I investigated these issues and developed solutions to ensure proper integration into the pipeline.

Examples:
- Adjusted texture color and parameters to better fit the scene
- Added ID masks to support HDA tools developed by other team members

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ENVIRONMENT WORK | LANDSCAPE CREATION

APPROACH	EFFICIENCY	PROS	CONS
Gaea	Unsure, learning curve	Open world size, has texture and details	Still need sculpting if doing real world reference
Unreal sculpting tool	Slow	Easy use	Not natural, time consuming
Houdini	Unsure, learning curve	More possibilities	Lots of to learn
DTM Data Heightmap	Fast	Accurate and fast	Less artistic, still need modify

There are multiple methods for creating landscapes.
Considering the project timeline and requirements, I evaluated different approaches and chose to use real-world DTM data.

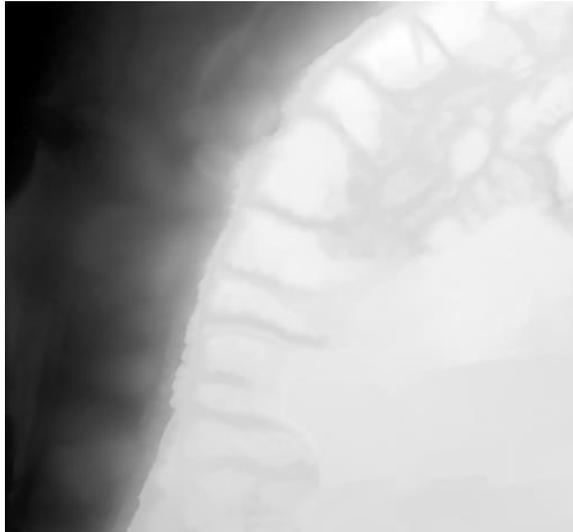# ENVIRONMENT WORK | LANDSCAPE CREATION

"The LIDAR Composite DTM (Digital Terrain Model) is a raster elevation model covering ~99% of England at 1m spatial resolution."

I download the DTM data map and process in Houdini to generate height map that can later be used in Unreal to create landscape

https://environment.data.gov.uk/survey
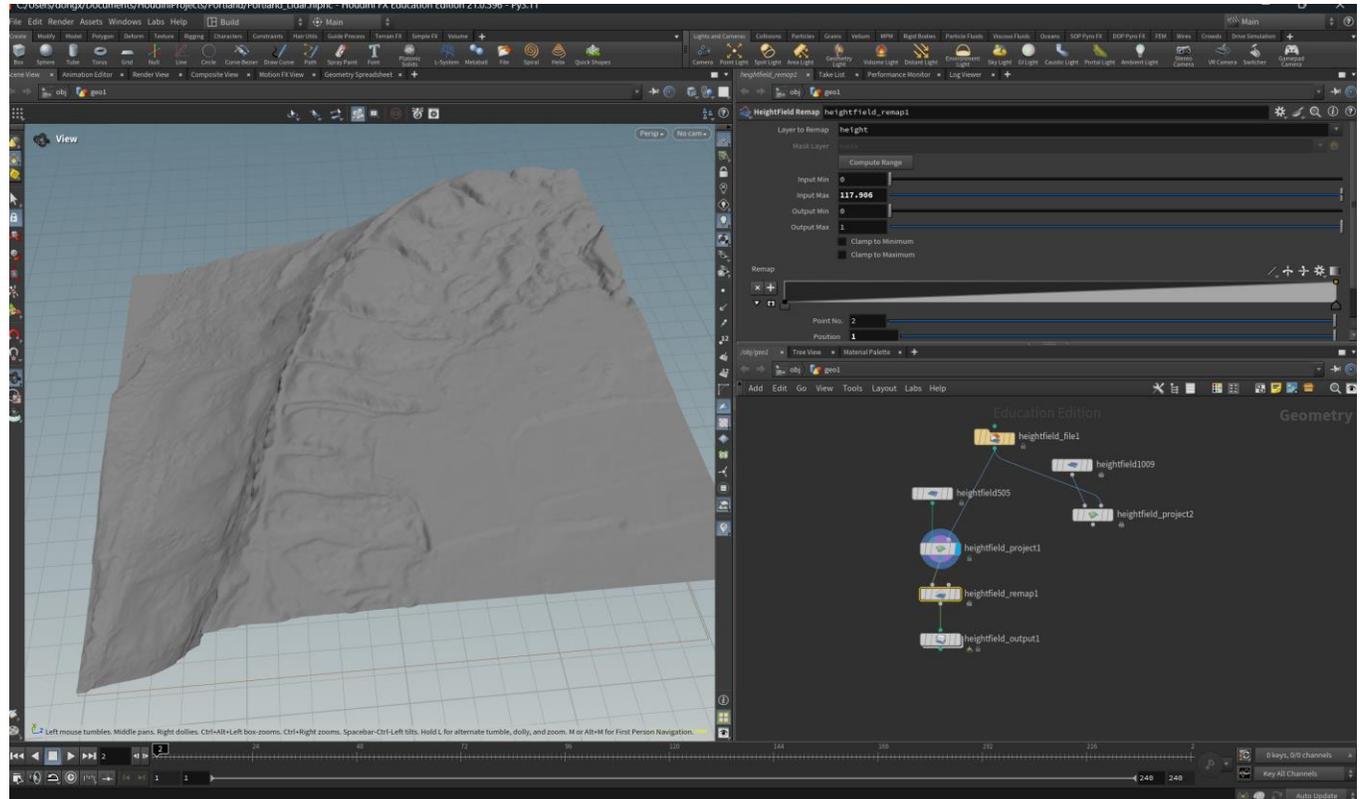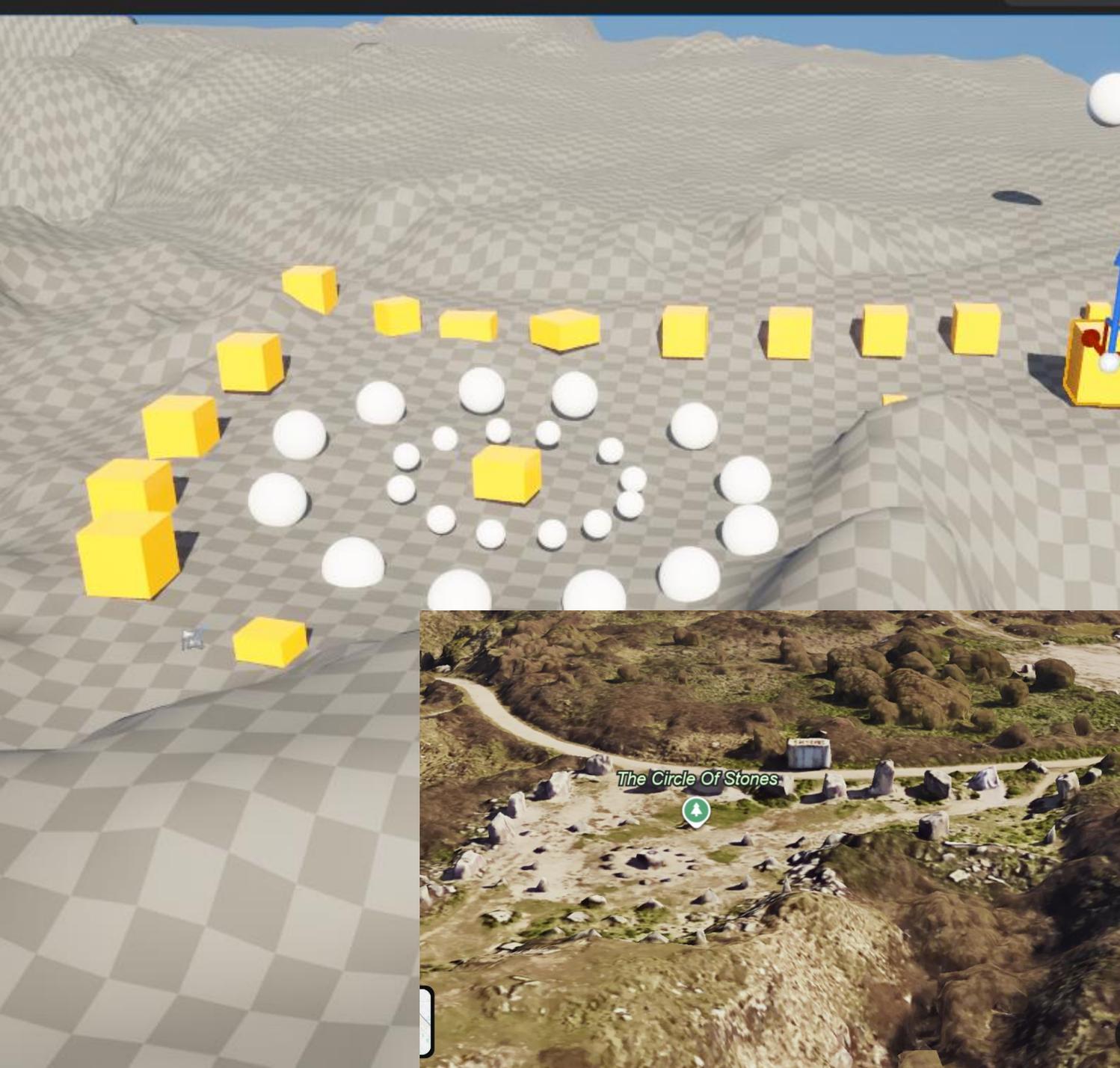
ENVIRONMENT WORK | LANDSCAPE CREATION
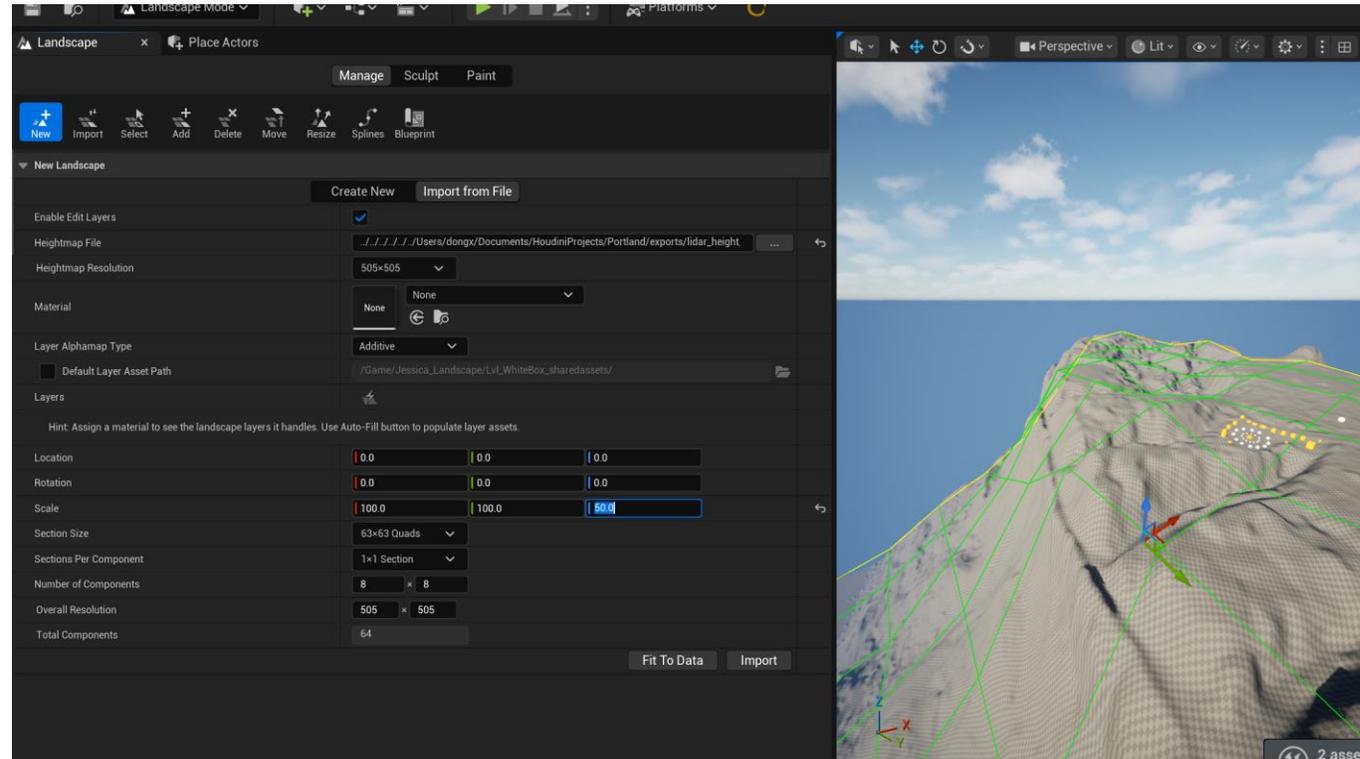
From Houdini I export a heightmap grayscale image and use it to create the landscape in UE.

ENVIRONMENT WORK | WHITEBOX

Create whitebox based on google earth 3d scan

Except for the reference pictures we took ourselves, google earth has a interactive map that have measurement

I measured the distance between the stones and create the whitebox layout in Unreal

ENVIRONMENT WORK | LANDSCAPE TEXTURE

I use Landscape auto material and custom layers to quickly texture ground and grass
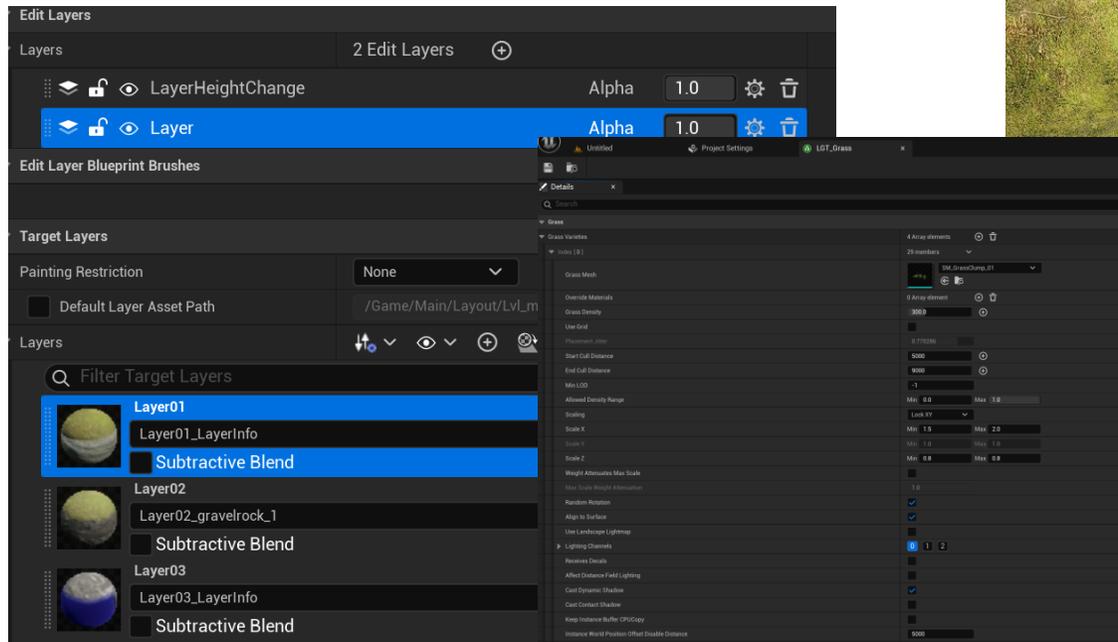
ENVIRONMENT WORK | ADD DETAILS

I add other 3d assets such as sculptures created or found by other members to the scene. I use foliage mode to create more shrubs in the background. I add small things like water plane.
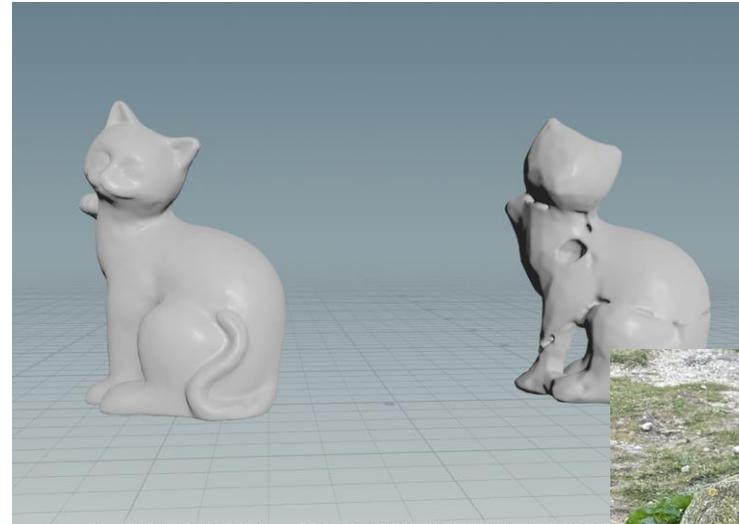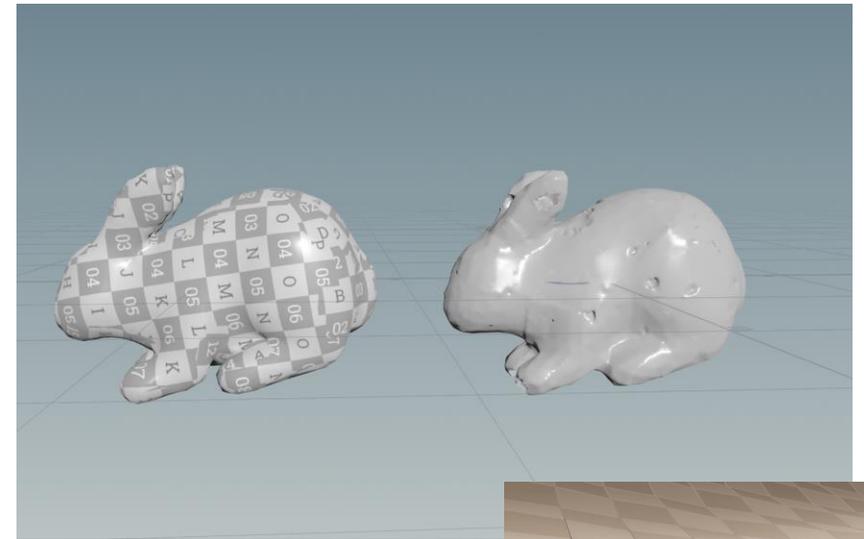
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TOOL DEVELOPMENT | HDA

Ruinify Tool

Based on our reference there are many corrupted stone sculptures. Therefore, I built Houdini Digital Asset that can transform model into a corrupted version.
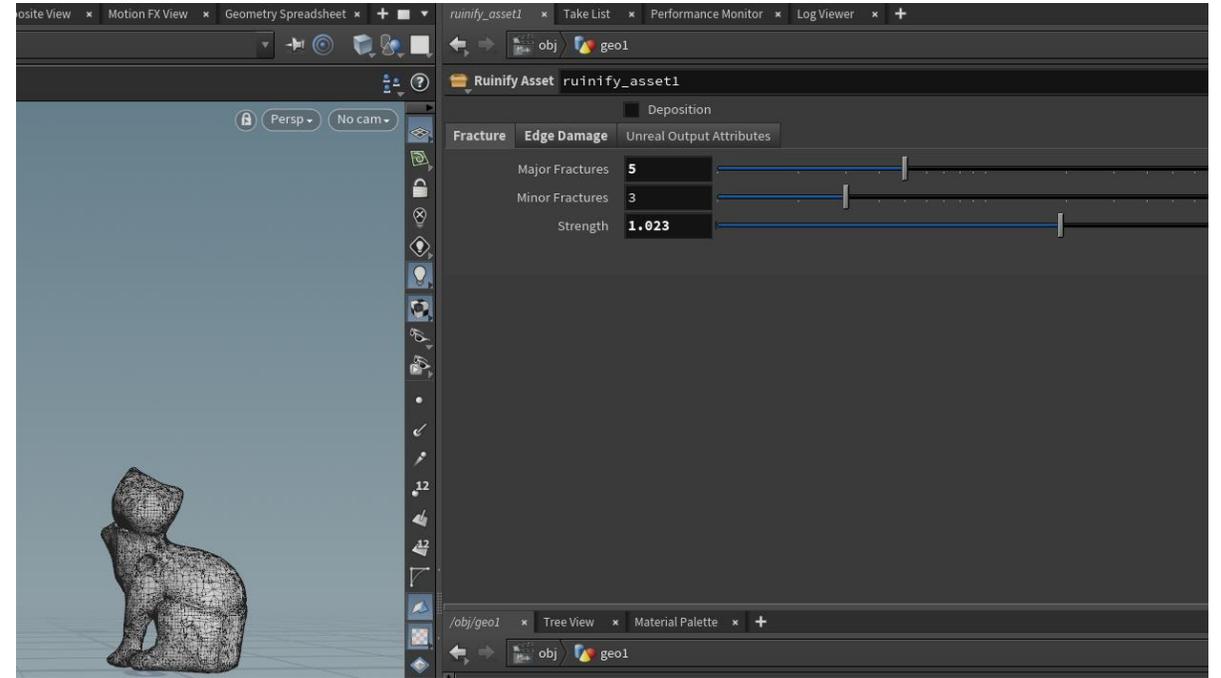
TOOL DEVELOPMENT | HDA

Tool Function

The tool has parameters to control fractures and corrupted level.

The method is that the had take model as input and transfer to VDB, use noes like Voronoi, copy to points, VDB combine etc. To process the model and finally transform it back to polygons.
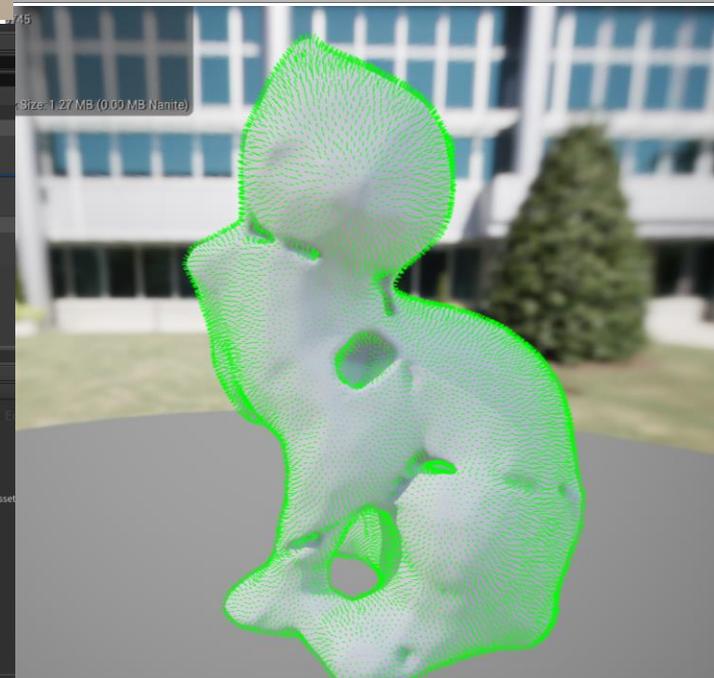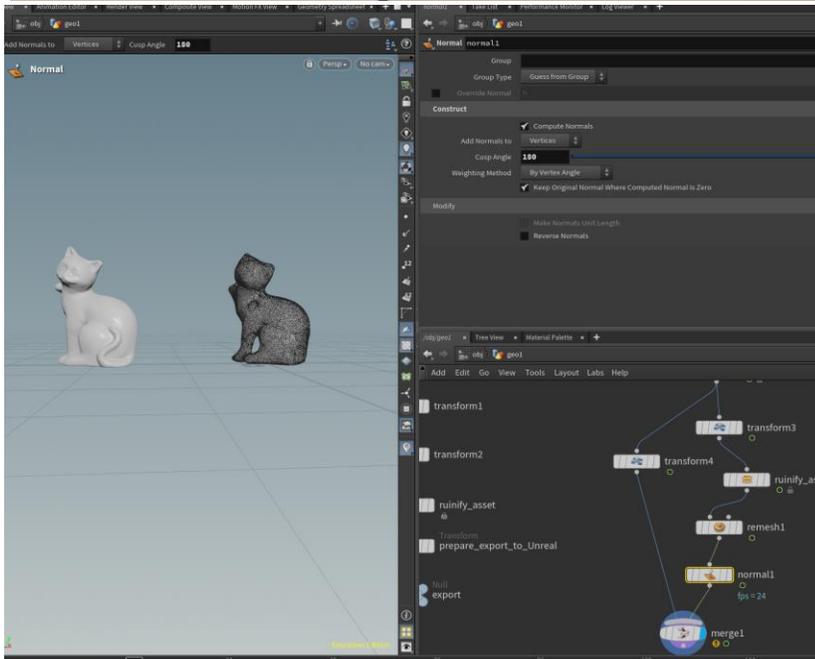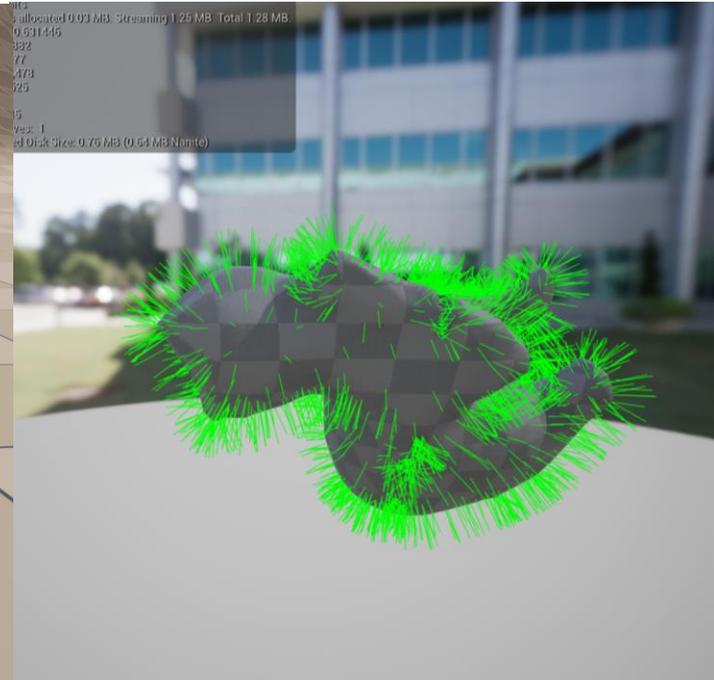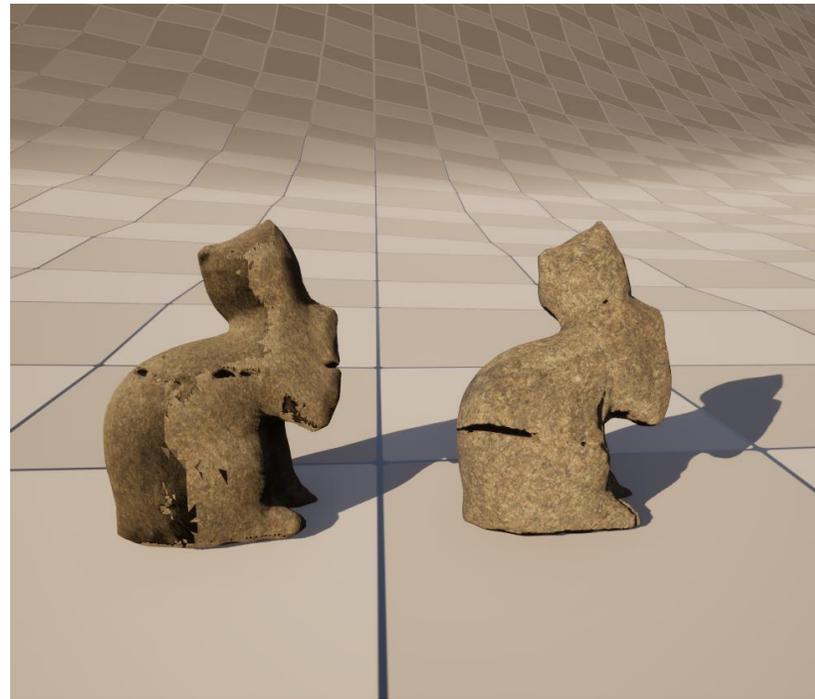
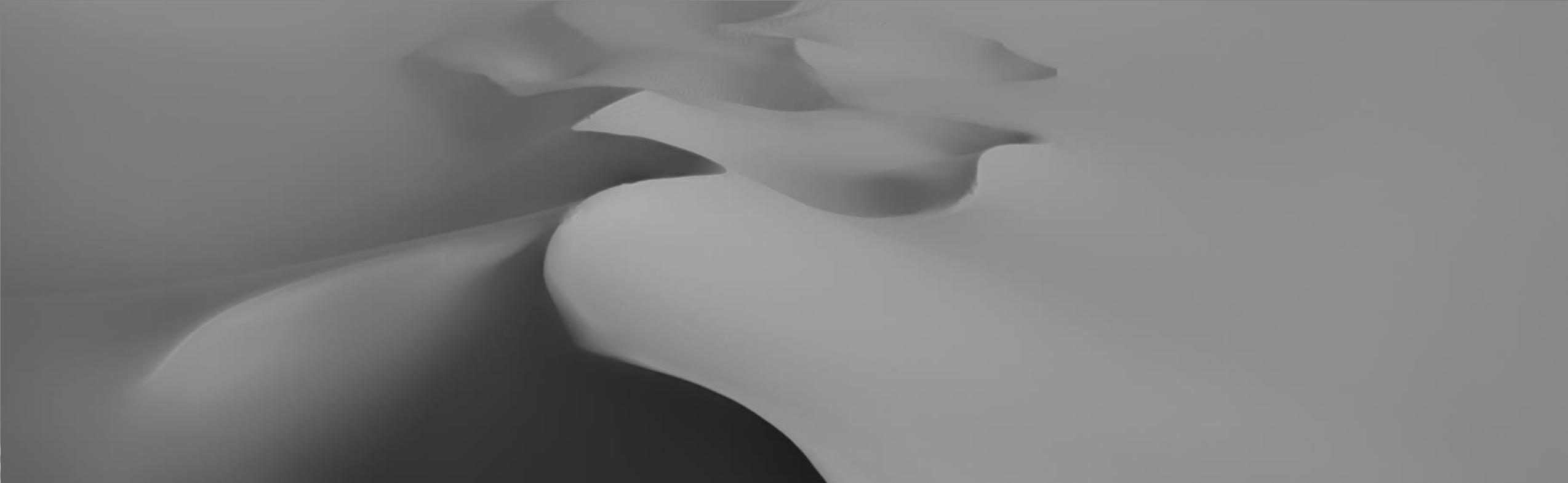The HDA works with Houdini Enginein Unreal to allow realtime editing

TOOL DEVELOPMENT | HDA

Smooth shading in UE

Most model has sharp edge shadow due to disconnected normals, I use normal SOP and make Cusp Angle 180 in Houdini to smooth shading, which will recalculate the shared faces vertex normal

THANK YOU

|

References

Department for Environment Food & Rural Affairs. LIDAR Composite DTM 2022 1M. Retrieved Mar 1, 2026 from https://environment.data.gov.uk/survey

Cygnos. Smiling Cat Figurine - Free 3D Download. FAB. Retrieved Mar 17, 2026 from https://fab.com/s/9b4197338f2e

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