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USING SIMPLIFIED GEOMETRY FOR CONCRETE SITES OF 3D-LANDSCAPE DETALIZATION

Abstract. *Description of approach for selecting the level of detailing for sites of 3D-landscape by analyzing the scene and selecting the desired level of detailing for the tile, allowing to keep the information content and increase the performance of the CPU and GPU. The principles of conservation the resolution of texture for tile that prevents blur or sharpen of the image are given.*

Keywords: *tile, quadtree, levels of detail, texturing, server OSM, analyzer of detail, scale of the rendering, perspective projection, camera, pixel*

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ПРИМЕНЕНИЕ УПРОЩЕННОЙ ГЕОМЕТРИИ ДЛЯ ДЕТАЛИЗАЦИИ КОНКРЕТНЫХ УЧАСТКОВ 3D-ЛАНДШАФТА

Аннотация. *Предложен подход к выбору уровня детализации для участков 3D-ландшафта за счет анализа сцены и выбора уровней детализации тайлов, что позволяет сохранить информативность и повысить производительность процессора и видеокарты. Описаны принципы сохранения разрешения текстуры тайла, что предотвращает размытие или избыточную резкость изображения.*

Ключевые слова: *тайл, дерево тайлов, уровни детализации, текстурирование, сервер OSM, анализатор детализации, масштаб рендринга, перспективная проекция, камера, пиксель*

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ЗАСТОСУВАННЯ СПРОЩЕНОЇ ГЕОМЕТРІЇ ДЛЯ ДЕТАЛІЗАЦІЇ КОНКРЕТНИХ ДІЛЯНОК 3D-ЛАНДШАФТУ

Анотація.*Запропоновано підхід до вибору рівня деталізації для ділянок 3D-ландшафту, за рахунок аналізу сцени і вибору рівнів деталізації тайлів, що дозволяє зберегти інформативність та підвищити продуктивність процесора і відеокарти. Описані принципи збереження оригінального розміру текстури тайла, що запобігає розмиттю або зайвої різкості зображення.*

Ключові слова: *тайл, дерево тайлів, рівні деталізації, текстурування, сервер OSM, аналізатор деталізації, масштаб рендрінга, перспективна проекція, камера, піксель*

Introduction

Traditional approaches for generation of 3D-maps lead to a significant increase in the load on the graphics processor, which leads to development of methods to improve the performance of the GPU or search for alternative approaches to reduce the load by reducing the calculations. It is necessary to apply a simplified geometry to reduce the load on the GPU and CPU when drawing objects of 3D-map [1].

Usually landscape has several levels of detail and is divided into sections called tiles. It should be noted that each subsequent tile is partitioned into four parts (also tiles), etc. Then the initial tile of landscape can be detailed by four subsequent "descendants", Fig. 1 [1].

The use of simplified geometry is possible after analyzing the scene and selecting the level of detail (LOD) for current tiles. The tasks of analyzer of detail include analysis of the location of the camera, choice of the LOD for each plot of terrain. Decision making should be of high quality and fast to prevent blur of the texture of tile. Blurring occurs when the resolution of the texture on the screen does not correspond to resolution of the original. The elimination of this blur of texture should be attributed to the problem of analyzer of detail for the current scene.

Therefore, the aim is to improve analyzer of detail of the scene.

To choose the appropriate LOD is necessary that analyzer of detail takes into account that plots of the landscape (tiles) depending on the location of the camera (observer) should have a different LOD: closer plots should use tiles with high detail, and remote should use tiles with low detail Fig.1.

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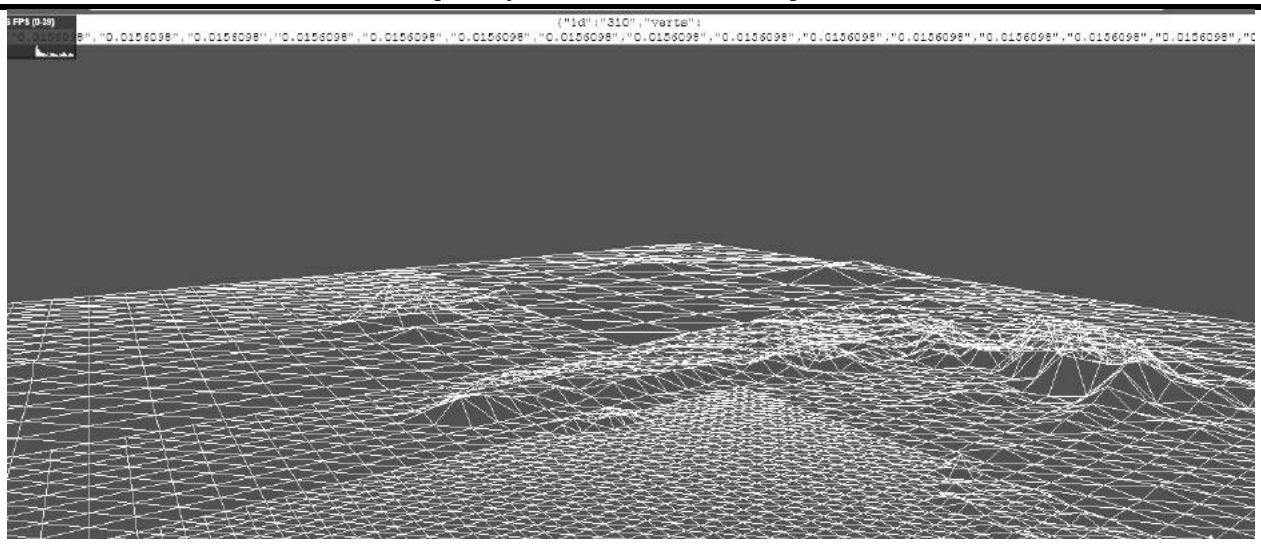
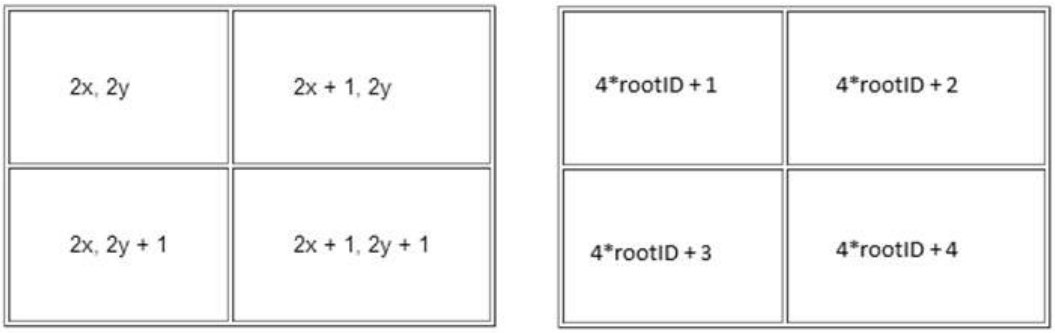
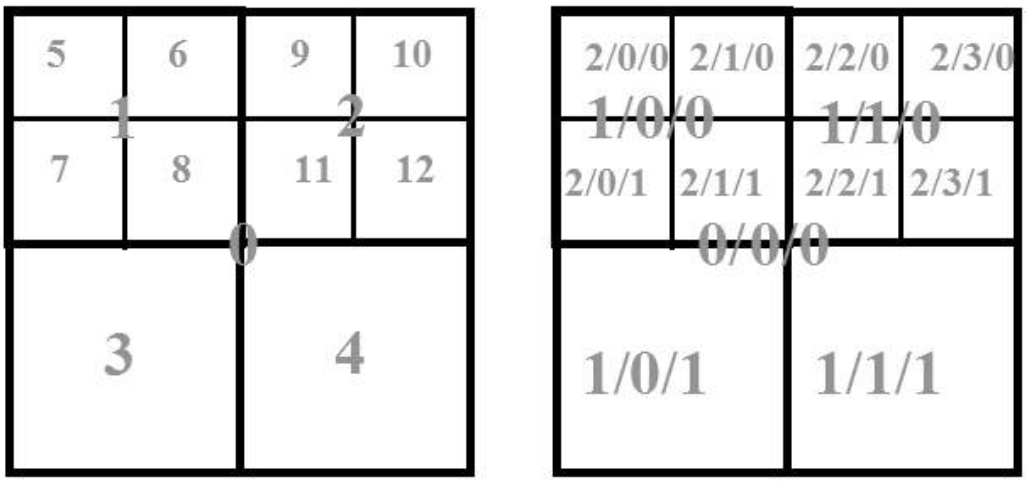


Fig. 5. Visualization of landscape with different LOD without texturing



a b

Fig. 6. Identification of the tiles on the quadtree of the landscape:
a – OSM-formation; b – formation, which is proposed to use



a b

Fig. 7. Example of identification of the tiles on the quadtree:
a – fragments are defined by the formula (Fig. 6 b); b – fragments are defined by zoom / x / y; x, y – according to the formula (Fig. 6 a), zoom – the LOD

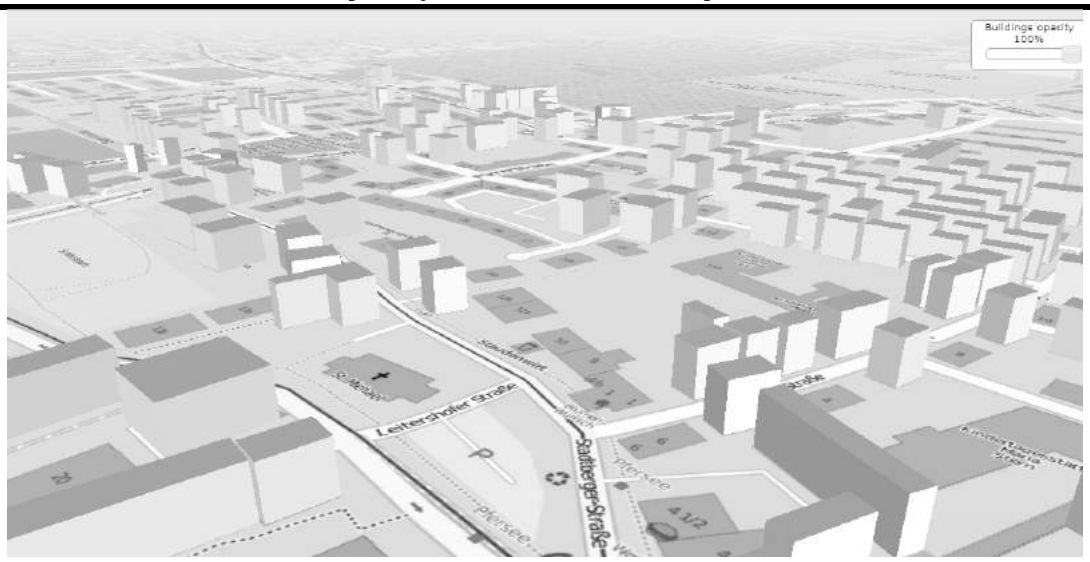


Fig. 8. Texturing of landscape with different levels of detail

Conclusions

Thus, these calculations allow us to improve the operation of the analyzer of detail by matching the number of pixels of the original texture of tile which is coming from the map server that makes extensive use of the simplified geometry in remote areas of the image. In addition, the flexibility of the algorithm allow to minimize the transition to another resolution of texture of the server and appears universality conditions for transition to neighboring levels, which improves performance video card and processor.

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