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# THEORETICAL BASIS OF APPLICATION OF COMPUTER IMITATION MODELS IN TEACHING TYPES OF COMPUTER GRAPHICS

Shodmonkulov Mirolim Turanovich
Named after Tashmuhammad Qor Niyazi.
Pedagogical Research in Uzbekistan Institutes Base Doctoral Student
Mirolim.shodmonqulov@mail.ru

Dexqonov Inomjon Isroil Ugli

Mamajonov Muslimjon Mahmudjon Ugli

Mamaraximov Karim Mamarasulovich
Senior Inspectors of the Customs Committee of the Republic of Uzbekistan

## ANNOTATION

Today, with the help of modern technologies, great achievements are achieved in the field of technology, as evidenced by modern cars, parking lots, car parts, spaceships, skyscrapers, vertical forests, modern gardens and household appliances. Computer graphics are invaluable when creating equipment projects (interior, exterior and landscape). Therefore, this article deals with the topics of computer graphics, that is, the organization of training in raster and vector graphics based on simulation models.

**Keywords:** Simulation model, computer graphics, raster graphics, vector graphics, fractal graphics, pixels, lines, system analysis, information technology.

**Аннотатsiя:** Сегодня с помощью современных технологий достигаются большие достижения в области техники, о чем свидетельствуют современные автомобили, автостоянки, автомобильные запчасти, космические корабли, небоскребы, вертикальные леса, современные сады и бытовая техника. Неоценима компьютерная графика при создании проектов оборудования (интерьера, экстерьера и ландшафта). Поэтому в данной статье рассматриваются темы компьютерной графики, то есть организатsiя обучения растровой и векторной графике на основе имитационных моделей.

**Ключевые слова:** имитационная модель, компьютерная графика, растровая графика, векторная графика, фрактальная графика, пиксели, линии, системный анализ информационные технологии.

Annotatsiya: Bugungi kunda zamonaviy texnologiyalar yordamida texnika sohasida ulkan yutuqlarga erishilib kelmoqda bularga yaqqol misol sifatida zamonaviy avtomobillar, avto turargohlar, avtomobil ehtiyot qismlari, ko'smik kemalar, osmon o'par binolar, vertical o'rmonlar, zamonaviy bog'lar va mayshiy texnika jihozlarining loyihalarini yaratishda (interyer, exteryer va landshaft) kompyuter grafikasining o'rni beqiyosdir. Shu bois ushbu

maqolada kompyuter grafikasining mavzulari bo‘yicha ya’ni rastrli va vektorli grafikalarni imitatsion modellar asosida o‘qitishni tashkil etish masalalari tadqiq etilgan.

Kalit so‘z: Imitatsion model, kompyuter grafikasi, rastrli grafika, vektorli grafika, fraktal grafika, piksel, chiziqlar, tizimli tahlil, axborot texnologiyalari.

The teaching of computer graphics in the field of "Information Technology" in higher education in the field of technology today is carried out on the basis of various visual aids. Examples include the use of whiteboards and the organization of lectures and workshops based on a variety of presentations.

When we analyze the research of foreign and domestic scientists in this area, we see that the following work has been done:

- Bolshakov V.P. (Professor, Doctor of Philosophy) in the textbook "Engineering and Computer Graphics" "Engineering graphics learns to design computer technology with a modern approach based on three-dimensional modeling, the use of automated design systems using information technology to create documents. [1]
- Zalogova L.A. The Computer Graphics tutorial discusses the presentation of graphic images, descriptions of color shades on monitors and printers, graphic file formats, the main features of CorelDRAW vector graphics and Adobe Photoshop bitmap graphics editors. Dedicated to mastering the skills of creating and editing images using CorelDRAW and Adobe Photoshop, as well as the exchange of graphic information between different applications for practice lessons. [2]
- Mironov D.F. The textbook "Computer Graphics and Design" covers the basic concepts of "Computer Graphics", information color models, models of vector and raster images and methods of working with them. The main advantage of the textbook is that the presentation of the material is not limited to specific software products. A detailed description of the practical methods of vector and pixel graphics is supplemented by many examples and illustrations, and a glossary of basic computer graphics terms is given. [3]
- Tozik V.T. The textbook "Computer Graphics and Design" covers the theoretical foundations of "Computer Graphics", types of computer graphics, layout designer workplace equipment, technological bases of color separation and pre-printing, the most popular graphics editors, as well as the basics of decorative composition, color, book and business graphics. fonts and spelling. Specific examples and methods of developing original models of various types of printing products are given. [4]
- Degtyarev V.M. The research work "Computer Geometry and Graphics" considered the methods of geometric modeling and problems to be solved, the implementation of geometric modeling on a computer, the formation of graphic objects from primitive objects and their visualization. Architecture and software of modern graphics stations , modern standards of computer graphics, dialog systems and their use. interactive graphics in information systems are presented in systems for various purposes. There are clear examples, methods, methods of solving geometric problems for the creation and visualization of spatial objects and dynamic scenes. [5]
- Boreskov A.V. In the textbook "Computer Graphics" In modern life we are constantly faced with computer graphics. Visualization is very important for engineers and architects, and computer graphics play a huge role in the advertising and entertainment industry. It was impossible to create many computer games without it. Computer graphics is evolving at a rapid pace, with new methods and algorithms constantly emerging that allow it to display complex and exciting effects, consuming

less computing resources. This textbook describes the basic aspects of computer graphics, both mathematical and algorithmic, the concepts studied and the basic algorithms. [6]

The above-mentioned research shows that little attention is paid to the methodology of teaching the subject of "Information Technology" on the basis of computer simulation in higher education institutions in the field of technology. In some special cases, a solution is provided.

This article presents the simulation models created on the main topics of teaching the subject "Information Technology" on the basis of computer simulation in higher education institutions in the field of technology.

A computer simulation model is an adequate or approximate model of a real event and process based on computer programs. Computer-based simulation usually begins with the study of an object, the appearance of events, subject areas, life situations, and issues. Once the object is studied, a model is created. [7]

In modeling, the main main factors are separated (the secondary ones are omitted). An algorithm, a program, and a computer experiment are then created. The use of computer simulation models in the educational process provides an opportunity to demonstrate the ability to present educational materials in analytical (computational and logical) and figurative form of the computer, as well as the internal and external properties of the object under study. creation and use of multimedia electronic manuals and virtual laboratories on the basis of computer simulation model (methodology).

The paper presents the types of computer graphics and their elements using computer simulation models to give students a broader understanding.

The image shows how pixels form the basis of raster graphics using simulation models. A pixel is the smallest logical two-dimensional element of a digital image in raster graphics, or an element of the display matrix that forms the image. As a disadvantage of raster graphics, the image scaling process can worsen the image quality as the pixel size increases.


Figure 2. Viewing a raster image using an imitation model.

In raster graphics, we may lose image quality if we increase the image size. When we enlarge the image using simulation models, we can clearly see that the image is made up of pixels. The higher the number of pixels in an image, the better the image, and showing students these processes using simulation models will make it easier for them to understand the subject. [8]

In vector graphics, the line is considered as the main element of the image. A straight line or a curved line can be used as a line. In true graphics, such lines are created using dots (pixels), while in vector graphics, lines that are more general than dots are used to create the images, making the images more accurate. The advantage of vector graphics is that the image takes up less space in memory, because in this case the space in the memory does not depend on the size of the line.


Figure 4. View of a vector image using an imitation model.

In this figure, we can show that the basis of vector graphics is lines, using simulation models. In vector graphics, the quality of an image does not change when we zoom in or out.

In conclusion, there is a lack of research on the introduction of computer simulation models in the educational process, especially in technical higher education institutions. Therefore, this article examines the issues of computer graphics, ie the organization of teaching raster and vector graphics on the basis of simulation models.

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