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## COMPUTER GRAPHICS AND PHOTOGRAPHY IN TERMS OF DESIGN

***Abstract.*** *The use of computer graphics and photography helps to diversify the educational process, improves the quality of training of future designers, expands their technical capabilities for the artistic modeling of clothing models. The use of graphic editors in the learning process increases the professional level of students, provides positive motivation, promotes creativity and self-expression, provides ample opportunities for experimentation, greatly facilitates the work and expands opportunities to implement their own, sometimes unique creative ideas.*

***Keywords:*** *clothing design; computer graphics and photography; costume design; raster and vector images; color balance; Adobe Illustrator; CorelDraw; Xara Designer Pro.*

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## КОМП'ЮТЕРНА ГРАФІКА ТА ФОТОГРАФІКА В АСПЕКТІ ДИЗАЙНЕРСЬКОЇ ДІЯЛЬНОСТІ

***Анотація.*** *Застосування комп'ютерної графіки та фотографіки допомагає урізноманітнити навчальний процес, підвищує якість підготовки майбутніх дизайнерів, розширює їхні технічні можливості стосовно художнього моделювання моделей одягу. Використання графічних редакторів у процесі навчання підвищує професійний рівень студентів, забезпечує позитивну мотивацію, сприяє творчості та самовираженню, забезпечує широкі можливості для експериментування, істотно полегшує роботу і розширює можливості для реалізації власних, часом унікальних творчих задумів.*

***Ключові слова:*** *дизайн одягу; комп'ютерна графіка та фотографіка; художнє моделювання костюма; растрові і векторні зображення; баланс кольорів; Adobe Illustrator; CorelDraw; Xara Designer Pro.*

**Introduction.** The aim of the course is to master the programs and methods that could be used to create clothing design, photography in combination with the use of existing software. Professional training of future design specialists. To teach students the process of artistic modeling of clothing design, the method of studying computer graphics and photography. Computer graphics and photography are an important component of a modern designer's education. In many cases, graphics needs can be met by various existing graphics programs and cameras.

**Setting objectives.** The method of teaching artistic clothing design of future design professionals is the study of graphic programs. Computer graphics and photography are an integral part of all modern computer technology. Computer graphics attracts the attention of many specialists in various fields of knowledge – programmers, visualization designers, clothing designers, photographers, etc. Every designer or photographer needs to know the basics of computer graphics. Computer graphics is a field of knowledge in which, on the one hand, a considerable baggage of knowledge is accumulated, on the other hand, methods, algorithms and practical applications are constantly developed. Computer graphics and photography are an important component of the education of a modern fashion designer.

**Research results.** The study is based on the study of modern graphic programs, theoretical approaches to choosing the content of vocational education; formation of professional competence of the individual; project culture of clothing design and aesthetics of design creativity; artistic modeling of a suit.

**Practical significance.** Deep mastery of the basic graphics programs of computer graphics and photography is the main key to understanding the further development of clothing modeling.

***Preface.*** The rapid development of computer software is contributing to qualitative changes in traditional clothing design technologies. Among them, computer graphics, photography, three-dimensional modeling and animation are the most dynamically developing. In many cases, clothing modeling needs can be met by various existing graphic editors and programs.

**The most famous graphic editors.** Graphic editors are applications designed to create and process graphic images on a computer. Professional graphic dialogue involves, in addition to data entry, the selection of lines, graphic elements, tools from menu tables with images of typical elements. All graphics processing programs can be divided into two groups: raster and vector. Such programs include, in particular, the most advanced and popular editor of Adobe Photoshop (Fig. 1).


*Figure 1*

This software package has powerful capabilities for processing finished images and their modifications. This is facilitated by a huge set of different filters and effects. The package has the means to restore damaged images, retouch photos and more. Adobe updates Photoshop's graphics editor about once every two years. One of the latest versions of Photoshop CC 2020 21.2.3 contains all the features of the standard version of the graphics editor and, in addition, additional tools. In CC 2020 21.2.3 you can work not only with 2D graphics, but also with three-dimensional models, apply textures, create animation, open video files, work as a video editor and more. Xara Designer Pro is an equally well-known graphics editor for processing raster graphics. This program also has a variety of tools for working with graphics, the only difference is in the interface and the speed of graphics operations. These programs are used by almost all artists and photographers to achieve various artistic effects. The source material for processing in these editors can be obtained in different ways: by scanning a color illustration,

inputting an image from a digital video or camera. In addition, a conventional camera can also be used to produce electronic images suitable for processing in a graphics editor, as a new service has been introduced at the film development points – recording photos on CDs.

Adobe Illustrator, CorelDraw, Xara Designer Pro and others are used to work with vector graphics. Adobe Illustrator is designed to prepare documents that contain vector and raster images, such as logos, posters, booklets, brochures, Web images, and more. CorelDraw - this multifunctional editor is designed to process and create vector and raster graphics. Xara Designer Pro is a program for designers working in the field of printing, which has many features for graphics that arise in the design process and is a world leader in vector graphics.

**Types of computer graphics.** Although there are many different programs for modeling clothes, there are only three types of computer graphics: raster, vector and fractal. They differ in the principles of image formation when displayed on a monitor screen and when printed on paper.

**Raster graphics.** In raster systems, the image is divided into lines, the basic element of which is a dot. A raster is a set of points (matrix of elements) defined on a discrete flat rectangular lattice. If the image is a screen, then these points are called pixels (from the English. Picture element – picture element). A pixel is an indivisible grain of an image, the smallest element of an image on a screen that can be generated by a computer. Each pixel has its own color. A set of pixels of different colors forms an image, that is, a bitmap image in the computer's memory is a set of color data of pixels arranged in rows. Raster and vector images differ significantly in the way of presenting graphic information. Vector images are images that are constructed from graphic primitives that are defined by their characteristic parameters. In raster graphics, the main element of the image is a point, and in vector graphics – a line (contour), which is also called a vector. The contour can be a straight or curved line, closed or open. Each circuit has two or more reference points (nodes). There is a contour segment between the two nodes (Figure 2).

*Figure 2*

The shape of the contour is set through reference points. Since a line is the main object of vector graphics, and more complex objects in vector graphics consist of simpler (lines), vector graphics are also called object-oriented graphics. The most important aspect of vector graphics is that you can resize a vector image without losing its quality. Vector graphics are easy to solve for scaling. When enlarging the image, you can consider some details of the image, ie we have the opportunity to resize the vector image without losing quality. This is the biggest advantage of vector graphics. Each program stores data in its own format, so the image created in one editor is usually not converted to the format of another program without errors. The only exception is the AD file format of Adobe Illustrator. The AI format is supported by almost all vector graphics programs.

Fractal graphics are indispensable in the generation of extraordinary images and in the illustration of complex non-Euclidean objects whose patterns are similar to natural ones. Many objects of animate and inanimate nature have fractal properties. A normal snowflake (magnified many times) is a fractal object. Fractal algorithms underlie the growth of crystals, corals, plants (each child branch repeats the properties of a branch of a higher level). Fractals are used to generate terrain, artificial clouds, mountains, etc. Fractal graphics – a special area of cognitive graphics. The cognitive function of fractal graphics, like graphics in general, is to use some image to gain new knowledge that the designer does not even guess. The fractal archiver unpacks not only static information but also video much faster than its closest JPEG competitor. In 1992, Microsoft released a disk encyclopedia of flowers, trees, picturesque places. This disc recorded 7 hours of sound, 100 animated videos, 800 terrain maps, 7000 high-quality photos. A regular 650 MB CD without the use of compression can hold 56 minutes of audio or 700 photos measuring 640 × 480 pixels.

**Graphic file formats.** Graphic file format is a set of rules and methods according to which data containing graphic images is written to files. When choosing a file format, keep in mind that this format must be supported by the specified scope. Image file formats can be classified according to various criteria. Classification of computer graphics files can be done by types of computer graphics, ie there are raster, vector file formats and metafile formats: - raster formats (BMP, PCX, GIF, JPEG, PNG, RLE, DIC, TIFF, CAM, CLP , IMG, PSD, TGA, DCM, FIF); - vector formats (AutoCad DXF, AI, DWF); - those that combine raster and vector images (EPS, PIC, CDR); - metafiles (CGM, PDF, EMF, WMF. Raster formats are used to describe bitmap graphics, which is a set of numerical values that determine the color of individual pixels.

**Examples of graphic formats.** The GIF format effectively compresses graphic images with large fragments of a uniform fill, but compresses photos poorly because the photos contain many shades. Another limitation of GIF is that color images cannot be recorded in more than 256 colors, but in many cases this is enough, for example, to transfer graphics to the Internet.

JPEG or JPG (Joint Photographics Experts Group) is one of the most common raster formats. It is used to display photos and other tonal images on electronic networks. It uses efficient compression algorithms that significantly reduce file size (saves 50% to 70% of memory) but loses information. In JPG format, you can get a file 500 times smaller than BMP.

The TIFF (Tagget Image File Format) is designed to store scanned images in high resolution (high quality) and to exchange documents between different programs and different computer platforms. TIFF allows you to store multiple images in a file and can use different color models, has the widest range of color reproduction - from monochrome to 32-bit, supports many methods of compression.

The AI format is Adobe Illustrator's own vector format. This format is supported by almost all vector graphics programs. The DXF (Drawing Exchange Format) was developed in 1982 to share drawings and other graphic documents in the AutoCad environment (Fig. 3).

PDF format is a format for presenting documents, it is designed for electronic publications and graphics on the Internet. This format stores documents that are read-only and cannot be edited. The PDF format is hardware-independent, so images can be output to different devices.

The PNG format is a relatively new format that has replaced the GIF. This format uses lossless compression. For example, each time a vector file is sent to an output device (monitor), it is subject to a raster construction operation - converting the image into individual pixels.

***Color models.*** Most color shades are formed by mixing primary colors. These models are known as RGB, CMYK and HSB. The main colors are red, green and blue, because human perception of color is built on these colors. Combining different values of points R, G, B, we

can get any color. Today, the RGB system is the official standard. is always used when preparing a screen image.

*Figure 3*

The CMYK color model is used to prepare not screen, but printed images, ie for devices that implement the principle of absorption (subtraction) of colors. Printed images differ from screen images in that they are seen not in transmitted light but in reflected light because the sheet of paper does not emit light. The drawn paper absorbs some electromagnetic waves from the optical range and reflects the rest, and our eye perceives only the reflected waves. Therefore, for the preparation of printed images is not used additive model RGB, and subtractive model CMY. Unlike the RGB model, the white dot in CMY is the lack of inks on the paper. The name of this model consists of the names of subtractive colors (opposite to R, G, B) – blue (Cyan), magenta (Magenta) and yellow (Yellow Subjective color model HSB (HSV) Models RGB, CMY, CMYK are focused on working with If the RGB model is the most suitable for the computer, the CMYK model – for printing houses, the HSB model is the most convenient for the person. It is simple and intuitive. S (Saturation) and B / V color brightness (Brightness / Value), so this model is called HSB or HSV, and by adjusting the three components, you can get the same color as with other models.

Some graphics editors allow you to work with the HSB color model. The HSB model is convenient for use in those graphic editors which are focused not on processing of ready images, and for creation of own works of art. This model uses a cylindrical coordinate system, and the set of all allowable colors is a cone placed on top.

The HSB model is convenient for choosing colors on the screen. You can first display a simplified palette on the screen, and then increase or decrease the brightness. For example, this is the case when modeling the shading of objects or twilight. Graphic editors allow you to work with color images in different models. For example, Paint Brush for Windows uses two

models to set the color – RGB and HSV (there are corresponding formulas for the relationship between the parameters R, G, B and H, S, V).

***Color balance.*** Arbitrary change of the color component affects the overall color balance, ie the change of one component is necessarily reflected in other colors. Therefore, the basis of any color correction is not to adjust individual colors, and color balance, and the same result can be achieved in different ways. To make it easier to imagine the interaction of color components, it is necessary to consider a simplified color scheme that allows you to clearly demonstrate the interaction of color balance components. For example, to change the color to blue, you need to reduce the red content. To reduce the purple component, you can reduce it directly, but it is better to do it by increasing the blue and yellow components, which will maintain the saturation of the image. So, to affect the purple color, you can use all the colors of the circle. Thus, at arbitrary influences on color components, it is necessary to consider that it is reflected on all space of colors. In this regard, it is necessary to take into account the following patterns:

1) colors that lie in a circle opposite each other are interrelated (decreasing the content of one color increases the content of the opposite color);

2) the content of a certain color can be changed by affecting neighboring colors;

3) to increase the content of a particular color, you can reduce the content of colors that are adjacent to the opposite, and vice versa.

**Conclusion.** The use of computer graphics in the process of teaching students-designers for artistic modeling of clothes effectively influences the development of artistic and creative, research abilities, education of aesthetic feelings. Future fashion designers master a set of necessary design skills, including: - research skills: problem identification; collection of information; search for analogous situations; - analytical and synthetic skills: analysis of the collected information; synthesis of analysis results into the initial graphic design object; formation of a creative concept; - artistic skills: creating graphic versions of the product in the form of fore-sketches, search and creative sketches; development of an artistic image of a clothing model; selection of textures, textures, filters, computer graphics effects; demonstration of a product or group of products in a completed graphic sketch project by means of computer graphics, etc. (Fig. 4). Thus, based on our previous analysis of scientific sources and practical training of future designers, we can say that the use of computer graphics and photography helps to diversify the educational process, improve the training of future designers, expands their technical capabilities for artistic modeling of clothing. The use of graphic editors in the learning process increases the professional level of students, provides positive motivation, promotes creativity and self-expression, provides ample opportunities for experimentation, greatly facilitates the work and expands opportunities to implement their own, sometimes unique creative ideas.

*Figure 4*

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