inScience
through time and space

Жамият ва инновациялар –
Общество и инновации –
Society and innovations
Journal home page:
https://inscience.uz/index.php/socinov/index

The concept of graphic information and its essence

Akbar XALIKOV[1], Sultonjon EGAMOV[2], Jahongir NORMATOV[3]

Jizzakh State Pedagogical Institute

ARTICLE INFO

Article history:
Received February 2021
Received in revised form
28 March 2022
Accepted 20 April 2022
Available online
15 May 2022

Keywords:
graphical reports,
Paint,
Microsoft Photo Editor,
Adobe Photo Shop,
Fractal Design Painter,
Micrografx Picture
Publisher.

ABSTRACT

The article provides insights into their types and importance of the concept of graphic information and its role in education. It talks about the possibilities that can be implemented with the help of graphical ahboros and what programs are convenient. Scientific works of foreign scientists were widely used in covering the topic of the article.

DOI: https://doi.org/10.47689/2181-1415-vol3-iss4/S-pp163-168

Grafik axborotlar tushunchasi va uning mohiyati

Kalit so'zlar:
grafik axborotlar,
Paint,
Microsoft Photo Editor,
Adobe Photo Shop,
Fractal Design Painter,
Micrografx Picture
Publisher.

ANNOTATSIYA

Maqolada grafik axborotlar tushunchasi, ularning turlari, ahamiyati va ta'limda tutgan o'rni haqida fikr-mulohazalar keltirilgan. Grafik axborotlar yordamida amalga oshirish mumkin bo'lgan imkoniyatlar va qaysi dasturlarning qulayligi to'g'risida so'z boradi. Maqola mavzusini yoritishda xorijlik olimlarning ilmiy ishlanmalaridan keng ravishda foydalanildi.

Понятие графической информации и ее сущность

Ключевые слова:
графическая информация,
Paint,
Microsoft Photo Editor,
Adobe Photo Shop,
Fractal Design Painter,
Micrografx Picture
Publisher.

АННОТАЦИЯ

В статье представлены размышления о понятии графической информации, ее видах и значении и роли в образовании. Речь пойдет о возможностях, которые можно реализовать с помощью графической информации, и о том, какие программы удобны. В освещении темы статьи широко использованы научные разработки зарубежных ученых.

[1] Lecturer at the Department of "Distance Education in Natural and Applied Sciences", Jizzakh State Pedagogical Institute.
[2] Lecturer at the Department of "Distance Education in Natural and Applied Sciences", Jizzakh State Pedagogical Institute.
[3] Lecturer at the Department of "Distance Education in Natural and Applied Sciences", Jizzakh State Pedagogical Institute.

Graphic information is information presented in the form of diagrams, sketches, images, graphs, diagrams, and symbols. Graphic information is a type of visual (visual) information. It includes: drawings, engravings, posters, diagrams, geographical maps, scans, sketches, etc. It consists of dots, strokes, and lines that are drawn in pencil, ink, chalk, or felt-tip pen on paper, cardboard, or blackboard, etc.

It is worth saying that graphic information accompanies a person from the moment of his appearance and develops with him simultaneously. The earliest graphic information includes images drawn with charcoal, soot, or scratched on cave walls and rocks. In the modern world, digital technology has come to the aid of creating graphic information for a person.

Currently, it is possible to get drawings and drawings on the monitor screen in the same form as on paper with the help of brushes, paints, and drawing tools. This kind of graphic information is called digital (digital graphics). In addition, the drawing from the computer's memory can be displayed not only on the screen, but also on paper using the printer. Today, there are color printers that provide photo-level image quality.

Computer graphics applications are very diverse. For each direction, special software is created, which is called graphics programs, or graphics packages.

Depending on the method of image formation**, the following types of computer graphics are distinguished:**

• raster graphics – used in the development of electronic (multimedia) and printed publications. Illustrations made using raster graphics are rarely created manually using computer programs.

• vector graphics – used for creating illustrations and, to a lesser extent, for processing them. Such tools are widely used in advertising agencies, design bureaus, editorial offices, and publishing houses.

• three-dimensional graphics – widely used in engineering programming, computer modeling of physical objects and processes, animation, cinematography, and computer games.

Programs for working with raster graphics include:

- Paint
- Microsoft Photo Editor
- Adobe Photo Shop
- Fractal Design Painter
- Micrografx Picture Publisher

To work with vector graphics, use:

- Corel Draw
- Adobe Illustrator
- Fractal Design Expression
- Macromedia Freehand
- AutoCAD

Thus, in bitmap graphics, an image is encoded by dividing the image into small dots or pixels. Each pixel is assigned its color code together. Information about each such point is stored in computer video memory. The creation of vector graphics involves primitive objects – a line, curve, point, rectangle, triangle, circle. These elements and their volumes are described using mathematical formulas. Graphic information can be presented indifferent ways. The way graphic information is presented depends on the purpose of this information and the type of devices it is intended for.

Representation of graphical information is performed by:

- using the coordinate method. This method is based on the representation of a flat (monochrome) image in the form of coordinates of rectangular raster elements.
- by the receptor method. A variant of the coordinate method. It is based on the representation of the entire image field in the form of rectangular areas, which are called receptors.
- a method for element-by-element representation of graphical information. It is based on the representation of an image as a set of graphic primitives, which can be a straight line segment, an arc, or a circle.
- structural and symbolic method. It is based on the use of standard graphic elements for image formation.
- analytical method. This method is based on its representation in the form of surface equations.

How three-dimensional images are created using computer graphics. Based on the above, we set the following research goals: find out how computer graphics are related to our lives; in what areas of human society it is used and how it affects the person himself.

To achieve these goals, we have put forward the following tasks:

- review and systematize your computer graphics knowledge.
- gain experience in creating fractal graphics;
- to show that the progressive development of the information world of human society is impossible without computer technologies;
- study theoretical material on this topic;
- define the concept of “computer graphics”.
- show that different mathematical objects are used in different types of graphics.
- use graphic material to show examples of using various geometric shapes.
- find examples of the use of computer graphics in various fields of human activity;
- consider the characteristics and varieties of computer graphics.
- consider color models and graphic formats of computer graphics.
- create your own graphic drawings.
- conduct a study and compare the perception of computer graphics by adults and children.
- study of literature on this topic;
- comparison of essential features of different types of graphic images;
- creating graphic images using a computer program;
- generalization of the received information; identification of the main directions of application of computer graphics in the life of human society;

The practical significance of the work is determined by the creation of practical materials on the research topic, the use of materials and results of research work to expand the knowledge of students in the field of computer graphics in computer science lessons and elective courses.

The scientific significance of this work lies in the fact that computer graphics, which appeared on the Internet, using the knowledge of the two sciences of mathematics and computer science, and developing, thanks to new scientific discoveries, is increasingly changing the life of mankind. Studying computer graphics is interesting and useful for learning, development, and recreation.

The main theoretical conclusions of the work are based on the works of A.E. Bubnov, A.A. Zalogova, A.A. Krichalov, S.V. Simonovich, P.G. Stoyanov and others.

When working with color in computer graphics, the following concepts are used: color depth (also called color resolution) and color model. A different number of bits can be allocated to encode the color of an image pixel. This determines how many colors can be displayed on the screen at the same time. The longer the binary color code length, the more colors can be used in the drawing. Color depth is the number of bits that are used to encode the color of a single pixel. To encode a two-color (black-and-white) image, it is enough to allocate one bit per color representation of each pixel. Allocating a single byte allows you to encode 256 different color shades. Two bytes (16 bits) allow you to define 65536 different colors. This mode is called High Color. If three bytes (24 bits) are used for color encoding, 16.5 million colors can be displayed simultaneously. This mode is called True Color. The size of the file in which the image is saved depends on the color depth [7]. Colors in nature are rarely simple. Most color shades are formed by mixing primary colors. The method of dividing a color shade into its component components is called a color model. There are many different types of color models, but computer graphics typically use three. These models are known as RGB, CMYK, and HSB [6].

Depending on the method of creating a graphic image, you can distinguish between raster, vector, fractal, and three-dimensional (3D) graphics. In bitmap graphics, an image is formed as a raster-a collection of points (pixels) that form rows and columns. Each pixel can take any color from the palette. When you save a bitmap image, the computer stores information about the color of each pixel included in it. The quality of a bitmap image increases as the number of pixels in the image increases. This increases the information volume of the entire image. A large amount of information is one of the main disadvantages of bitmaps. Next the disadvantage of bitmaps occurs when you change their scale. Thus, when a bitmap image is reduced, several neighboring pixels are converted to one, which leads to a loss of clarity in small image details. When the image is enlarged, new pixels are added to it.

In this case, neighboring pixels take on the same color and a stepwise effect occurs [7].

In vector graphics, the main element of an image is a line, and it doesn't matter if it's a straight line or a curve. In vector graphics, the amount of memory occupied by a line does not depend on the size of the line, since the line is represented as a formula. Whatever is done with this line, only its parameters stored in memory cells are changed. The number of cells remains the same for any line.

A line is an elementary object of vector graphics. Everything in the vector illustration consists of lines.

The simplest objects are combined into more complex ones. For example, a quadrilateral object can be considered as four connected lines, and to represent a circle using vector graphics, only the coordinates of one point of the center and radius are required. The information volume of vector images is significantly smaller than that of raster images. Another advantage of vector images is the ability to scale them without losing quality. But not everything is so good. Vector graphics have their main drawback. Vector images are not as rich in color as raster images [7].

Fractal graphics, like vector graphics, are based on mathematical calculations. However, the basic element of fractal graphics is the mathematical formula itself, that is, no geometric shapes are stored in the computer's memory as in vector graphics, and the image is built exclusively using equations. This method is used to build both simple regular structures and complex illustrations that mimic natural landscapes and three-dimensional objects.

A fractal is a mathematical shape that has self-similarity properties. That is, a fractal is made up of some parts, each of which is similar to the entire figure. Simply put, a single object is copied several times, resulting in a drawing. The image is constructed using an equation, so you don't need to store anything other than the formula. By changing the coefficients in the equation, you can get a perfect about another picture. Software tools for working with fractal graphics are designed for automatic image generation by mathematical calculations.

Creating a fractal artistic composition is not a matter of drawing or designing, but of programming. Fractal graphics are more often used in entertainment programs [7].

Three-dimensional graphics (3D). Three-dimensional graphics work with objects in three-dimensional space.

Usually, the results are a flat image or projection. Three-dimensional computer graphics are widely used in movies and computer games.

In three-dimensional computer graphics, all objects are usually represented as a set of surfaces or particles. The minimal surface is called a polygon. Triangles are usually chosen as polygons.

All visual transformations in 3D graphics are controlled by matrices.

Computer graphics use three types of matrices:

- rotation matrix.
- shift matrix.
- the scaling matrix.

Any polygon can be represented as a set of coordinates of its vertices. So, the triangle will have 3 vertices. The coordinates of each vertex are a vector (x, y, z). By multiplying the vector by the corresponding matrix, we get a new vector. By doing this transformation with all the polygon vertices, we get a new polygon, and by converting all the polygons, we get a new object that is rotated (shifted) and scaled relative to the original one [8].

Color models

Color model

RGB.

Any color is considered to consist of three main components: red (Red), Green (Green) and blue (Blue). These colors are called primary colors. It is also assumed that when one component is superimposed on another, the brightness of the total color increases. Combining the three components gives a neutral color (gray), which tends to white at high brightness. The method of obtaining a new shade by summing the brightness of the components is called the additive method. It is not difficult to guess that the lower the brightness, the darker the shade.

Therefore, in the additive model, the center point that has zero component values (0,0,0) is black (there is no glow on the monitor screen). The white color corresponds to the maximum values of the components (255, 255, 255). The RGB model is additive, and its components: red (255,0,0), green (0,255,0), and blue (0,0,255) are called primary colors [7].

Color model

CMYK.

This model is used for preparing printed images rather than screen images. They differ in that they are seen not in passing, but in reflected light. The more ink you put on the paper, the more light it absorbs and the less it reflects. The combination of the three main colors absorbs almost all the incident light, and the image looks almost black from the outside. Unlike the RGB model, increasing the amount of paint does not increase the visual brightness, but rather decreases it. Therefore, the subtractive (subtractive) model is used to prepare printed images rather than the additive (summing) model. The color components of this model are not primary colors, but those obtained by subtracting primary colors from white:

blue (Cyan) = White-Red = Green + blue (0,255,255); Magenta (Purple) (Magenta) = White-Green = Red + blue (255,0,255); Yellow (Yellow) = White-Blue = Red + Green (255,255,0).

These three colors are called complementary because they complement the primary colors to white. A significant difficulty in printing is represented by the black color. Theoretically, it can be obtained by combining three main or additional colors, but in practice the result is poor.

Therefore, a fourth component has been added to the CMYK color model-black.

This system owes it the letter K in its name (blacK) [7]. The HSB color model.

Some image editors allow you to work with the HSB color model. If the RGB model is most computer-friendly and the CMYK model is most printer-friendly, then the HSB model is most human-friendly. It is simple and intuitive. The HSB model also has three components: Hue, Saturation, and Brightness. By adjusting these three components, you can get just as many random colors as you can with other models. The hue of a color indicates the color number in the spectral palette. The saturation of a color characterizes its intensity-the higher it is, the “cleaner” the color. The brightness of the color depends on the addition of black to the given color-the more it is, the lower the brightness of the color [7].

REFERENCES:

1. Алдушонков В.Н. Влияние компьютерных технологий обучения на формирование познавательной самостоятельности студентов. Дисс... канд. пед. наук.; Брянск, 2001.

2. Альберт Д.И., Альберт Е.Э. Самоучитель Macromedia FlashMX 2004. – СПб.: БХВ-Петербург,2004. – С. 624.

3. Аранова С.В. Обучение изобразительному искусству. Интеграция художественного и логического СПб.: КАРО, 2004. – С. 176.

4. Дубровский В.Я., Шедровинский Г.П. Проблемы системного инженерно-психологического проектирования. М.: МГУ, 1971. – С. 5. Ермолаева-Томина Л.Б. Психология художественного творчества. – М.: Академический Проект, 2003. – С. 304.

5. Есипов Б.П., Равкин З.И. Метод проектов / Б.П. Есипов, З.И. Равкин // Педагогическая энциклопедия. М., 1965. – Т.2. – С. 806.

6. Затулий А.И. Художественный авангард в решениях практических задач компьютерного дизайна. М., 2001.