



AREAS WHERE COMPUTER GRAPHICS CAN BE USED

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Abstract: The article reveals the concept and essence of computer graphics, discusses the main types of computer graphics, provides statistical data and describes the main ways of using graphic information in various areas of public life. Computer graphics is a branch of informatics that studies methods and tools for representing and visualizing data in graphical form using software and hardware.

Keywords: Computer graphics, fractal graphics, images, graphics, 3D graphics, data, polygraphy, pixel, fractal and 3D computer graphics.

Introduction

In the conditions of the modern world, a person is increasingly faced with large amounts of information that are quite difficult to interact with if they are not presented in a convenient form, so today it is difficult to imagine life without tables, diagrams, graphs, diagrams, pictures and videos, since these are the means information views help us visualize any kind of data. Graphic information in a computerized environment is the final product of computer graphics - an image.

Computer graphics is a branch of informatics that studies methods and tools for representing and visualizing data in graphical form using software and hardware. It is the fastest growing segment in information technology. The wide range of possibilities that computer graphics can implement, from video surveillance systems to online multiplayer games and video viewing on video hosting sites, is constantly expanding, allowing us to comprehensively develop our environment.

Depending on the methods and techniques for creating graphic information, raster, vector, fractal and three-dimensional (3D) computer graphics are distinguished.

Results.

The meaning of raster computer graphics is to represent an image as a collection of pixels of different colors. The pixel size of an image can be expressed as the number of pixels in width and height (800x600px, 1024x768px, 1600x1200px, etc.) or as the total number of pixels (for example, a 1920x1080 pixel image contains about 2 million and 74 thousand dots, which is equal to 2 megapixels). Pixel is the simplest element of raster graphics. Each pixel has its own fixed size, and each pixel has its own color attribute. Each color of a pixel is written as a certain combination of bits. The number of colors directly depends on the number of bits that are used for this, and this quality of a bitmap image is called color depth. An important indicator in raster graphics is the resolution of the image. This indicator expresses the number of pixels per inch: the more these pixels, the higher the resolution of the image and the sharper it is. This indicator is expressed in units of measurement "dpi" (dots per inch - dots per inch). The bitmap representation of an image is used in devices such as monitors, printers, scanners, mobile phones, and digital cameras.



Vector graphics is a type of computer graphics in which an image is represented as a collection of individual objects described by mathematical equations. Thus, if in raster graphics the image is constructed through the aggregate representation of pixels, then in vector graphics the basic element of image construction is a line (contour). In vector graphics, the path has its own properties: shape, color, outline (solid or dashed), thickness and shape of the ends (arrowed or rounded). Each contour has two or more reference points, which are called nodes, and the image is built on them. The circuit can be open and closed. Open path - if its start anchor point is not the same as the end anchor point. Closed path - if its last anchor point is both the first and the closing one.

This type of computer graphics is used in electronic printing, automatic design systems and to create any images that will need to be scaled in the future. This happens taking into account the fact that in vector graphics, unlike raster graphics, when the image is scaled up, the image quality does not deteriorate and there is no effect called "pixelization" (when raster elements become visible).

Fractal graphics is another type of image representation, through the inheritance of each new element of certain graphical properties of previous elements. In simple terms, this is an image built from repeated identical parts. Small elements of a fractal object repeat the properties of the entire object. The resulting object is called a "fractal figure". The process of inheritance can be continued indefinitely. By changing the coefficients of the equation, one can obtain images that are completely different from each other, and by changing and combining the color of fractal figures, one can simulate images of living and inanimate nature.

The main property of this type of computer graphics is that the image, when scaled, almost does not change either in geometric structure or in resolution level. Such an image always remains equally complex, and each of its elements is equally similar to all other elements. Fractal graphics are especially popular in the modern world, because this is one of the most unusual and easy ways to create complex images, because the graphics editor only needs to set the desired mathematical formula and specify the number of repetitions.

Fractal graphics allows you to create abstract compositions, where you can implement such compositional techniques as horizontals and verticals, diagonal directions, symmetry and asymmetry, etc. Fractal graphics are indispensable for creating images of clouds, mountains, water and other surfaces that are very reminiscent of natural non-Euclidean surfaces. Often fractal graphics are used to create advertising signs, websites and applications, because fractal images on a subconscious level attract the attention of a person. Fractal graphics methods often simulate turbulent flows and create various patterns. Fractal graphics is by far one of the fastest growing promising types of computer graphics.

Three-dimensional 3D graphics is one of the most complex types of computer graphics, but at the same time one of the most useful in the life of a modern person. 3D modeling allows you to create a three-dimensional three-dimensional model, taking into account many conditions that you can change yourself. Conditions mean such things as lighting, the point of view of an object, its dimensions relative to other objects, etc. This type of imaging has a huge number of advantages over all other types of computer graphics that I have described above. Three-dimensional graphics are used in almost all areas of human life. Examples are almost everything that surrounds us, because the vast majority of household items, before going into production, are created in graphic editors of three-dimensional models [3]. Take, for example, any mobile phone. During the creation process, engineers first calculated the approximate shape and layout of all the parts inside the case, after which they create a 3D model that reflects the exact minimum dimensions of the device. After that, designers, taking into account these values, design how the device should look like and impose new objects and skins (image layers) on top of the primary 3D model of the smartphone, etc. That is, this technology allows you to design a particular device immediately in its three-dimensional form and taking into account many nuances, which naturally speeds up and facilitates the process of designing household objects.



Today, computer graphics is one of the fastest growing areas of information technology: graphic information is used in almost all spheres of human life.

Entertainment content occupies a large share of all graphic information presented on the Internet. With the help of websites, online games, applications for smartphones and social networks, network users organize their free time. In particular, it is worth paying attention to the strong integration of graphic information in the field of entertainment and leisure. This is confirmed by YouTube.com statistics from November 2019. This resource was created to view videos on various topics, which is used by 1.9 billion people in the world - this is the second most popular service after Facebook. In other words, 79% of Internet users have their own YouTube account, which is available in 80 different languages. Every minute, 500 hours of video are uploaded to YouTube around the world, which translates into 30,000 hours of video uploaded every hour. It would take a person about 82 years to watch these videos. 62% of businesses use YouTube as a channel for publishing video content, with 90% of users discovering new brands and products on YouTube. Therefore, the above statistics prove to us that the Internet and the graphic information that society receives with its help plays a significant role in the life of modern society.

Discussion.

In addition to the sphere of leisure and entertainment, computer graphics are indispensable in the field of healthcare, as the conditions of the modern world force us to look for more advanced means of combating various diseases. In this regard, the vast majority of countries in the world have been trying hard for the past 30 years to introduce modern information technologies in the field of medicine. And in this modernization process, one of the most significant places is the introduction of computer graphics. It is actively used in creating models of internal organs, processing and displaying images from an ultrasound scanner and computed tomography on a computer screen. All these data are recorded in the computer memory and subsequently a three-dimensional image is compiled on their basis. With the help of these technologies, about 80% of all diseases are detected even in the early stages, which greatly simplifies the process of treating patients.

Particular attention is paid to graphic information among scientists and in the field of education. In these industries, a person simply needs graphic support in almost all matters, from school PowerPoint presentations to complex graphical models of various chemical reactions. In these areas, computer graphics allows you to make premature assumptions about the origin of any processes, the flow of which would take more than one millennium. Examples are computer graphic programs that simulate the origin of life on earth, various natural disasters and the collision of elementary particles (the program for analyzing the results of the Large Hadron Collider).

However, the development and use of graphic information has not reached the limit, and today there are many plans to introduce computer graphics into everyday life. For example, in many countries it is planned to search for information about criminals from photographs and video recordings on the Internet using neural networks. At the moment, this technology has not been fully studied and has a certain percentage of error, but according to scientists, this technology will be fully mastered in the near future.

Conclusion.

Vehicles are of great importance for people, but due to many circumstances, it would be more convenient for mankind to move away from self-driving cars. Knowing this, Google launched testing of its unmanned vehicles back in 2009, the ITC.ua information portal presented the following statistics: "Since 2009, Google unmanned vehicles have driven about 2.72 million km, of which about 1.7 million km in autopilot mode. During this time, cars were involved in 11 minor accidents, which is very different from the number of human-caused accidents. The traffic management algorithm used in the Google program is much more practical, as it takes into account many factors that are recorded using cameras using computer graphics technologies (for example, the level of illumination on the road, the distance to road markings and other objects, the behavior of other cars)



, and then it calculates in a fraction of a second and allows you to respond to any changes in the environment almost instantly.

Thus, graphical information is a very convenient tool for presenting data. With the introduction of computers into everyday life, leisure and entertainment, healthcare, business, education, art, etc. began to develop. The process of developing the presentation of graphic information and means of processing it has a high speed. For 20–25 years, computer graphics technologies have reached unprecedented heights, and what used to be science fiction is now used everywhere, for example, virtual reality [7]. In the late 1960s, the American computer artist Myron Krueger formulated the term "artificial reality", which defines a technically created object world, transmitted to a person through his sensations. In 1964, the Polish philosopher and writer Stanislaw Lem in his book "The Sum of Technology" for the first time theoretically described the possibility of creating the surrounding reality, almost no different from ours, but subject to other laws. Exactly 20 years later, the first system was created that allows manipulating objects on the screen with the help of hand movements, and in 1989 the term "virtual reality" itself was introduced. Today, from simple manipulators and theoretical assumptions, this technology has grown into a full-fledged hardware and software system that allows a person to find himself in the virtual world through controllers and a special helmet and control the objects located there. Therefore, the speed of development of graphic technologies is high, and every year the methods of presenting graphic information become more accessible to the average user.

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