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Investigation Of the Possibilities and Application of The Autocad Software Package for Creating Electronic Versions of Textbooks for The Course "Engineering and Computer Graphics

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Abstract. This article provides examples to show that AutoCAD (Computer Aided Design (CAD)) has been and remains a powerful tool for technical graphics. Since Autodesk is a pioneer in the commercially available CAD market, Autodesk has developed CAD principles (which can be used by relatively untrained users), the nature and scope of commands, the sequence and specifics of their implementation. In terms of technical characteristics, AutoCAD is a complete tool that covers the entire range of functions in the area of the course "Engineering and Computer Graphics".

Keywords: CAD, education, engineering and computer graphics.

Introduction. CAD, design and development of technical documentation using a personal computer are the most important modern means of informatization of design and technological activities, as well as an important part of the information environment in modern production, science and education, especially in higher technical educational institutions. Among these tools related to science and technology, AutoCAD and its modifications occupy an important place [1], [2].

AutoCAD is a powerful tool for automating graphic work on the basis of personal computers. This gives the user capabilities that previously could only be realized on large and expensive computing systems: any hand-drawn drawing can now be built using AutoCAD. AutoCAD is capable of performing almost any graphic work [3], [4]. Thus, it provides high speed and ease of drawing creation and updating, which, in turn, allows you to significantly reduce the need to complete these processes compared to manual drawing. In this regard, the system is widely used, in particular, for such purposes as:

- execution of architectural and engineering drawings;
- interior design and layout of premises;
- production of technological maps and organizational charts;
- production of blueprints for the electronic, chemical, construction, engineering and aerospace industries;
- production of topographic and nautical maps;
- ceiling design;
- graphic and other images of mathematical functions;
- stage design;

However, the capabilities of AutoCAD are not limited to the creation of static drawings. If there are such packages as AutoDescRenderman, 3DStudio, AutodeskAnimator, AnimatorPro, etc. designed for coloring and "animating" a picture, it becomes an effective tool for creating a cinematic effect and demonstrating the interaction of objects [5], [6].

Choice of structure model and boundary conditions. AutoCAD allows you to create more than ordinary drawings. Logically related fragments can be placed on separate layers or grouped into complex objects. And we see them as a whole. AutoCAD "remembers" the position, size, color of the constructed objects and writes this data to the internal database for their subsequent search, analysis and processing. AutoCAD can work with a wide range of personal computers and graphic workstations running various operating systems [7], [8]

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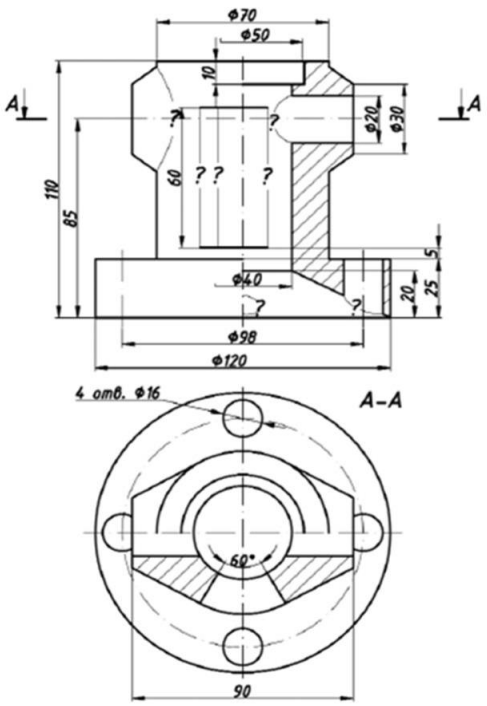

Figure 1. An example of a task.

When used with AutoCAD Civil 3D, AutoCAD Map 3D, and Autodesk Topobase ™, AutoCAD Raster Design provides tools for displaying and analyzing georeferenced images. The ability to receive and use geographic data from various sources allows us to easily and efficiently edit raster images, visually analyze and process spatial images. The program allows you to use images provided by central and local government agencies via the Internet or on CD in the popular Lizard Tech ECW and MrSID formats. We can insert a digital globe.

- Quick Bird satellite imagery, Landsat-FAST multispectral imagery, and National Image Transfer Format (NITF) imagery to projects.
- holding the projection axes, dividing the drawing field into four equal parts; carrying out the bisector by the polar method.
- assignment in relative coordinates;
- drawing an axis of symmetry for three views, halving a quarter of the drawing field;
- Using the Endpoint, Midpoint, Center, and Intersection snap-ins, creating a circle from the base of the cylinders in the top view, and then other projections from the front and left using the Offset tool;
- drawing the center line of a truncated cone at the top of the array and building its projections in three views using the Offset tool and tangential fixation (for a top view);
- drawing a circle at the top where the centers of the cylindrical holes are located based on the template, and creating the holes using the Array tool in polar mode
- (Figure 2).

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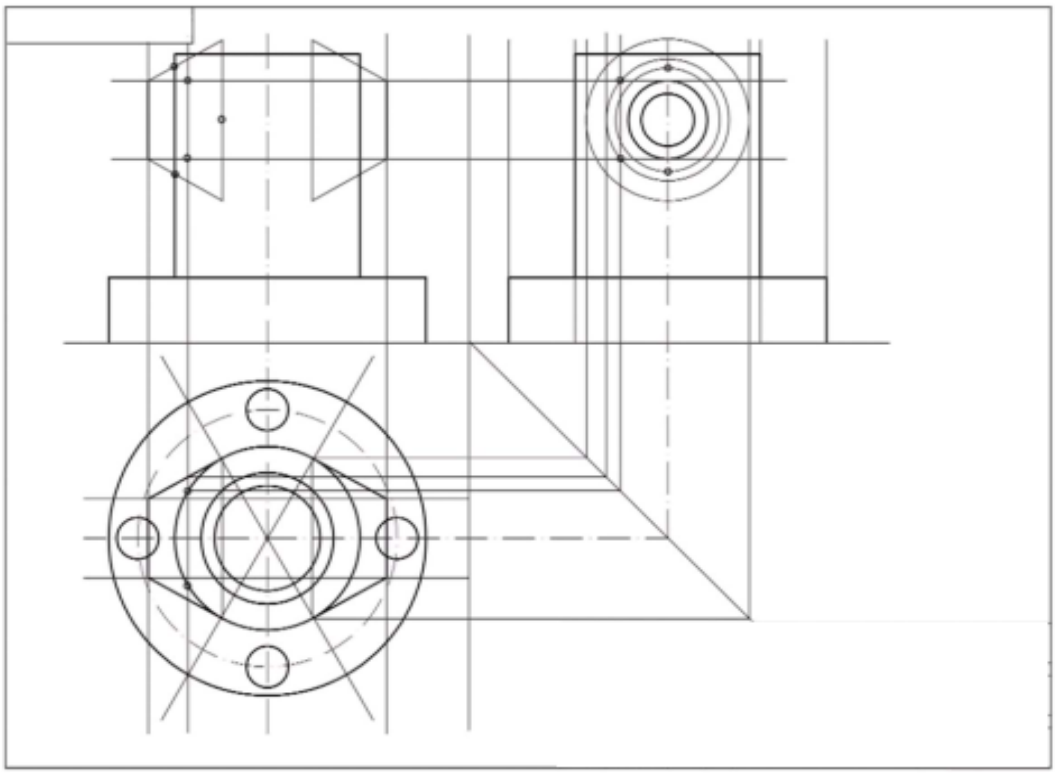

Figure 2. Construction of the third type and definition of intersection lines.

Construction of lines of intersection of surfaces:

- determination of points of intersection of a truncated cone with a cylinder by the method of auxiliary section planes (frontal projection), construction of these points on the left side of the front view and on the left side of the view;
- after drawing the required number of points, connect them with a smooth curve using the Spline tool, and then delete the auxiliary lines (Fig. 2.).

Building a section in front and top view:

- build a slot on the right side of the front view;
- determination of the starting point of intersection of a cylindrical hole inside a truncated cone in the front form with a through cylindrical hole inside the part;
- efining the starting point for the intersection of the cylindrical hole at the base of the part with the inner hole in the form of a frusto-cone in the front view;
- determination of the boundary points of the protrusion of the cylindrical hole (along the center line) in the inner part of the base;
- connection about the points of intersection of a smooth curve (in three places where there were question marks) using the Spline tool, delete construction lines (Figure 3).

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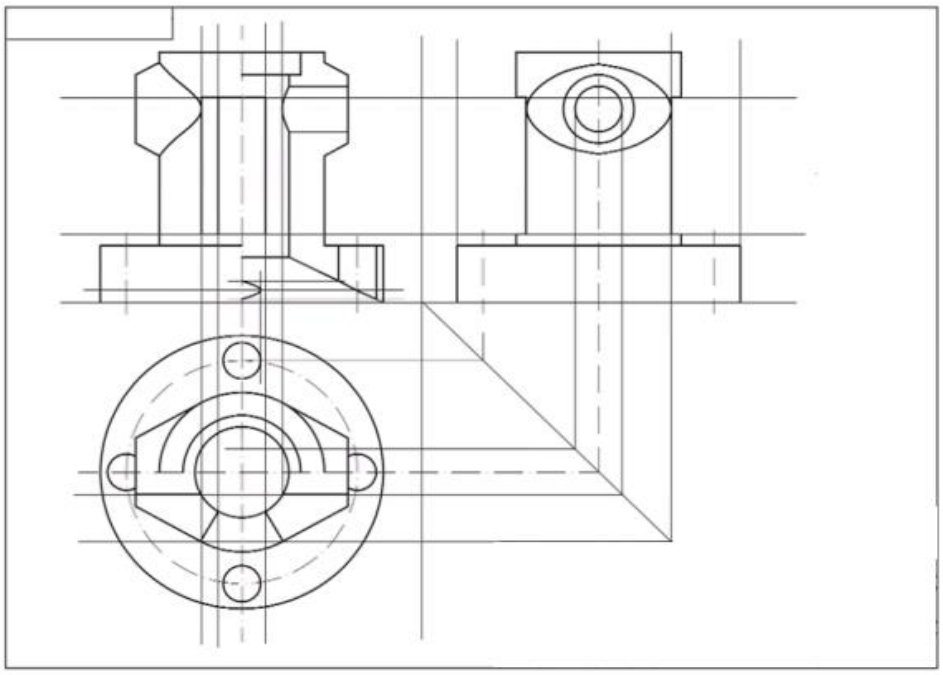

Figure 3. Construction of intersection lines.

Construction of a given horizontal section in the top view and a through prismatic hole in all images:

- building a horizontal section from above on the plane of the section A-A;
- construction according to the given sizes of protrusions through a prismatic aperture in front and left views;
- dismantling of auxiliary structures;
- using the hatch tool, shade cross-sectional shapes in the images, making sure they are closed;
- with an indication of the position of the section plane A-A and the elevation of the section (text layer).
- using the Dimension Style tool to adjust the parameters;
- size with the Size tool;
- saving the drawing and printing it (Figure 4.).

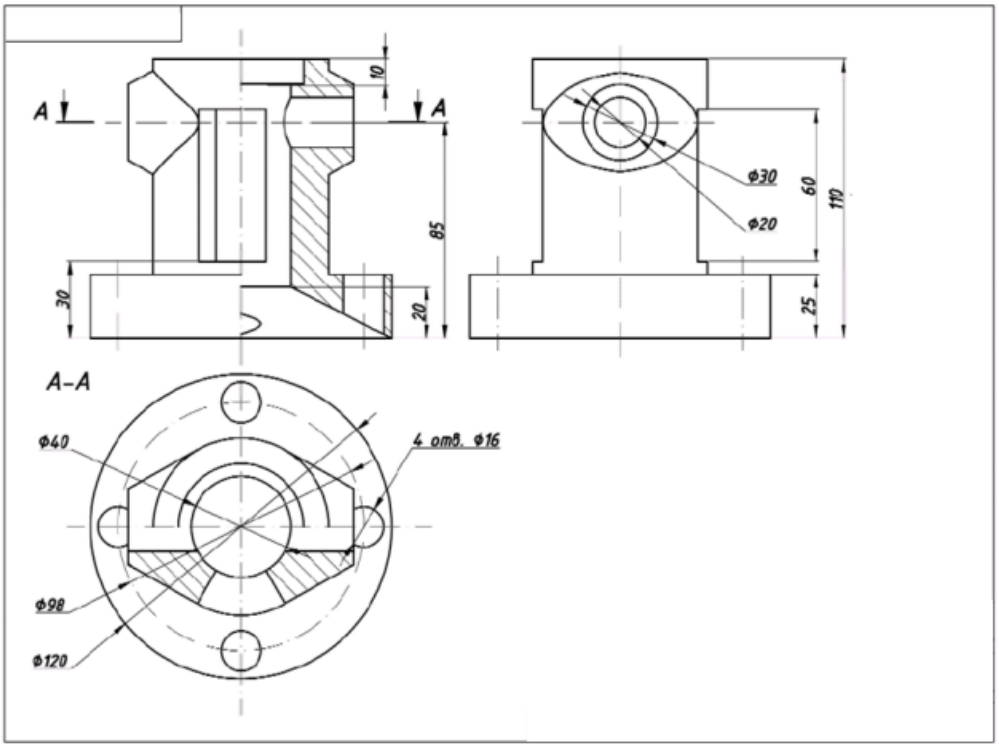

Figure 4. Finished drawing of a part of the "Housing" type.

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Conclusions. The examples reviewed show that AutoCAD was and remains a powerful tool for technical drawing. In this regard, the system has the widest application and is used for the following purposes:

- execution of architectural and engineering drawings;
- interior design and layout of premises;
- production of technological maps and organizational charts;
- production of blueprints for the electronic, chemical, construction, engineering and aerospace industries;
- production of topographic and nautical maps;
- ship design;
- graphical and other representations of mathematical functions;
- stage design;
- recording of notes;
- production of technical illustrations and diagrams, trademarks and logos, greeting cards, as well as other art and graphic works;
- from a technical point of view, AutoCAD is a full-fledged tool that covers the entire range of works in the discipline "Engineering and Computer Graphics".

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