AREAS OF APPLICATION OF COMPUTER GRAPHICS.

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Annotation:
This article provides information on the concept of computer graphics and its types, areas of application and history of computer graphics.

Keywords:
computer, graphics, computer, multimedia, technology, printer, algorithm, 3D, fractal, raster, vector, program, object.

The concept of computer graphics includes all aspects of working with statistical images.

Computer graphics is the process of inserting, outputting, displaying, modifying, and editing graphical objects in computer control. Computer graphics is a special branch of computer science that studies the methods and tools for creating and processing images using computer hardware.

The history of computer graphics dates back to the 20th century and continues to this day. It is no secret that graphics have contributed to the rapid growth of computer performance.

1940-1970 - the era of big computers (personal computers of the previous period). When working on the printer, we only worked with graphics.

1971-1985 - Personal computers appear, meaning that the user has access to the displays. The role of graphics has increased dramatically, but the computer is running very slowly.

1986-1990 - The advent of multimedia technology. Sound and video processing are added to graphics, and communication between the user and the computer is expanded.

1991-2008 - A look at the virtual reality graphics of our time. Change sensors have appeared, which allow the computer to change the images using the signals sent to it. The architecture of the program has completely changed. If Virt, the father of programming, used to say that any program is an algorithm + data structure, with the advent of computer graphics on a personal computer, the program is an algorithm + data structure + user interface (graph).

The transition to the graphical interface was associated with the fact that a person receives 80% of the data through the image, and only 20% through the mind, emotions, etc. Computer graphics is usually divided into raster, vector and fractal, depending on the method of image formation. Three-dimensional (3D) graphics is a separate topic that studies the techniques and methods of building three-dimensional models of objects in virtual space. As a rule, it combines vector and raster imaging methods. The features of the color gamut describe concepts such as black-and-white and color graphics. The names of some departments indicate specialization in certain fields: Engineering Graphics, Fractal Graphics.

Fractal graphs are based on mathematical calculations. The main element of fractal graphics is the mathematical formula itself, i.e. no object is stored in computer memory and the image is constructed only according to the equations. Thus, both the simplest regular structures and complex paintings that mimic natural landscapes and three-dimensional objects are constructed.

3D graphics

Three-dimensional graphics have found wide application in areas such as scientific calculations, engineering design, and computer modeling of physical objects (Figure 3). As an example, let's look at the most complex version of three-dimensional modeling - creating a moving image of a real physical body.

To simplify the spatial modeling of an object in a simplified form, the following is required:

designing and creating a virtual skeleton ("skeleton") that best matches the actual shape of the object;

design and creation of virtual materials similar to real in the physical properties of visualization;

assignment of materials to different parts of the object surface (in professional jargon "design of textures on the object");

adjust the physical parameters of the object working space - set the properties of light, gravity, atmosphere, the properties of interacting objects and surfaces;
define the trajectories of the motion of objects;
apply surface effects to the final animation.
Geometric primitives (rectangles, cubes, spheres, cones, etc.) and smooth, so-called spline surfaces are used to create a realistic model of an object. In the second case, the most commonly used method is bicubic rational B-splines in a non-uniform grid (NURBS). In this case, the surface type is determined by a grid of control points located in space. Each point is given a coefficient, the value of which determines the degree of impact on the part of the surface passing near the point. The shape and "smoothness" of the surface generally depends on the relative position of the dots and the size of the coefficients. Scientific graphics, web graphics, computer printing, etc. Although computer graphics is only a tool, its structure and methods are based on the advanced achievements of fundamental and applied sciences: mathematics, physics, chemistry, biology, statistics, programming and many other sciences. This note applies to software and hardware tools for creating and processing images on a computer. Therefore, computer graphics is one of the fastest growing branches of informatics and in many cases serves as a “locomotive” that attracts the entire computer industry.
Raster graphics
For raster images consisting of points, the concept of accuracy, which represents the number of points per unit length, is of particular importance. In this case, the following should be distinguished: Original resolution; Screen resolution; Dimensions of the printed image.
Original permission. The original resolution is measured in dots per inch (dpi) and depends on the image quality and file size requirements, the method of digitizing and creating the original image, the selected file format, and other parameters. In general, the rule applies: the higher the quality requirement, the higher the dimensions of the original.
Screen resolution. For screen copies of an image, the elemental raster point is commonly referred to as a pixel. The pixel size varies depending on the selected screen resolution (from the default value range), the original resolution, and the display scale.
Monitors for image processing with a diagonal of 20-21 inches (professional level), as a rule, provide standard screen resolutions 640x480, 800x600, 1024x768, 1280x1024, 1600x1200, 1600x11920, pix 1600x1190, pixels. On a high-quality monitor, the distance between adjacent points of phosphor is 0.22-0.25 mm.
A resolution of 72 dpi is sufficient for a screen copy, 150-200 dpi for printing on a color or laser printer, and 200-300 dpi for output on a photo exposure device. The basic rule was that the size of the original should be 1.5 times the screen resolution of the output device when printing. If the paper copy is enlarged relative to the original, these values should be multiplied by the multiplication factor. The point size on both the paper copy of the bitmap image (paper, film, etc.) and on the screen depends on the method used and the original rasterization parameters. In rasterization, the original is placed in a grid of rows, the cells of which form a raster element. The frequency of a raster grid is measured by the number of lines (Ipi) per inch and is called the line.
Vector graphics
If the main element of the image in raster graphics is a point, in vector graphics it is a line. The line is mathematically described as a single object, and therefore the amount of data required to represent an object by means of vector graphics is significantly less than that of raster graphics. A line is an elementary object of vector graphics. Like any object, a line has properties: shape (straight, curved), thickness, color, style (solid, linear). Closed lines take on a fill feature. The space they cover can be filled with other objects (textures, maps) or selected colors. The simplest open line is bounded by two points called nodes. Nodes also have properties, the parameters of which affect the shape of the line end and the nature of the fillet with other objects. All other vector graphics objects consist of lines. For example, a cube can consist of six connected rectangles, each of which in turn consists of four connected lines. The cube can be thought of as twelve connected lines forming the edges.

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