Mukhtar Usupov[1*] iD , Karlygash Barnakhanova[2] iD

[1,2]M.Dulati Taraz Regional University, Taraz, Kazakhstan

E-mail: [1]ussupov_m@mail.ru, [2]barnakhanova@mail.ru

Application of AutoCAD and KOMPAS graphic editors

Abstract. In this article, on the example of two graphics programs AutoCAD and KOMPAS, we tried to identify the most convenient computer graphics program for work. Most teachers prefer the interactive (computer) type of teaching. Interactive learning is much more effective than traditional learning. The success of interactive learning can mainly depend on the teacher and the level of interest of the students themselves. The article provides a comparative analysis of these programs and shows that these programs are indispensable when performing 3D modeling tasks. When the scale is reduced, changes occur in the Compass 3D program: for example, when creating a basic shape on a plane, the sketch parameters change. And when changing the coordinate axes in AutoCAD, it becomes difficult to draw figures such as parallelepipeds, cylinders, cones, etc. In AutoCAD, once you are familiar with the panel tools and have knowledge of descriptive geometry, you can easily begin drawing an axonometric image. The operation is also considered in the Compass program, since in this program there are no repetitions of the contour boundaries.The results showed that KOMPAS-3D is a fast and convenient tool for creating simple models, which makes it suitable for training and working with novice users. The article also shows the importance of choosing the right program depending on the user level and specifics of the work, which is an important aspect in the field of computer-aided design and engineering graphics.

Keywords: computer graphics, interactive (computer-based) teaching, graphics programs, AutoCAD, KOMPAS.

Introduction

With the development of innovative technologies, modern education does not stand still. Moreover, interactive (computer-based) teaching has already found the right application in educational institutions. Teaching in the traditional educational form is losing its relevance day by day. The majority of teachers give their preference to interactive (computer-based) type of teaching. Experience shows that interactive teaching is much more effective than traditional teaching. The success of interactive teaching, mainly, may depend on the teacher and the level of interest of the students themselves. Students, receiving not only auditory but also visual information, learn the subject much better [1].

Computer graphics and object-image style is the main channel of communication between human and computer. The fundamental role of geometric, spatial thinking in industrial activity, in technology is quite obvious. Graphics is the language of technology, and drawing is the main carrier of technical information. It is no coincidence that even Egyptian pyramids, temples and palaces of Greece and Rome were built according to drawings, and the word "techne" has long denoted the skill and ability of people. Therefore, today in techne it is important not just to know the language of drawing, but to know the computer language of drawing. Computer graphics is the culture of modern graphic labor [2].

The main applications of computer graphics are: Scientific graphics; Business graphics; Computer-aided design; Graphic illustrations; Graphic advertisements; Animations.

Materials and methods

The methodology of this study was designed to compare two computer-aided design (CAD) systems: AutoCAD and KOMPAS-3D. The research aimed to evaluate the efficiency and usability of both applications in performing three-dimensional modeling tasks.

Selection of CAD Systems: The study focused on AutoCAD and KOMPAS-3D as the primary CAD systems for comparison. These two programs were chosen because of their widespread use in industries like construction, architecture, and

mechanical engineering. Both software applications are known for their capabilities in 2D and 3D modeling but differ in their approaches and features.

Criteria for Comparison: The comparison was based on several criteria: Efficiency of Model Creation: Time and the number of attempts required to create a 3D part in both programs were recorded.

Usability: The ease of use of the programs, particularly for students and professionals, was considered. This included the interface design and the complexity of the tools available for 3D modeling. Technical Features: Differences in the design and manipulation of 3D objects were examined, such as how each program handles sketches, solids libraries, and assembly items.

Procedure: A simple 3D part was created in both AutoCAD and KOMPAS-3D to assess the time taken and the number of actions needed. Each action was carefully noted, and the time taken for completion was measured. The tasks were performed by a user familiar with both programs to ensure consistent results. The comparative analysis of these programs included the study of the software's design techniques and the specific features they offer, such as sketch-based modeling in KOMPAS-3D and object manipulation via a solids library in AutoCAD.

Data Collection: The data collected focused on the time taken to create the 3D model and the number of attempts needed to complete the task. These measurements were used as the primary indicators of the efficiency and ease of use of each program. Qualitative analysis was also performed, including user feedback on the interface and usability of both applications.

Results and Discussion

It follows that the leading role of graphics worldwide belongs to computer graphics. In this article, on the example of two graphics programs AutoCAD and KOMPAS, we will try to identify the most convenient computer graphics program for work. One of the leading graphic CAD programs are Compass and AutoCAD, and knowledge of other application programs. In order to choose from a large number of different CAD systems, to choose the best-satisfying professional needs, it is necessary to compare and recommendations on the selection of CAD systems. We base our software package selection on the expertise of experts and our

familiarity with Compass and AutoCAD. AutoCAD and KOMPAS, two automated programs, were progressively included [3].

Autodesk created the two- and three-dimensional AutoCAD computer-aided design and drafting system. Throughout the construction,architecture, mechanical engineering, and other industries, AutoCAD and its specific applications are extensively utilized.

Simple objects like text, arc lines, and circles were the only basic objects available in early AutoCAD versions. From these, more sophisticated objects could be created.As such, AutoCAD earned a reputation as an "electronic drafting tool" that remains with it today. However, AutoCAD's capabilities today are vast and far exceed those of the "electronic drafting machine" [4].

A collection of computer-aided design systems called KOMPAS is capable of producing design and construction documentation in compliance with the SPDS and ESCD series standards.Developed by the Russian company Ascon. The name of the product line is an acronym from the phrase "COMPLEX Automated Systems", the trademarks use capital letters. The first release of Compass (version 1.0) took place in 1989. The first Windows version, Compass 5.0. - was released in 1997 [5].

These applications automatically generate associative views of three-dimensional models, such as sections, cross sections, local sections, local views, arrow views, and break views. The primary functions of the KOMPAS-3D and AutoCAD systems include product modeling, which helps to shorten product development times and expedite product introduction into production [6].

Using the example of producing a three-dimensional part that was first made in KOMPAS-3D and then later in AutoCAD, let's try to compare these two programs. Creating a part in AutoCAD and KOMPAS-3D programs, the time was recorded and all actions were taken into account in order to compare the results. It took 57 seconds and 21 attempts to create the part in AutoCAD (Figure 1), and 44 seconds and 19 attempts to create the part in KOMPAS 3D (Figure 2). As a result, Compass 3D took 2 fewer attempts to build the part and the job was completed 13 seconds faster.
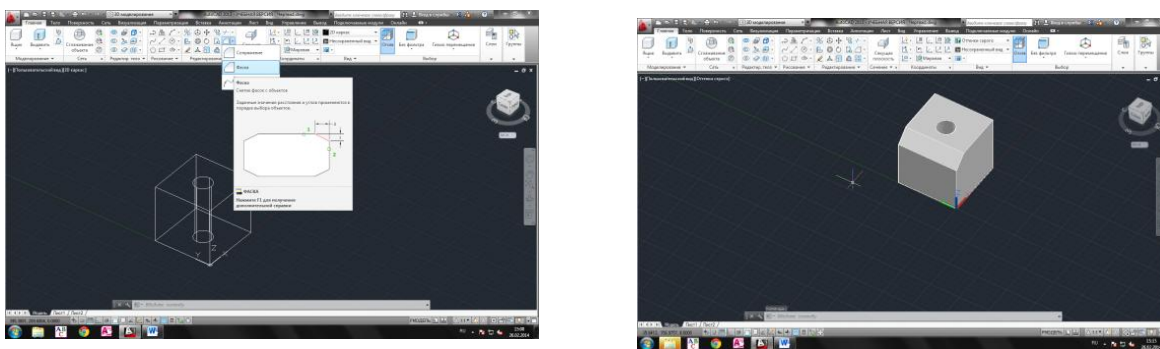
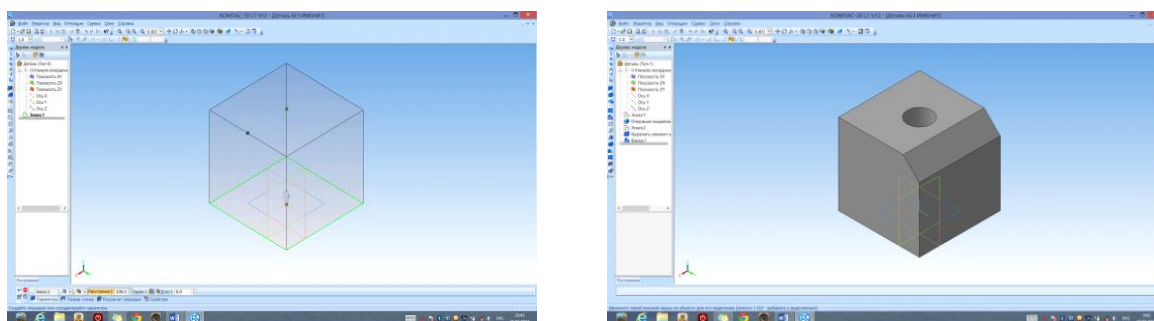Figure 1 - Creating a model in the program "AutoCAD"

Figure 2 - Creating a model in Compass 3D

Every feature of the aforementioned applications has advantages and disadvantages of its own. The techniques for building 3D objects are where KOMPAS-3D and AutoCAD diverge the most. Everything in KOMPAS-3D is built on working with sketches, which are two-dimensional objects with specific attributes and locations on planes. These properties are known as sketch requirements. Basic processes are used to generate three-dimensional things from sketches [7].

The solids library is a tool that AutoCAD utilizes to build and manipulate 3D objects. Using the interface mechanism in KOMPAS-3D, assembly items can be created.

In AutoCAD, objects can be produced independently and exported to a single file; there is no build system. Simple movements in the user coordinate system are used to place objects in relation to one another. It may be claimed that the work in both KOMPAS-3D and AutoCAD is based on the same operations,

such as simple and kinematic extrusion, rotation, cutting, as well as logical processes, despite their variances.

The findings of the study reveal several key insights into the comparative performance of AutoCAD and KOMPAS-3D:

Efficiency and Time: The results indicate that KOMPAS-3D was slightly faster in completing the 3D part, with a difference of 13 seconds in total time compared to AutoCAD. Additionally, KOMPAS-3D required fewer attempts (19 vs. 21) to complete the task, suggesting a more streamlined process for creating parts. However, the time difference may not be substantial enough to significantly influence the choice between the two programs for professional use. The results suggest that the choice between the two may be more influenced by the specific needs of the user and the complexity of the projects they are working on.

Usability and User Experience: KOMPAS-3D was found to have a simpler interface that makes it more accessible for students and less experienced users. The program's use of sketches for 3D modeling can be more intuitive for beginners.AutoCAD, on the other hand, offers a more complex range of tools and is better suited for highly skilled professionals working on detailed and sophisticated designs. The flexibility and advanced features of AutoCAD make it more suitable for large-scale projects, such as those in architectural and mechanical engineering.

Technical Features: KOMPAS-3D's approach to working with sketches, which are two-dimensional objects with specific attributes, makes the design process easier for users new to CAD software. Its ease of use for basic 3D modeling tasks can be an advantage in educational settings or for smaller-scale projects.AutoCAD's more robust library of solid objects and its capabilities in 3D object manipulation offer greater versatility for professional users. However, it requires a deeper understanding of CAD techniques and is less intuitive for novice users.

Suitability for Different Users: KOMPAS-3D's straightforward interface and its educational value make it particularly suitable for students and beginners in the field of design. Its design tools are not as complex, which can simplify the learning process.AutoCAD, with its wide range of features and tools, is better suited for professional designers, engineers, and architects. Its complexity may be a barrier for students or less experienced users, but it is necessary for those engaged in more advanced design and engineering projects.

Limitations and Areas for Improvement: While both programs excel in different areas, AutoCAD may pose a challenge for users working with certain shapes (such as parallelepipeds and cylinders) due to the difficulty of adjusting coordinate axes.KOMPAS-3D has limitations when it comes to handling complex shapes and providing certain views like axonometric projections. This feature is essential for creating specific types of technical drawings, which AutoCAD handles with ease.

Conclusion

After conducting a comparative analysis of these programs, we came to the following conclusion that these programs are indispensable when performing tasks with three-dimensional modeling. But when you zoom out, the following changes occur in the Compass 3D program: so, when creating the main shape on the plane, the sketch parameters change. And when changing coordinate axes in AutoCAD, it becomes difficult to draw shapes such as parallelepipeds, cylinders, cones, etc.

In the AutoCAD program, after familiarizing yourself with the tools on the panel and knowledge of descriptive geometry, you can easily start drawing an axonometric image. And in the Compass program, it is impossible to perform such an operation, since there are no repetitions of contour boundaries in this program.

Based on the above, we conclude that the KOMPAS-3D program is convenient for school students, as it is easy to manage (a simple interface for designing, drawing and printing). And the AutoCAD program is suitable for highly qualified specialists working in design institutes developing projects of residential and industrial buildings for various purposes.

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Мұхтар [Усупов][*1], Қарлығаш Барнаханова[2]

[1,2]М. Дулати атындағыТараз өңірлік университеті, Тараз, Қазақстан

AutoCAD және КОМПАС графикалық редакторларын қолдану

Аңдатпа: Мақалада екі жетекші компьютерлік жобалау жүйелері қарастырылады: AutoCAD және KOMPAS-3D. Зерттеудің мақсаты үш өлшемді модельдеуде қолдану тұрғысынан осы бағдарламаларды салыстырмалы талдау болып табылады. AutoCAD және KOMPAS-3D сәулет, құрылыс, машина жасау және т.б. сияқты әртүрлі салаларда кеңінен қолданылады және екі бағдарлама да кең функционалдылыққа ие, бірақ интерфейс мүмкіндіктерімен, пайдаланудың қарапайымдылығымен және модель құру алгоритмдерімен ерекшеленеді. Эксперимент барысында екі бағдарламада бірдей 3D моделін жасауға жұмсалған уақыт пен әрекеттер саны өлшенді. Нәтижелер KOMPAS-3D қарапайым модельдерді құрудың жылдам әрі ыңғайлы құралы болып табылатынын, оны жаңадан бастаған пайдаланушыларды оқытуға және жұмыс істеуге қолайлы ететінін көрсетті. AutoCAD күрделі интерфейсі мен жұмыс әдістеріне қарамастан, күрделі дизайн тапсырмаларын орындайтын жоғары білікті мамандар үшін қолайлы. Сондай-ақ мақалада компьютерлік дизайн және инженерлік графика саласындағы маңызды аспект болып табылатын пайдаланушы деңгейіне және жұмыс ерекшелігіне байланысты дұрыс бағдарламаны таңдаудың маңыздылығы көрсетілген. Ал AutoCAD-та координат осьтерін өзгерткенде, параллелепипедтер, цилиндрлер, конустар және т.б. фигураларды салу қиынға соғады. AutoCAD-та панельдік құралдарды меңгеріп, сызба геометриясын білетін болсаңыз, аксонометриялық

фигураны салуды оңай бастауға болады. Операция KOMPAS бағдарламасында да қарастырылады, өйткені бұл бағдарламада контур шекараларының қайталануы жоқ.

Түйін сөздер: компьютерлік графика, интерактивті (компьютерлік) оқыту, графикалық бағдарламалар, AutoCAD, KOMPAS.

Мухтар Усупов*[1], Карлыгаш Барнаханова[2]

[1,2]Таразский региональный университет им. М.Дулати,
Тараз, Казахстан

Применение графических редакторов AutoCAD и КОМПАС

Аннотация: В статье рассматриваются две ведущие системы автоматизированного проектирования — AutoCAD и KOMPAS-3D. Целью исследования является сравнительный анализ этих программ с точки зрения их применения в трехмерном моделировании. AutoCAD и KOMPAS-3D широко используются в различных отраслях, таких как архитектура, строительство, машиностроение и другие, и обе программы обладают широкими функциональными возможностями, но различаются по особенностям интерфейса, удобству работы и алгоритмам построения моделей. В ходе эксперимента были измерены время и количество попыток, затраченные на создание одной и той же 3D-модели в обеих программах. Результаты показали, что KOMPAS-3D является более быстрым и удобным инструментом для создания простых моделей, что делает его подходящим для обучения и работы начинающих пользователей. В то время как AutoCAD, несмотря на более сложный интерфейс и методы работы, подходит для высококвалифицированных специалистов, выполняющих сложные проектные задачи. Статья также подчеркивает важность выбора подходящей программы в зависимости от уровня пользователя и специфики работы, что является важным аспектом в сфере компьютерного проектирования и инженерного графики.

Ключевые слова: компьютерная графика, интерактивное (компьютерное) обучение, графические программы, AutoCAD, KOMPAS.

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Авторлар туралы мәліметтер:
Усупов Мұхтар – хат-хабар авторы, техника ғылымдарының кандидаты, доцент, М. Дулати атындағы Тараз өңірлік университеті, көш. Сүлейменов 7, Тараз, Қазақстан.
Барнаханова Қарлығаш – аға оқытушы, М. Дулати атындағы Тараз өңірлік университеті, көш. Сүлейменов 7, Тараз, Қазақстан.

Сведения об авторах:
Усупов Мухтар– автор для корреспонденции, кандидат технических наук, доцент, Таразский региональный университет им. М.Дулати, ул. Сулейменов 7, Тараз, Казахстан.
Барнаханова Карлыгаш – ст. преподаватель, Таразский региональный университет им. М.Дулати, ул. Сулейменов 7, Тараз, Казахстан.

Information about authors:
Usupov Mukhtar – corresponding author, candidate of technical sciences, associate Professor, M.Dulati Taraz Regional University, st. Suleimenov 7, Taraz, Kazakhstan.
Barnahanova Karlygash – senior lecturer, M.Dulati Taraz Regional University, st. Suleimenov 7, Taraz, Kazakhstan.