

through and seeing beyond existing ideas to discover higher order ideas from within one's own mind.

People give meaning to and make sound assumptions through what they experience and learn. When a person infers, they examine their prior experience and knowledge and combine them with suggested facts to arrive at a new belief or course of action. Thinking outside the box is characterized by being receptive to other views and having the willingness to change views with new facts and evidence. It increases intellectual capabilities by allowing for new experiences and perspectives. A narrow focus, conversely, hinders problem-solving and new experiences.

Synthesis combines pieces of information and ideas and recasts them to form something original. In synthesis, a person examines how information is connected. As they understand each piece of information separately, they enhance their understanding of them as a whole and can thus form new insight.

Thus, to be competitive IT specialists should constantly sharpen their critical thinking skills in order to understand how they articulate and communicate their ideas to others, as well as how they process information being communicated to them. Two common reasoning problems include fallacies and biases. Since both practices are commonly used in debates and the exchange of ideas, it is important to recognize how these logic flaws are used to manipulate the message and undercut any discussion. They rely on critical thinking skills to tell themselves and others whether to depend on some information or not. Blending comprehension with critical thinking leads to the highest possible levels of understanding.

To conclude, IT specialists should try to acquire a specific skill set based on what is in demand but also with consideration of their personality, likes and dislikes, and relevancy to their field of work or profession. Their employability is also affected by the degree of employability of others, as how employable they are is relative to other job applicants. A high supply of candidates with similar qualifications does not improve their employability when competing for a specific type of job or position.

UDC 372.881.1

3D ANIMATION: TOOLS AND RESOURCES

***Kostyrava S.S., PhD, associate professor, Gulyaeva M.S., student,
Kremizovich A.P., student***

*Vitebsk State Technological University,
Vitebsk, Republic of Belarus*

Abstract. *The article highlights the description of 3D animation phenomenon. The process of creating 3D animation is described. The main stages of animation creating are considered.*

Keywords: three-dimensional computer animation, CGI graphics, voiceover, script, storyboarding.

Computer animation is a type of three-dimensional animation created using three-dimensional computer graphics ("CGI graphics"). Although computers have been widely used in animation since the 1980s, the term "computer animation" currently refers specifically to three-dimensional CGI animation, while other terms are used for two-dimensional hand-drawn animation using a computer, for example, 'Flash animation' and 'GIF animation'.

Disney cartoons and popular video games have already made 3D animation a familiar part of the entertainment industry. With the development of computer technology, 3D graphics have become more dynamic, clear and cool. The entertainment industry is not the only area in which 3D animation is in demand. It has found wide application in education, healthcare, architecture and, of course, advertising. 3D animation has become the most popular among all types of animation, especially among the younger generation.

Viewers undoubtedly like 3D animations: they are bright, attractive, and convey emotions well. Therefore, many brands prefer to tell stories, create a trusting image and attract new customers with the help of 3D animation videos. Exploring the world of 3D animation production researchers have to deal with a number of issues under investigation: how to create it, which programmes for 3D animation to use, and how to create animation online, even if you do not have professional skills, and also share useful tips and tricks.

First of all, we should give the definition of 3D animation. 3D animation is a graphic technique that utilizes motion in order to bring characters, objects, props, and more to life. Though 3D animation has primarily been used in the creation of video games, films, and TV shows, its usages have grown alongside its popularity. Now, 3D animation is used to create materials for companies that can help them market their products and services.

3D animation is often seen as the art of using motion to bring characters, vehicles, props, and more to life within TV shows, films, and games. The basic idea which unveils the nature of 3D animation is the following: 3D animation is the result of placing and manipulating characters and objects in three-dimensional space and creating the illusion of movement. Objects are created based on 3D models assimilated in a digital environment using 3D modeling tools. Another way is that real objects are scanned and transferred to a computer as the basis for animated 3D objects.

What 3D animators strive for is the most realistic movement of objects and characters. You can create the perfect cartoon character, but if his movements are unnatural, not smooth or like a robot, all the work will go down the drain. Therefore, animators spend a lot of time studying the basic principles of movement in order to make a believable animation.

The process of creating 3D animation has been improved lately. The greatest potential of artificial intelligence is employed. Modern 3D animation is closely related to rapid advances in technology.

The practical part is based on the theoretically justified grounds and ideas. To have a clear idea how it works in reality one should imagine how to create 3D animations. 3D animation pre-production is somewhat similar to 2D animation. The process begins with writing a script and storyboarding, followed by sketches of 3D characters, background settings and preparation for the animation process itself. The whole process of creating animation is complex and multifaceted, so we will give only the main stages.

1. Modeling.

Before the picture with objects and characters begins to move, it is necessary to create these very 3D objects. As it is mentioned above, objects are created on the basis of 3D computer models. A simple computer model is a 3D object made of a grid consisting of vertices, lines and curves that give the object shape. For a computer, such models are integral geometric shapes. An object becomes 'alive' after textures and colour are applied to it. But before the character starts moving, it is necessary to create his controlled skeleton, such as in humans and animals. The process of creating a skeleton is called rigging. After the skeleton is created, a 3D model (also called skin) is attached to the skeleton to prepare the character for animation.

2. Staging and animation.

When the 3D characters are ready, they are placed in the appropriate scenes and set in motion using computer programs for 3D animation. The animation is not adjusted at the initial stage – the movements and transitions are originally sharp and unnatural. The initial version of the animation looks like this, because first animators create the initial and final poses of any movement. These poses are called keyframes. Lighting, camerawork (choosing the angle and depth of the frame), effects and other details are added much later, when the final version of the animation is drawn up, which viewers see on the screens.

3. Rendering.

The final stage of animation creation is rendering. The process involves finalizing the animation and getting an image. This stage requires close attention to details, and the final result depends on it. This stage ends the main animation creation process, followed by post-production, when animators add special effects, music, voiceover and sound effects and synchronize them with the entire animation.

Creating 3D animation is undoubtedly a time-consuming process, but despite this, it can be significantly simplified. Of course, the work process will accelerate and its quality will improve over time, when creators gain experience. But nevertheless, life hacks have already turned up.

Technologies are progressing: new updates, new programmes are constantly coming out, functions are being updated, and sometimes it is difficult to keep up. But if a person is determined to stay up to date with the trends in 3D animation field, they need to keep pace with technology. Computer programmes for creating 3D animations have become more advanced, and the right tools can help save time to devote it to other projects. One should choose a program for 3D animation that matches their skill level. Use complex programs can be really a burden if you are not really into it. It is a must for every developer or creator to study the program, icons, buttons and functions and adapt the tools to suit oneself.

When creating an animation, a person can get confused in the process and start clinging to

details, missing the whole picture. If they correctly allocate top priorities – first working out the basic points, then the details, it will save the creators both time and nerves. First of all, focus on the key poses; they are the ones that lay the foundation for all the work. One can always go back and adjust the details, and the key frames should be worked out from the very beginning. This will not only help optimize the time spent, but also focus on the main storyline and character movements and not be distracted by details.

The original text is handled by translators. Their goal is to translate and adapt the text into Russian, for example. After the translators, the text falls into the hands of the stacker. His task is to make the Russian text sound synchronously with the original one: vowels and consonants should coincide in both soundtracks. A particular problem is the length of sentences. In English, in which most rental films are released, phrases sound shorter. The goal of the stacker is to make sure that the difference is not noticeable. And only after that the text finally gets into the hands of the dubbing actors. Only a few days are given to re-sound the film. In most cases, actors successfully record the text from one take – a lot of experience affects. The original text is cleaned not only from the mat, but also from everything that can hurt someone or be misunderstood.

Not everybody can voice a character. They can be brilliant actors with a great diction by nature. But still, the excellent quality of voice acting is the result of professional education and vast experience. For example, Nikolai Bystrov graduated from Shchepkin VTU, and Igor Taradaykin (the voice of Agent Mulder in *The X-Files*, voice acting ORT) graduated from VGIK.

All dubbing actors graduated from specialized universities, where they necessarily teach stage speech. After all, perfect diction is required for voice acting. Ideally, when an actor is also able to manipulate the voice or change it. Then he will be able to voice several roles at once. For example, Marge, Bart and Lisa Simpsons in the popular animated series were voiced by the same actress – Irina Savina. And Igor Taradaykin's voice is spoken by all the male characters in season 1 of *The Big Bang Theory* in the voice acting of NTV.

The 'understudy' should convey the character of the character. He plays no less than the actor himself, although he remains behind the scenes. Biff Tannen, one of the heroes of the *Back to the Future* trilogy, constantly uses the expression make like a tree and get out of here. At first glance, it seems completely meaningless: make it like a tree, get out of here. It's not English that's so weird, it's Biff who got it all mixed up. The original expression, which is based on a play on words, sounds like 'make like a tree and leave', leave translates both as 'to leave' and as 'a leaf on a tree'. In English-speaking culture, the film has long become a cult, so if you use the wrong version of Biff, you will earn yourself a reputation as a person with good artistic taste.

The character of Winnie the Pooh often resorts to wordplay, both in books and in the recent film adaptation of *Christopher Robin*. In the film, he especially likes to play his name Pooh, in which some critics saw 'toilet' humor. It's not fair: It's not Winnie-the-Pooh's fault that his name is so consonant with poo. If your name is not Pooh, such puns are unlikely to be useful to you in life. But you can borrow a couple of witty reactions from Vinnie to hackneyed motivational phrases that, instead of a desire to improve themselves, cause an acute attack of irritation.

Thus, at the beginning of the XXI century by means of computer transformations, the expressive possibilities of screen art were changed and multiplied, which significantly affects the process of creating an animated image. With the advent of modern digital technologies, the role and place of animation in cultural and social life has grown significantly, from a purely cinematic industry, animation has turned into a commonly used element in many areas. Computer animation is constantly used in television, film and video production, the Internet and computer games. This led to the emergence of a new interpretation of the very concept of 'animation'.

It is generally known that the word 'animation' comes from the Latin language: 'anima' – soul, 'animation' – animation or animation. Also, this view in the post-Soviet space is often called animation (from Latin 'multiplication' – multiplication). The first name ('animation') is based on the essence of the concept 'revitalization' of an inanimate object (drawing, doll, shadows, etc.), the second name means the way this is achieved, namely 'multiplication' of images that differ from each other another phase of movement.

However, today computer animation covers not only that part of new technologies that is associated with animation as a type of film (animation), but also in a broader context – with the art of animating a static image in other types of cinema. Computer (sprite) animation is implemented using a programming language.

Rapidly developing, computer animation has become widely used in various fields of activity – from promotional products to business projects and presentations. It has a common root with computer graphics; therefore, it uses similar methods and technologies for creating a digital image:

vector graphics, raster graphics, fractal graphics, three-dimensional graphics (3D). Computer animation brings static virtual models to life by giving them movement and action.

Practice makes perfect. When you are first learning, it takes some time to get your animations as smooth and precise as you would like. Repetition will eventually make the tedious aspects quick and natural, which will then let you focus on the more in-depth nuances and personality of your animations. Research is the key and constant advanced training in exploring the field of Artificial Intelligence and all relevant issues as well.

UDC 372.881.1

THE CITY OF THE FUTURE: AI (ARTIFICIAL INTELLIGENCE) POTENTIAL

Kostyrava S.S., PhD, associate professor, Shakhmetov T.D., student

*Vitebsk State Technological University,
Vitebsk, Republic of Belarus*

Abstract. *The article considers possible concepts for the development of the city of the future and ideas for solving the problems of the modern city. The development of the proposed concepts is important both for improving the quality of life of the urban population and for promoting new scientific technologies around the world.*

Keywords: information technologies, smart city, global transport problem, variety of houses, water recirculation system, single-seat aircraft, surveillance cameras, eco-friendly environment, sensors, artificial intelligence.

Information technologies are used in a variety of fields, including the urban economy. The development of such services has led to the formation of the concept of a 'smart city', in which processes critical for a locality are implemented on the basis of modern IT infrastructure. As a rule, this assumes the presence of extensive backbone networks to which various objects of the city are connected. In addition, a data center and a single control center for urban systems are needed – this is the brain of a 'smart city', where information flows from various sensors – nerve cells of a digital metropolis.

Currently, many concepts of a 'smart city' have been invented in connection with the need to solve the problems of a modern city. To solve the global transport problem, the idea of using only underground parking to preserve urban space for more important objects is proposed – modern automated underground parking. It is also often suggested the idea of building a variety of houses that do not have the same details, and which are painted in eye-pleasing colours – different looking houses.

Another concept is the use of a water recirculation system in residential buildings, which is allowed for economical use of water. In winter, such a system will provide the apartment with heat, and in summer, such a system will allow using water for condensation – regulating the temperature in the apartment – water recirculation system.

In addition to the water recycling system, it is proposed to place waste shredders in the apartments, with the help of which the waste will be sorted and, in the future, will be burned to generate energy.

Currently, single-seat aircraft on autonomous control are already being tested, which would solve the global transport problem and would help solve the problems of a modern city.

To reduce the number of crimes in the city of the future, the concept of the ubiquitous placement of autonomous surveillance cameras that will track suspicious actions of citizens, identify them and notify the police of violations of the law on their part is being considered – autonomous surveillance cameras.

In the city of the future, the problem of carbon emissions will be solved by building houses from eco-friendly materials, and their costs will be automatically calculated by a special system.

As technology develops, people need officials less and less to form an objective picture of what is happening in the city. In the future, compact, multifunctional and cheap electronic sensors will appear that assess the quality of water, air, measure the temperature of the environment, the degree of ultraviolet radiation and other conditions. Citizens themselves will be able to compile reports on the indicators of the urban environment that concern them, without waiting for local authorities to do so, and send them using applications in mobile phones to centralized information