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RESEARCH ON SOFTWARE FOR VIRTUAL GUIDE

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Розглянуто та проаналізовано найпопулярніші прикладні програми для створення 3d-моделей, а також рушіїв для створення ефекту присутності.
Ключові слова: моделювання, рушій, рендер.

This article discusses and analyzes the most popular applications for creating 3d-models and engines to create the effect of presence.
Key words: modeling, engine, render.

Introduction

In 3D computer graphics, 3D modeling is the process of developing a mathematical representation of any three-dimensional surface of an object (either inanimate or living) via specialized software. The product is called a 3D model. It can be displayed as a two-dimensional image through a process called 3D rendering or used in a computer simulation of physical phenomena. The model can also be physically created using 3D printing devices [1].

Models may be created automatically or manually. The manual modeling process of preparing geometric data for 3D computer graphics is similar to plastic arts such as sculpting.

3D modeling software is a class of 3D computer graphics software used to produce 3D models. Individual programs of this class are called modeling applications or modelers [2].

3d Modeling

When choosing any 3d software, you need to find one that is easy to learn and use. And you should choose one that is going to perform the task you want to and at the level of quality you want to reach. Most professional 3D software is expensive, however there are always some free software that you can use and create the magic [3].

For our purposes we picked Blender, because it is an open source 3D software modeling application that's easy enough for novices to learn but features a flexible user interface that gives advanced users the customization capabilities they need. Built to be cross-platform, it works seamlessly on Linux, Windows, and Mac computers and serves as the perfect 3D printing and modeling software for both individuals and small studios who appreciate the true community basis of the brand.

With features like a 3D creation pipeline and the ability for users to make changes to the code base, Blender was developed for artists but is accessible to everyone. While customization is key for many advanced users who rely on Python scripting for custom tools and creations, fast modeling on this software is possible for any user to achieve with easy-to-remember keyboard shortcuts and N-Gon support.

Following is a list of Blender features.

Photorealistic Rendering

Blender now features a powerful new unbiased rendering engine called Cycles that offers stunning ultra-realistic rendering. The built-in Cycles rendering engine offers:

- GPU & CPU rendering;
- Real-time viewport preview;
- HDR lighting support;
- Permissive License for linking with external software.

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Fast Modeling

Blender's comprehensive array of modeling tools make creating, transforming and editing your models a breeze. Blender's modeling tools include:

- Keyboard shortcuts for a fast workflow;
- N-Gon support;
- Edge slide, collapse and dissolve;
- Grid and Bridge fill;
- Python scripting for custom tools and add-ons.

Realistic Materials

With Blender's new rendering engine the possibilities for materials are endless. Key features are:
- Complete Node Support for full customization;
- Physically accurate shaders like glass, translucency and SSS;
- Open Shading Language (OSL) support for coding unique shaders.

Sculpting

Experience the joy of sculpting organic subjects using the built-in sculpting feature set of Blender. Sculpting in Blender includes:

- 20 different brush types;
- Multi-res sculpting support;
- Dynamic Topology sculpting;
- Mirrored sculpting.

Fast UV Unwrapping

Easily unwrap your mesh right inside Blender, and use image textures or paint your own directly onto the model. Blender allows for:

- Fast Cube, Cylinder, Sphere and Camera projections;
- Conformal and Angle Based unwrapping (with edge seams and vertex pinning);
- Painting directly onto the mesh;
- Multiple UV layers;
- UV layout image exporting.

We decided to compare Blender with the most popular 3d-modeling software 3d Studio Max. This helps us to make the final choice. Common features are not present in this table.

1	2	3
	3Ds Max	Blender
Type of User		
Hobbyist	–	+
Professional	+	+
Studio	+	+
Pricing information		
Price	1,470 $	Free
License	Proprietary	Open Source
Animation Features		
3D Camera Tracker	–	+
Fluid Dynamics	–	+
LipSync	–	+
Masks	–	+
Multiply Camera Shots	–	+

1	2	3
Onion Skinning	–	+
Procedural Animation	+	–
Puppet Animation	+	–
Real-time Animation	–	+
Rotoscoping	–	+
Scripted Animation	–	+
Modeling Features		
Clipping	+	–
Color Palettes	+	–
Color Transform	–	+
Deform	–	+
Filter Effect	+	–
Layers	–	+
Metaballs	–	+
NURBS	–	+
Pencil Lines	–	+
Polygon	+	–
Procedural Environments	+	–
Tablet Compatible	–	+
Rendering Features		
3D Stereoscopy	–	+
Global Illumination	–	+
Materials and Textures		
Muscles	+	–
Toon Shading	–	+
Supported Platforms		
Windows	+	+
Mac	–	+
Linux	–	+

We made a little presentation of what we have done using Blender tools.

Fig. 1. Render of one of the audiences in Blender

Fig. 2. Real photo of that audience

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Engine

Among other engines we picked Unity 3D as the most convenient for our purposes. Unity is a cross-platform game engine developed by Unity Technologies and used to develop video games for PC, consoles, mobile devices and websites. First announced only for OS X, at Apple's Worldwide Developers Conference in 2005, it has since been extended to target more than fifteen platforms

Unity Pro is available for a fee and Unity Personal has no fee; it is available for any use to individuals or companies with less than US$100,000 of annual gross revenue. On March 3, 2015 with the release of Unity 5.0, Unity Technologies made the complete engine available for free including all features, less source code and premium support. Unity is noted for an ability to target games to multiple platforms.

Following is a list of Unity features.

General

Unity3D is relevant platform through which you can create their own applications and export them to different devices. The main capabilities that we can use in the project developed:

- Scripting with C#, JavaScript or Boo;
- Action-Packed Physics;
- Life-Like Animation;
- One-Click Deployment;
- Optimized Graphics;
- Unmatched Import Pipeline;
- 64-bit Editor;
- Fully Extendible Editor.

Animation

When developing basic animation scenes enumerate all possible basic possibilities in creating animations with Unity3D:

- Retargeting;
- Blend Trees;
- State Machines;
- Integrated Animation Editor;
- Inverse Kinematics;
- Sync Layers and Additional Curves.

Graphics

When developing basic graphic scenes enumerate all possible key features in creating graphics engine with Unity3D

- Physically-Based Shading;
- Shuriken Particle System;
- Enlighten-powered Real-time Global Illumination;
- Low-Level Rendering Access;
- Dynamic Fonts with Markup;
- Static Batching;
- Render-to-Texture Effects;
- Full-Screen Post-Processing Effects.

3d Physics

A physics3D engine is computer software that provides an approximate simulation of certain physical systems, such as rigid body dynamics, soft body dynamics, and fluid dynamics, of use in the domains of computer graphics, video games and film:

- Multithreaded Simulation;
- Cloth Component;
- Advanced Vehicle Physics;
- Super-Accurate Collision Detection;
- Bake-free Scaled MeshCollider Support.

Optimization

Optimization shows how to bake lighting results for better performance, and how the developers of Shadowgun levered high-contrast textures, with lighting baked-in, to make their scene look great:

- Occlusion Culling;
- Profiler;
- Level of Detail;
- Deferred Rendering;
- Stencil Buffer Access;
- GPU Skinning for DirectX 11 and OpenGL ES 3.0;
- Fully-Fledged Streaming with Asset Bundles;
- Dynamic Batching.

Summary

This article analyzed the most popular applications for creating 3d models. Shows in details features of Blender, software that we chose to make our next work. Also we picked Unity 3D as our engines to create the effect of presence. The first model was designed while doing this research. It represents the power of Blender and will be the start for our further research.

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