Ministry of Education and Science of Ukraine
Dnipro University of Technology
Institute of Economics
Faculty of Management
Department of Foreign Languages
Research and Education Centre "Geotechnical Systems Stability: Processes,
Phenomena, Risks"
Akademia Techniczno-Humanistyczna w Bielsku-Białej

WIDENING OUR HORIZONS

The 15th International Forum for Students and Young Researchers

May 20-21, 2020

Abstracts

Dnipro
Dnipro University of Technology
2020

УДК 001.371.322(06)
ББК 72:74.58я4
Р 65

Редакційна колегія:

Р 65   **Розширюючи** обрії: зб. тез п'ятнадцятого міжнар. форуму студ. і молодих учених, 20 – 21 травня 2020 р., м. Дніпро/ за ред. С. І. Кострицької; М-во освіти і науки України; Дніпровська політехніка. – Д.: ДП, 2020. – 506 с.

Подано матеріали міжнародного форуму студентів і молодих учених, який відбувся 20 – 21 травня 2020 р. в Національному технічному університеті «Дніпровська політехніка», м. Дніпро (Україна).
Розглянуто нагальні проблеми економіки, інженерії, інформаційних технологій, охорони навколишнього середовища, наук про землю, гуманітарних наук. Також приділено увагу сучасному законодавству, спрямованому на вирішення цих проблем. Матеріали згруповано у розділи, що відповідають секціям форуму і відображають сучасні тенденції та інноваційні розробки молодих учених, представників різних країн світу в різних галузях економіки.

Tatyana Lisnycha, Michail Pimakhov
S.V. Onyshchenko, research supervisor
I.A. Ivanchenko, language adviser
Dnipro University of Technology (Ukraine)

Autodesk Inventor 3D Max

Methodology: an analysis of main fields of application of 3D modeling, indication of main features of 3Ds Max.

The rapid development of technology in the last decade has led to equally rapid growth in computer hardware and software. Just recently, a minor episode of the film, created with the help of special effects, caused a storm of delight and discussion. Today, special effects in movies and on television do not surprise anyone. They have become commonplace thanks to the mass distribution of computer graphics programs and, in particular, three-dimensional modeling. 3D graphics programs are the most interesting in their capabilities and difficult to master applications.

3Ds Max is one of the leading positions among such programs. Due to its unique capabilities and availability in mastering this program, today it has the largest number of fans, both amateurs and professionals. Perhaps there are very few areas of human activity associated with three-dimensional graphics, which do not use 3Ds Max. It is actively used in gaming and films, architecture and construction, medicine and physics, as well as in many other fields.

Three-dimensional graphics have already entered our lives so firmly that when we come across it, we sometimes do not even notice it. When looking at a room interior on a huge billboard, the amber shine of pouring beer in a commercial, watching as a plane explodes in an action movie, many do not realize that they are not real shootings, but the work result of masters of three-dimensional graphics. The field of application of three-dimensional graphics is extremely wide: from advertising and film industry to interior design and production of computer games.

When you create an advertisement, three-dimensional graphics help present the product promoted in the most favorable light. For example, with its help you can create an illusion of a perfectly white shirt, crystal clear mineral water, deliciously broken chocolate bar, well-foamed detergent, etc. In real life, the advertised object may have some flaws that can be easily hidden by using three-dimensional "twins" in advertising. You've probably noticed that dishes shine much more dully after using detergent in advertising, and hair does not look as beautiful after shampooing as on the TV screen. The reason for this is simple: too clean dishes are just a computer-calculated image, such dishes do not really exist.

The usage of computer technology in design and, particularly, in interior design helps see the final result long before it is recreated in reality. Three-dimensional graphics allows creating three-dimensional models of various objects (chairs, sofas, etc.), repeating their geometric shape and imitating the material, from which they are created. To get a complete picture of a certain object, you need to inspect it from all sides, from different points, in different light conditions. Three-dimensional graphics allows creating a demo movie, which captures a virtual walk on the floors of a future

cottage, which is just beginning to be built. As for the film industry, computer graphics are indispensable today there. It is hard to believe that a waterfall scene was created with ordinary salt for one of the first "Star Wars" films. Today you don't have to order kilograms of salt to create such scenes. You can easily simulate any waterfall with a 3D graphics editor and the viewer cannot distinguish it from a real one [1].

Autodesk 3Ds Max is a truly powerful visualization software that is compatible with many light modeling modules, the materials used and various effects. The application provides flexible control over settings, including exposure, depth of field, and more.

The window Material Editor in 3Ds Max is realized by a nodal principle, i.e. each function is taken out in a separate dialogue window. It is easy and convenient to operate materials due to this.

Let's start our 3Ds Max overview with a short program description. 3Ds Max is one of the first 3D graphics editors and has a history since 1990. During its existence, the package has managed to change several names. Since 2005, the program is released under the already familiar name Autodesk 3Ds Max. The application is rightly considered one of the most extensive 3D modeling packages, which contains many plugins and add-ons for a wide variety of tasks.

Traditionally, this program has been considered a professional tool for architects and interior designers. The reason for this is convenience in 3D modeling of solid-state objects, great freedom in creating models and quality modules for photorealistic visualization. Nevertheless, the latest versions of Autodesk 3Ds Max allow running a plenty of functions and creating something bigger than architectural models.

Thus, the particle system and animation tools are well implemented in the program. Due to a well-thought-out mechanism for calculating physics, modeling the behavior of hard and soft bodies is not very difficult. Users manage 3D models according to the actual laws of physics, thus achieving incredible realism. And it is impossible not to mention the Hairand Fur module, with which the creation and "styling" of hair and wool is done in two clicks.

Program features

First of all, it is necessary to enumerate the main and most impressive opportunities and features that many people want to explore the package for. Specifically:

3D modeling

The main function of the program is creation and editing of 3D graphics. Other options are designed to complement the created objects and bring them to a realistic appearance. The program is equipped with a huge number of various modifiers, tools for working with models. 3Ds Max offers these types of 3D object design:

- Polygonal modeling. The most widespread type of 3D modeling, found in many 3D graphics packages. It can be used to develop models of various complexity.
- Simulation based on primitives. 3Ds Max contains a built-in library of standard objects, the so-called primitives. In many cases creation of models begins with them, after all various modifiers are applicable to such primitive things.

- It's based on splines. Being also one of the basic methods of modelling, it is concluded in the construction of the product frame of three-dimensional curves (splines). It is used to generate the 3D object itself.
- Based on NURBS curves. NURBS, or heterogeneous rational B-spline, is a special technology for developing 3D models. Ideal for modeling organics and objects with a smooth surface.
- Based on Bezier surfaces. A special way of 3D modeling based on Bezier curves. It is often applied to separate parts of 3D models, for which a network of control points is created. With their help, the surface can be stretched in any direction.
- Texture and UV mapping. Overlaying textures in the latest versions of 3Ds Max is greatly simplified and provides high flexibility.
- Simulation of solid-state objects. Autodesk 3Ds Max is an extremely convenient program for this purpose. The package is equipped with all necessary tools for 3D modeling of Hard Surfaces;
- Booleans. Designed for simple and fast addition/subtraction of one object from another. Very popular option in 3D modeling environment.
- Particle system. Thanks to this system, implemented in a very high quality, it is possible to develop abstract components - smoke, rain drops, fountain splashes, etc.

Of course, these are not all application features, but they may vary depending on the version of the program.

Of course, the overview of 3Ds Max is not complete unless the scope of the program is discussed. A list of areas where the application is most useful is below:
- 3D modeling and visualization of architectural objects;
- Visualization and interior design;
- 3D modeling for computer games;
- Multiprofile design;
- Advertising animation;
- Artistic animation and creation of special effects;
- WEB-design and computer graphics [2].

A versatile program such as 3Ds Max can be used for a variety of purposes and is not limited to the areas listed. However, these are the most common areas, in which an application is not only used most, but also best suited.

From the above it can be concluded that polygonal modeling is necessary only for creative people (artists, designers, sculptors). However, it's not definite. For example, another major field of application of 3D models is **medicine,** namely, surgery. You can grow a prosthesis to replace a shattered bone. Like the lower jaw for a turtle.

At the moment, there are many interesting technologies in medicine, the application of which opens up additional opportunities and helps improve the results of treatment. But the most popular and interesting is the modeling technology, which is the basis for diagnosis in practical medicine, as well as for scientific experimental research. The application of this technology greatly simplifies making the right diagnosis and, importantly, does not require high financial costs.

Graphics allows visual recreation and study human organs without any harm to health. In this way, it is possible not only to examine the simulated organs, but also to perform various manipulations, which leads to early detection of the disease and its timely treatment.

It is possible to note 3D animation separately in medicine. It is actively used in demonstration of unique operations, modeling of processes of treatment of illnesses, creation of virtual video aids. Surgical simulators play an important role here, allowing students of medical specialties mastering and practicing surgery techniques and undergo testing, while practicing surgeons improve their skills and become familiar with new technologies. It is possible to clearly describe the processes taking place inside a person. Thanks to the above properties, 3D animation is often used in student learning. Visualization is used for technical installations, demonstration of devices and all kinds of physiological processes. In this way, students are able to see many processes in dynamics that were previously impossible to access.

Developments in the field of object imaging allow not just a more accurate disease diagnosis, but also improve and simplify the quality of patient care. And due to the fact that many models are publicly available and anyone can see how the body works, there is also an increase in medical literacy.

3D modeling has firmly entered our life, partially or completely reconstructing some kinds of business. There are both own certain standards, and tacit rules in each branch in which 3D modeling has brought the changes. But even within one industry, there are so many software packages that it can be very difficult for a beginner to understand and navigate where to start.

Autodesk, Inc. is a world leader in 3D design, engineering and virtual reality solutions. All Fortune 100 companies use Autodesk tools to design, model and visualize their ideas to save time and money, improve product quality and accelerate innovation. Since the release of AutoCAD in 1982, the company has developed a wide range of innovative programs that allow engineers, architects and designers to test their ideas before they are implemented [3].

In conclusion, we want to say, that 3D has long been a part of our lives and our jobs. It is not necessary to have a powerful device to create or animate something in 3D, so, everybody who wants to start practicing their 3D skills, can do so in an easy way, even if they haven't got a lot of money, there are lots of free software solutions, which can replace paid programs! It helps us sharing ideas in a way that is easier to understand, and, we suppose, this technology will only bloom in the future.

References:

1. https://www.bestreferat.ru/referat-188039.html
2. https://habr.com/ru/post/451266/
3. https://www.autodesk.com/autodesk-university/class/Visualization-Autodesk-Design-Suites-Inventor-3Ds-Max-2013