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**Types of Computer Graphics**

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Computer graphics are pictures and films created using computers. It is a vast and recent area in computer science. The phrase was coined in 1960, by computer graphics researchers Verne Hudson and William Fetter of Boeing. It is often abbreviated as CG [1].

Some topics in computer graphics include user interface design, sprite graphics, vector graphics, 3D modeling, shaders, GPU design, implicit surface visualization with ray tracing, and computer vision, among others. The overall methodology depends heavily on the underlying sciences of geometry, optics, and physics. Computer graphics is responsible for displaying art and image data effectively and meaningfully to the user. It is also used for processing image data received from the physical world [2]. Two-dimensional computer graphics are the computer-based generation of digital images. 2D computer graphics are mainly used in applications that were originally developed upon traditional printing and drawing technologies such as typography. In those applications, the two-dimensional image is independent artifact with added semantic value; two-dimensional models are therefore preferred because they give more direct control of the image than 3D computer graphics, whose approach is more akin to photography than to typography [3].

Fractal art is a form of algorithmic art created by calculating fractal objects and representing the calculation

results as still images, animations, and media. Fractals are different from other geometric figures because of the way in which they scale. Fractal art developed from the mid-1980s onwards. The mathematical beauty of fractals lies at the intersection of generative art and computer art. Fractal art is usually created indirectly with the assistance of fractal-generating software, iterating through three phases: setting parameters of appropriate fractal software; executing the possibly lengthy calculation; and evaluating the product [1].

A bitmap, a single-bit raster, corresponds bit-for-bit with an image displayed on a screen, generally in the same format used for storage in the display's video memory. A raster is technically characterized by the width and height of the image in pixels and by the number of bits per pixel. Raster graphics are best used for non-line art images; specifically digitized photographs, scanned artwork or detailed graphics [4]. Vector graphics represent an image as a set of geometric primitives. Usually they are selected as points, straight lines, circles, rectangles, as well as a General case, splines of some order. Some attributes are assigned to objects, such as line thickness and fill color. A drawing is stored as a set of coordinates, vectors, and other numbers that characterize a set of primitives. When playing back overlapping objects, their order is set. Image in vector format gives space for editing. The image can be losslessly scaled, rotated, deformed, and as an imitation of three-dimensionality in vector graphics easier than in a raster. The mathematical description of the vector pattern remains the same, only the values of some variables, such as coefficients, are changed. When you convert bitmap source data is only a description of the set of pixels, therefore there is the problem of replacement of a smaller number of pixels on a larger (zoomed in) or larger to smaller (decreasing) [1].

The choice of bitmap or vector format depends on the goals and tasks of working with the image. If you need

photographic accuracy, it is preferable to raster. Logos, schemes, design elements are more convenient to be presented in vector format. It is clear that in both raster and vector representation graphics (as well as text) are displayed on the screen of the monitor or the printing device as a set of points. On the Internet graphics is represented in one of the raster formats understood by browsers without installing additional modules – GIF, JPG, PNG [5]. However, there is a tendency towards convergence. Most modern vector editors are able to use bitmap images as a background, or even translate into vector format parts of the image using built-in tools (tracing). And usually there are tools for editing the loaded background image at least at the level of various built-in or installed filters. 8-I version Illustrator's is download .psd files Photoshop's and use each of the resulting layers. In addition, to use the same filters, the generated vector image can be translated directly into raster format and then used as a non-editable raster element. Moreover, all this in addition to the usually available converters from vector format to raster format to obtain the appropriate file [2].

Three-dimensional graphics operate on objects in three-dimensional space. Usually the results are a flat picture, a projection. Three-dimensional computer graphics is widely used in movies, computer games [1]. In three-dimensional computer graphics, all objects are usually represented as a set of surfaces or particles. The minimum surface is called a polygon. Triangles are usually chosen as the ground [4]. Three types of matrices are used in computer graphics: rotation matrix; translation matrix; scaling matrix. The study of computer graphics is a sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content. Although the term often refers to three-dimensional computer graphics, it also encompasses two-dimensional graphics and image processing [2].

As an academic discipline, computer graphics studies the manipulation of visual and geometric information using computational techniques. It focuses on the mathematical and computational foundations of image generation and processing rather than purely aesthetic issues. Computer graphics is often differentiated from the field of visualization, although the two fields have many similarities [5].

Any image on the monitor, because of its plane, becomes a raster, as the monitor is a matrix, it consists of columns and rows of three − Dimensional graphics exists only in our imagination, as what we see on the monitor is a projection of a three-dimensional figure, and we create space ourselves. Thus, the visualization of graphics is only raster and vector, and the method of visualization is only a raster, and the number of pixels depends on the method of specifying the image [3].

References:

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