Graphical Actions in Computer Graphics

Ilyos I Toshev, Sanjar T Naimov, Mukhiddin G Akmalov, Sherali Kh Urinov

Senior lecturer of department "Descriptive geometry and engineering graphics" , Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan
Senior lecturer of department "Descriptive geometry and engineering graphics" , Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan
Assistant teacher of department "Descriptive geometry and engineering graphics" , Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan
Assistant teacher of department "Descriptive geometry and engineering graphics" , Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan

ABSTRACT. This article highlights the types of graphical actions and their role in synchronous automatic drawing construction. The role of computer graphics in the transition to machine design. It is shown that the task "Determining the intersection point of a straight line with a plane" is performed in stages»

KEYWORD: design office, computer, design documentation, drawing, educational institution, KOMPAS-3D, AutoCAD, Solid Works, intersection point, straight line, plane.

I.INTRODUCTION

Now it is difficult to imagine a modern industrial enterprise or design office without computers and special programs designed for the development of design documentation or design of various products. The use of computer technology in this area has become a fait accompli and has proven to be highly effective. Life itself forces business managers and specialists to deal with issues of automation of design and technology departments.

The transition to machine design allows you to significantly reduce the time of development of design and technological documentation and thereby accelerate the start of production of new products [1]. At the same time, the quality of both the design developments themselves and the produced documentation is improved. Drawings of the most competitive products, made by hand at drawing board, today make a negative impression on partners, calling into question the conclusion of profitable contracts.

This situation is also developing in the field of education. Today, higher and secondary special education institutions pay great attention to the use of computer technology in teaching students. Already within the University, students master the most promising design technologies, acquire skills in working with computers and computer graphics systems [2]. The introduction of CAD/CAM systems affects not only students, but also teachers. Creative and initiative people, even in a crisis of higher education, find the opportunity to master computer technologies and use them in the educational process, which opens up a wide scope for various pedagogical innovations.

The development of machine graphics (MG) allowed us to create specialized systems for automated production of drawings. In recent years, personal computers have been widely used for this purpose. They are simple and easy to use, provide sufficient accuracy, the necessary quality of drawings, and ease of making dimensions. This article highlights the types of graphic actions and its role in synchronous automatic drawing construction [3].

At this time, we are aware of software engineering and computer graphics (ICG) as KOMPAS-3D, AutoCAD, Solid Works, etc. But these programs can not be used in the process of graphic training. At Universities, the course" Engineering and computer graphics " is studied by students only after listening to the courses "descriptive geometry and engineering graphics". Experience shows that a PC with a developed MG system allows you to create systems that can be used to teach the basics of descriptive geometry [4].

KOMPAS-3D, AutoCAD, and Solid Works subsystems are designed to automate design work in various industries. It can be successfully used in engineering, architecture, construction, drawing up plans and diagrams-wherever it is necessary to develop and produce drawing and text documentation. They are designed specifically for the MS Windows operating environment and take full advantage of all its features and benefits to provide the user with maximum comfort and convenience in their work. In addition, they are designed to create three-dimensional parametric models of parts and assemblies in order to transfer the geometry to the calculation packages and to the development

packages of control programs for CNC equipment, as well as to create a complete set of design documentation for the product. These subsystems are focused on creating models of specific products that contain both typical and non-standard, unique design elements. Parameterization of three-dimensional models allows you to quickly get standard parts and assemblies based on a prototype once designed.

Therefore, the issue of creating such systems is relevant, since they allow you to quickly solve geometric problems and conveniently explain the stages of performing graphic works; the basics of descriptive geometry, observing the properties of projection and geometric conventions, and also allow you to quickly develop an electronic version of educational materials, and increases efficiency in solving design problems in design and modeling.

The main purpose of the work is to study all the necessary graphical actions that perform the task solution, and their parameters; projection properties and drawing creation systems for creating a database and software development of commands and toolbars.

The novelty of the work lies in the fact that when solving positional or metric problems, first a spatial algorithm is compiled, then a geometric algorithm for solving problems, and on the basis of geometric algorithms, graphical actions are performed in stages. Support for automatic synchronous construction when projecting geometric shapes or solving problems is one of the most important features of computer graphics. In this case, the software is characterized by the fact that all graphical actions are divided into two: the main and dependent types. Dependent actions are performed automatically. To do this, the computer must be able to read the job drawing and the position of the auxiliary plane, and the intersection of planes. The main graphical actions are set in the command view or on the toolbar.

Switching to machine design allows you to significantly reduce the time of development of design and technological documentation and thus speed up the start of production of new products. At the same time, the quality of both the design developments themselves and the produced documentation is improved. Drawings of the most competitive products made by hand at Kulman today make a negative impression on partners, calling into question the conclusion of profitable contracts.

For fig.1 shows the step-by-step implementation of the task "Determining the intersection point of a straight line $a(a'a'')$ with the plane P $(P_H\ R_V)$, changing the drawing on the monitor after setting commands based on the selected main actions. When performing a task, first build a drawing of the task and set the command: "Drawing an auxiliary plane", - select the front-projection plane. And the solution of the problem is automatically displayed on the monitor.

The introduction of auxiliary planes in the process of solving problems can be identified as the main type of graphical actions, because they are used in solving many positional and metric problems. The auxiliary planes should be grouped on the horizontal-projecting and front-projecting planes. In the initial command assignment, these planes appear in the drawing field as a horizontal or frontal plane. With a secondary command assignment, it is moved to the desired position, such as a plane that runs from a given straight line or a plane that runs from a straight line and a point that does not belong to it.
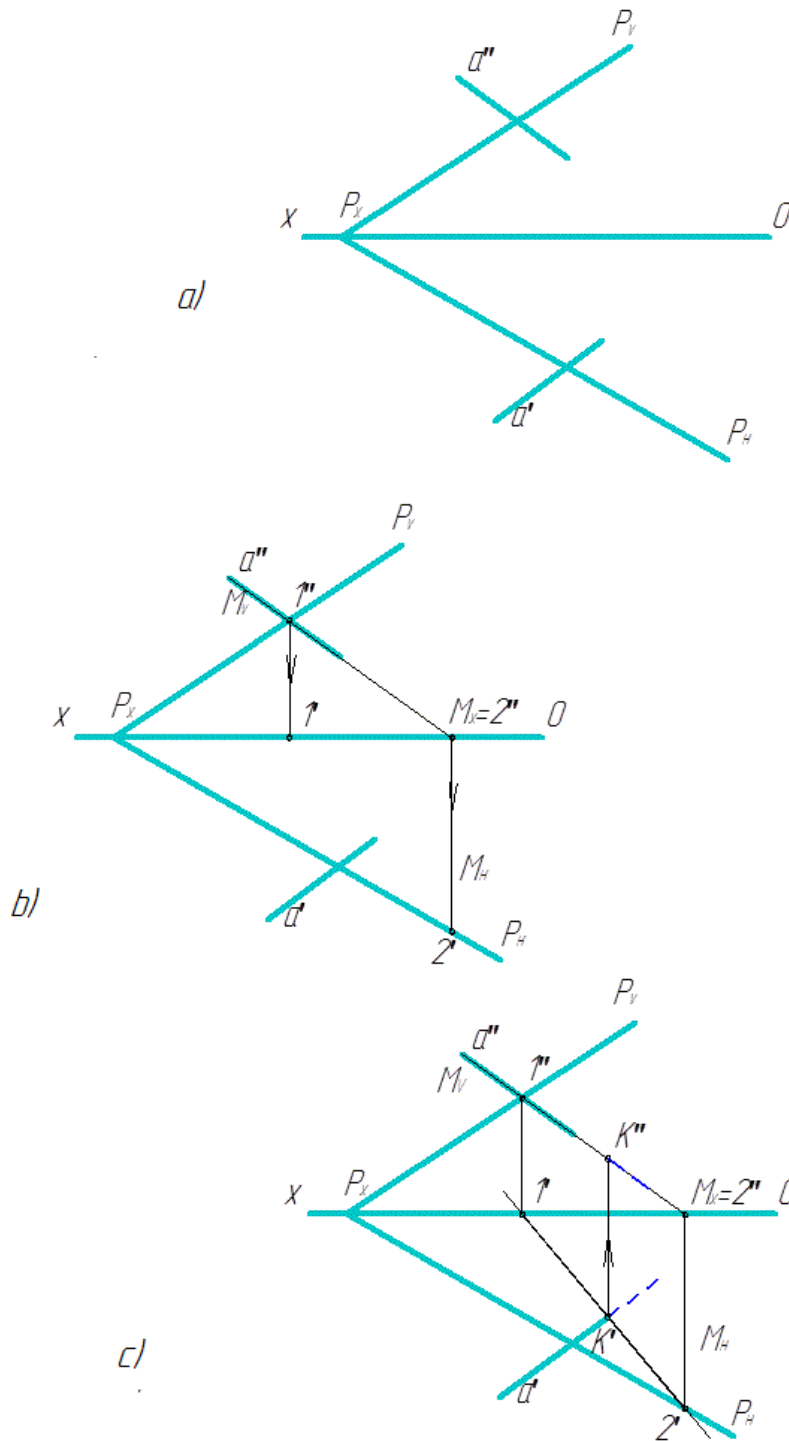
Fig.1. Step-by-step drawing construction.

a)   setting the drawing, b) Holding the auxiliary plane, c) connecting the same projections

When working in KOMPAS-3D or AutoCAD programs, the synchronous automatic relationship is followed only when constructing the projection of objects and in modeling. And when developing geometric problems, these relationships are powerless. In orthogonal projection, each geometric structure on a projection plane must have a synchronous relationship with the following projection planes.

Based on the data, you can offer the following graphical actions (commands).

1. The auxiliary plane.
2. Connections of the same name projections.
3. Drawing a straight line.
4. Rotation.
5. Restrictions and designations of a straight line.
6. Moving values or objects.
7. Determine the sizes or values.
8. Communication line.

II. CONCLUSION

The selected commands not only work for performing geometric constructions, but also meet the requirements of synchronous drawing construction. Based on this system, you can develop a training program for the course "computer graphics Engineering", which includes all the necessary sections of the course "descriptive geometry and engineering graphics".

In automated drawing production, the designer creates the "Electronic" equivalent of a drawing using a graphic display screen and input device instead of pencil and paper. The prepared drawing is written to a magnetic disk. Then it is drawn by a plotter (GP or plotter).

REFERENCES

1. Foley George., Van Dam A. "Fundamentals of interactive machine graphics". M., 1995, 385 p.
2. Rogers D. "Fundamentals of machine graphics". M., "Mir".1996, 503 p.
3. Gordon V. O. et al. "Course of descriptive geometry". Moscow, 1988.
4. Vlasov M. P. "Engineering graphics". M., 1979.