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SHORT COMMUNICATION

Creative Integration for 3D Environments: From Modelling to Rendering

Integración creativa para entornos 3D: Del modelado al renderizado

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ABSTRACT

The rationale for the project was based on the use of three key tools: Blender, Substance Painter and Unreal Engine. Blender was selected for its free, open source nature and its large development community. This cross-platform software enabled modelling, sculpting, UV mapping, texturing, animation and video editing. Its dynamic and customisable interface, together with the use of shortcuts, facilitated the workflow. In addition, the modifiers and sculpting mode offered advantages in the efficient creation of models without altering the original mesh. Substance Painter was mainly used for texturing, excelling in working with PBR materials and providing the possibility to paint directly on the 3D model. Its layer-based system, with tools such as brushes, masks and erasers, allowed a high level of detail to be achieved. The user could import models from Blender and apply complex materials non-destructively. Finally, Unreal Engine was incorporated as a real-time rendering and visualisation engine. Its 'Lumen' technology offered dynamic global illumination, improving visual quality through diffuse interreflections. This Blender > Substance Painter > Unreal Engine pipeline was considered optimal for its seamless integration and efficiency, taking advantage of the best of each tool for the development of high quality 3D environments.

Keywords: Blender; Texturing; Modelling; Rendering; Integration; Integration.

RESUMEN

La fundamentación del proyecto se basó en el uso de tres herramientas clave: Blender, Substance Painter y Unreal Engine. Blender fue seleccionado por su carácter gratuito, de código abierto y su amplia comunidad de desarrollo. Este software multiplataforma permitió realizar modelado, esculpido, mapeado UV, texturizado, animación y edición de video. Su interfaz dinámica y personalizable, junto con el uso de atajos, facilitó el flujo de trabajo. Además, los modificadores y el modo de esculpido ofrecieron ventajas en la creación eficiente de modelos sin alterar la malla original. Substance Painter se utilizó principalmente para el texturizado, destacándose por trabajar con materiales PBR y brindar la posibilidad de pintar directamente sobre el modelo 3D. Su sistema basado en capas, con herramientas como pinceles, máscaras y borradores, permitió lograr un alto nivel de detalle. El usuario pudo importar modelos desde Blender y aplicar materiales complejos de forma no destructiva. Finalmente, Unreal Engine se incorporó como motor de renderizado y visualización en tiempo real. Su tecnología "Lumen" ofreció iluminación global dinámica, mejorando la calidad visual mediante interreflexiones difusas. Asimismo, "Nanite" permitió manejar geometrías complejas sin pérdida de rendimiento, gracias a su sistema de mallas internas optimizadas. Este pipeline Blender > Substance Painter > Unreal Engine se consideró óptimo por su integración fluida y eficiencia, aprovechando lo mejor de cada herramienta para el desarrollo de entornos 3D de alta calidad.

Palabras clave: Blender; Texturizado; Modelado; Renderizado; Integración.

BACKGROUND

Blender

The choice of implementing Blender for this proposal is based on the multiple tools it offers to the user, which align with the intended result.

According to the introduction provided by the Blender.org website, Blender is a fully integrated, free, and open-source 3D creation suite developed communally. In this regard, the Blender Foundation comprises a large worldwide community of creators, where each participant contributes to the development of the application. This active support from the Blender community, along with the large number of tasks it enables, is complemented by several online tutorials.[1]

Blender is a multi-platform software that is easily executable on Windows, Linux, or macOS. Its memory requirements are low, as are its storage requirements. "Its interface uses OpenGL and provides a consistent experience on all supported computers and platforms".

This program enables the creation of still images, as well as 3D development and visualization, 3D animations, visual effects shots, and video editing. It features a range of essential tools, including modeling, sculpting, mapping, and texturing, which we will utilize for this final deliverable project.[2]

Blender's interface is highly responsive, and by creating and collapsing different windows or "editors" (Editor Type), you can create UIs in a dynamic and customized way. Alternatively, these are organized in various layouts, each specific to a particular step in the pipeline.

Thus, new work tabs can be expanded without the need to reopen the program, allowing for simultaneous modeling, texture control, UV mapping, and real-time rendering preview, all contained within the software.[3]

The use of shortcuts makes it easier to access editing mode tools through pop-up commands or shortcuts.

Regardless of the selection type (vertices, edges, or faces), all work in a clean, simple, and orderly workspace, with ample space for direct work and without icons that draw unnecessary attention.

As its website announces, Blender's wide variety of tools makes it ideal for the production of "almost any type of media production" (artistic and commercial) for individual creators or small studios, as they "benefit from its unified workflow and active development process". Like any 3D creation software, Blender has additional technical complexity and jargon associated with its use. Therefore, "UVs, materials, shaders, meshes, and subdivisions" constitute the digital artist's optimal utilization of the program.

Regarding the use of UV maps and their subsequent transfer to the software in which we will make the textures, Blender's UV engine and UV generator, as well as its unwrap tools, are key qualities that make our choice.

Another highlight of Blender is its set of operators, known as Modifiers. These are non-destructive procedural operations that can add or remove without modifying the original mesh of the object.

Using sculpt mode in Blender is the most convenient tool for our project. It saves time in the workflow by consolidating work in a single software.

The 3D View has three main modes that enable the creation, editing, and manipulation of mesh models, with each mode offering a range of tools also available in the other modes.

In modeling, these modes include object mode (for creating and managing objects, including shape keys and color/UV layers), edit mode (used for most mesh editing operations), and sculpt mode, which is used for working with individual mesh elements and applying brushes.

Substance Painter

The primary use of Substance Painter is texturing.[4] Since its appearance, it has become the ultimate reference in painting and texturing for 3D. Its tools allow you to start with a basic material as a base to create textures with a high level of complexity.

Substance Painter offers the option to paint both 2D maps (planes) and 3D objects from a free perspective. The program works with PBR materials and a lighting system that speeds up the workflow; any modifications made to the texture are reflected in real time. This provides excellent versatility for creating and editing textures that can be imported into any render engine without issues.[4]

Its workflow is done through layers, where the upper one has a higher hierarchy over the rest.

Among the main tools in Substance Painter are the brush, the eraser, and the masks, which add a lot of detail to the texture with relatively few settings. The latter masking tool for texturing is one of the program's main features.

For all these reasons, we consider Substance Painter to be the ideal finishing program, as it allows you to import models created with other programs, such as Blender, or materials made in programs like Substance Designer and apply them to the model.[4]

Unreal Engine

Unreal Engine is a graphics engine that enables you to create cinematics with camera settings that mimic

the real-world settings of a movie camera, rendered in real-time, and offering high-definition graphics with a user-friendly interface.[1] This real-time feature makes it one of the most competitive on the market.

Its creators (Epic Games) have developed the "Lumen" technology for its latest version in the search for more realistic scenarios. This lighting system generates "diffuse interreflections (light reflections produced by objects) with infinite bounces," which generates more indirect lighting through bouncing.[2]

«Not only in their visual aspect but also in the way physics behaves within them. So Lumen is a global and dynamic lighting system».[5]

On the other hand, another significant contribution made by Unreal Engine is the "Nanite" technology, which utilizes virtual geometry in the form of internal meshes and renders at the pixel scale.

CONCLUSIONS

Blender > Substance Painter > Unreal Engine constitutes an ideal pipeline for developing 3D environment projects. It is very dynamic and efficient, thanks to the features above, including Blender's Unreal Bridge addon for automated switching between programs and Nanite, which enables unprecedented functionality by supporting high-density meshes without impacting computer performance.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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