Performance analysis

2016-04-05, Robin Sveningson

Analysis details:

The analysis was performed when using the following commit:

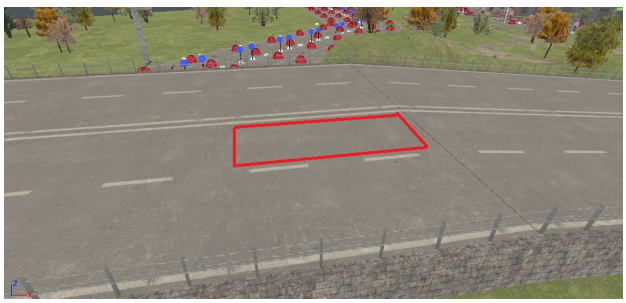
Tried to fix bug for t and x roads
slimjim10
2016-04-05
eb3c9df077586db030e87a16c9d4fdaea6204743

Analysis method:

This analysis was made on the level *Open World* with no local changes. The first step was building the level by clicking *Build* (everything was built, not only the lightning) while the lightning quality was set to *production*. Then the first data measure was recorded, which was used as a reference to all other measures. The data was collected by using the console command *stat unit* while running the game by clicking *Play this level in a new window*.

All groups of elements were then removed one by one (while always undoing the previous remove), and new data was measured for each element. The result when removing a specific group of element is the difference between the relative data measured initially and the newly recorded data. The world was **not** rebuilt after removing a given group of elements.

All data measures were made when standing on the following position of the large highway bridge, while looking towards the city:




The view mode was always from *first person*, which means the car was always seen through the driver's seat.

The computer used during the analysis had the following stats:

Intel Core i7-4770K CPU @ 3.50GHz
16 GB RAM
64-bit Windows 7 Enterprise
NVIDIA GeForce GTX 970
Unreal Engine 4, version 4.10.4

Measured results:

Initial data measure (relative data):

Changes:
No changes made

Results:

FPS	33.72
Frame (ms)	29.39
Game (ms)	11.09
Draw (ms)	0.26
GPU (ms)	29.41

Roads:

Changes:
Removed all road components, including everything placed on them (such as signs, traffic lights, street lights, AI-nodes…).

Results:

FPS	65.53	~194%
Frame (ms)	15.38	~52%
Game (ms)	8.79	~79%
Draw (ms)	0.26	100%
GPU (ms)	15.41	~52%

Buildings:

Changes:
Removed all buildings, including the skyscrapers. Not including stores, diners, outer diners or advertisement.

Results:

FPS	35.29	~105%
Frame (ms)	28.46	~97%
Game (ms)	10.62	~96%
Draw (ms)	0.35	~135%
GPU (ms)	28.49	~97%

Landscape:

Changes:
Removed both grass/cobblestone/dirt landscape as well as water landscape.

Results:

FPS	32.34	~96%
Frame (ms)	30.88	~105%
Game (ms)	10.67	~96%
Draw (ms)	0.48	~185%
GPU (ms)	30.88	~105%

Light:

Changes:
Removed BP_sky_sphere, SkyLight and DirectionalLight.

Results:

FPS	45.68	~135%
Frame (ms)	21.96	~75%
Game (ms)	11.30	~102%
Draw (ms)	0.78	~300%
GPU (ms)	21.98	~75%

Nature:

Changes:
Removed foliage of trees and bushes.

Results:

FPS	32.53	~96%
Frame (ms)	30.49	~104%
Game (ms)	11.09	~100%
Draw (ms)	0.48	~185%
GPU (ms)	30.50	~104%

AI-nodes:

Changes:
Set the attribute *Actor hidden in Game* to true for all AI-nodes which are supposed to be invisible during release.

Results:

FPS	49.06	~145%
Frame (ms)	20.34	~69%
Game (ms)	16.30	~147%
Draw (ms)	0.19	~73%
GPU (ms)	20.34	~69%

Summary:

Based on the FPS-difference, here is an approximate result:

Roads:	Very heavy
Buildings:	No difference
Landscape:	Improves performance
Light:	Heavy
Nature:	No difference
AI-nodes:	Very heavy

It is, however, strange that nature makes virtually no difference. This might be the result of that there aren't really many trees visible when standing on the bridge.

On release the AI-nodes will be removed, so the overall FPS will increase rapidly by that change alone. If the application still doesn't run smoothly, the lightning could be replaced with a simpler one. Currently the built in sky sphere is used for the sky and lightning. Perhaps it can be swapped with a less demanding version, such as a static light and a static

sky texture. Another thing that can be considered is whether the roads can be made more simple to increase the overall FPS.

Future analyses:

We should consider doing another performance analysis when the product is finished. Then we should consider doing the following changes to the analysis to be able to get a more accurate test result:

- Measure the same data several times and calculate an average. All the values measured in this test aren't necessary representative, since they could be extreme values. The values should instead be measured over a longer time.
- The test could be performed with different positions of the car. Perhaps one position is facing the city from the bridge, while another could be the car on the highway showing more landscape. The nature test seemed to be wrong, and the result might be more accurate if data was collected where there are more trees.
- More specific elements should be tested. What happens if we remove railings from highways? Fire escapes? Park benches?