ENGINEERING THESIS

Game Level Building Techniques Using a Game Engine

Procedural Generation and Photogrammetry in Unreal Engine

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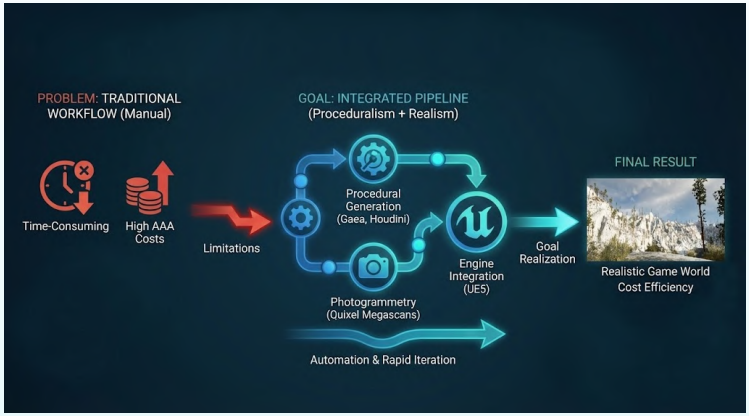
Research Objective and Problem

Problem:

- Time-consuming manual work.
- High AAA costs.

Thesis objective:

- Integrated pipeline.
- **Proceduralism** + **Realism**.



Technology Stack

Unreal Engine 5
Core & Render

Gaea
Terrain → Erosion

Houdini
Vegetation HDA

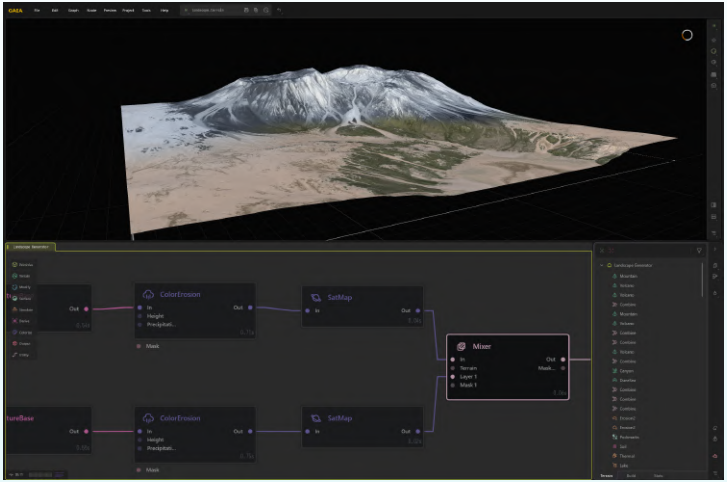
Quixel Tools
3D Scans

GitLab
Backup

Methodology: Terrain Generation (Gaea)

Process:

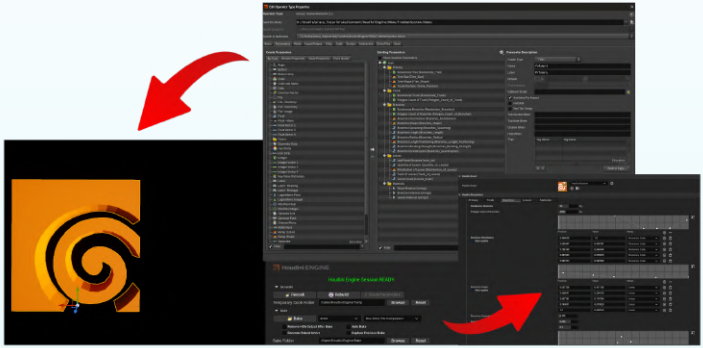
- Natural erosion simulation.
- Flow mask generation.



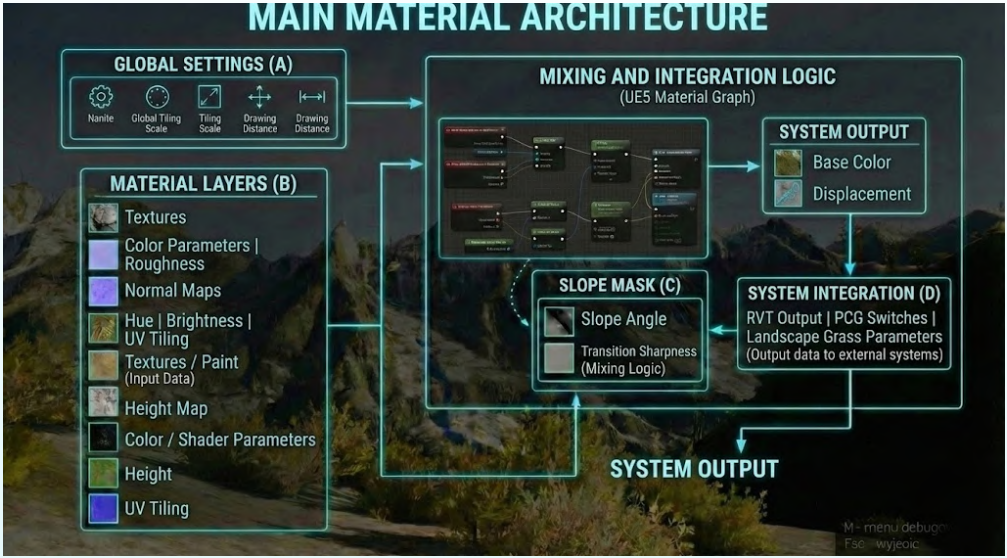
Methodology: Procedural Vegetation (Houdini)

Houdini Digital Assets (HDA):

- Creating "live" tools in UE5.
- Parameterization of vegetation density and type.



Logic: Auto Blend Material



Results: Three Biomes, One System

1. Sunny

Results: Three Biomes, One System

2. Desert

Results: Three Biomes, One System

3. Winter

Performance

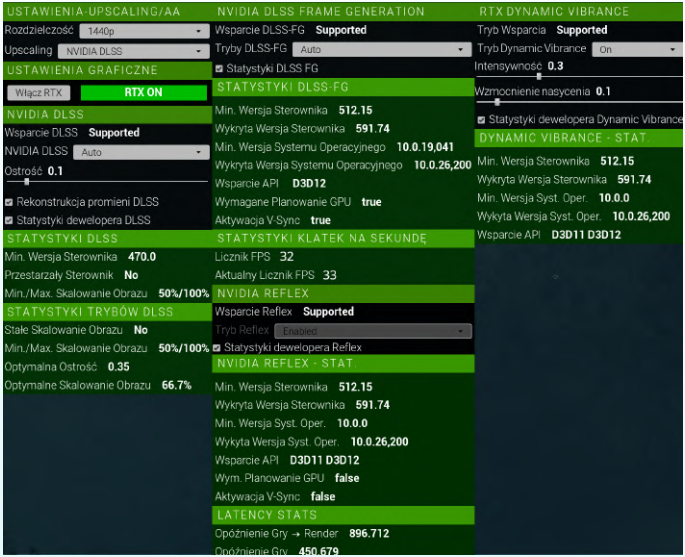
30-36

FPS (1440p, Epic)

94%

VRAM Usage (8GB)

Technical Overview



Summary: Personal Contribution

Implementation and Logic:

- Development of a procedural pipeline (Gaea, Houdini → UE5).
- Creation of HDA tools in Houdini (vegetation).
- Implementation of a Master Material with an Auto Blend function.

Art & Design:

- Composition of three diverse biomes.

Custom solution
for tool integration

Summary: Conclusions and Future Work

Encountered problems and limitations

- High VRAM usage with 4K textures.

Perspectives for future work

- Optimization to improve performance.
- Adaptation of the pipeline for generating simulation environments (automotive/aviation).

Thank you for your attention