

APPLICATION OF CAD / CAM SYSTEM FOR FINDING INTERSECTION OF GEOMETRIC OBJECTS IN THE LEARNING PROCESS

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Abstract: This work is predstaveno decision of task of finding the intersection of geometric objects with the use of CAD / CAM systems in particular graphical programming environment Autocad .. The problem is solved by the method of auxiliary secant planes. Based on the studies and analyzes on resolving this type of geometric tasks is summarized methodology for finding the intersection between the two geometric objects. The process of the graphic finding the intersection by using the CAD / CAM system is illustrated step by step on the basis of the methodology.

Keywords: GEOMETRIC OBJECT, METHODS, CAD / CAM, LINE OF INTERSECTION

1. Introduction

The actual units are usually built of parts of geometric bodies. When viewing them receive limited lines crossing each other and contours. Most - great interest in the depiction of faces and bodies are lines like sections and surfaces. These lines are essential for certain technical applications, when searching the shape and dimensions of the surfaces, for example the construction of flat patterns. It is allowed in some cases complicated to build lines of intersection can be displayed approximately. The way to solve these tasks depends on the location of geometrical objects relative to the projection planes and their form. The process of finding a graphic projections of the common elements of intersecting geometric objects through various stages, including reading assignment and build a mental image of the spatial geometric objects and auxiliary geometric elements (lines, secant planes, etc.) Needed for solving mission. This often difficult to beginners in engineering graphics. Using CAD / CAM system for finding the points and the intersection of geometric lens significantly facilitates this task [1]. Formulated above problem is solved by using the graphical programming system AutoCAD, which allows for viewing of objects from different angles, off parts of objects, displaying objects in different views, creating three-dimensional images. The tasks of the graphical construction of the projections of the common elements (dots or lines of intersection) are solved by known literature methods.

Developed dozens of examples of finding the points or the intersection of various geometric objects - lines, planes, rotary and angular surfaces. With AutoCAD graphics system is presented the process of finding the intersection between the two geometric objects using the method of auxiliary secant planes. The process is illustrated step by step on the basis of the presented methodology.

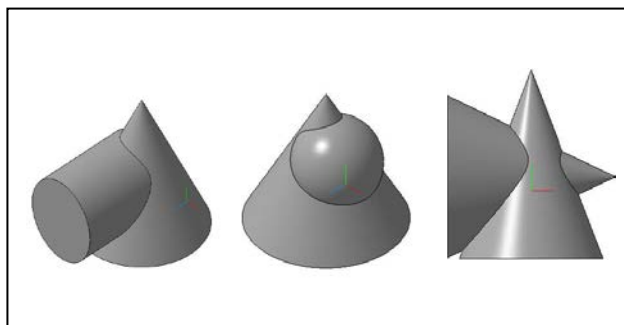


Fig. 1 Three-dimensional images of intersecting solid of revolution:
a) cone and cylinder; b) cone and sphere b) cone and the cone

2. Methods for the construction of the line of intersection of the geometrical objects

2.1. Methodology for the construction of the intersection of geometric objects by the method of auxiliary secant planes in graphical programming environment Autocad. The projections of the intersection is built in points (1, 2, 3, 4,5) belonging

simultaneously to both surfaces. To find such points in the series at - generally used auxiliary secant planes i.e. intermediary. Can distinguish the following stages:

2.1.1. Analysis of the body - the body is examined from what surfaces is made, what is their relationship and their position relative to the projection plane.

2.1.2. Enter series auxiliary secant planes.

2.1.3. Designate points of the intersection, obtained without any additional constructions.

2.1.4. Located intersection of the secant with surfaces default.

2.1.5. The intersections of the lines are found points connected line of intersection.

2.1.6. Merging intersections and analyzes visibility.

2.2. Condition of the task: to build the intersection of geometric objects - hemisphere and cone with the software Autocad based on formulated - above methodology.

To find the intersection (each line of intersection) of the two bodies had been used method auxiliary secant planes whose planes are parallel to the horizontal plane π_2

The method of auxiliary secant planes comprises the following:

2.2.1. Construction of the two projections π_1 and π_2 task in the sizes Fig.2.

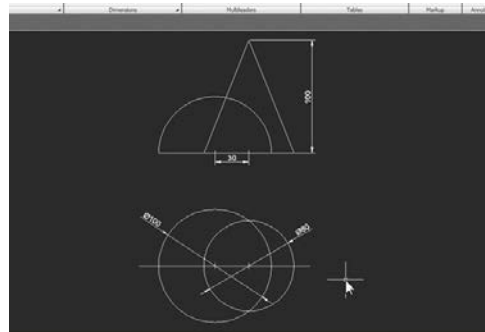


Fig. 2

2.2.2. Selects a random number secant planes planes parallel to the horizontal plane of projection, shown in Figure 3

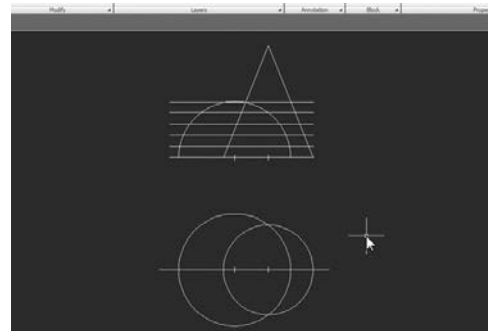


Fig. 3

2.2.3. Secant planes intersect the cone in circles with radii corresponding starting t.O top view (Figure 4).

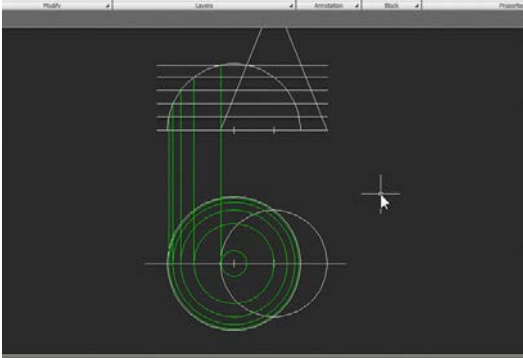


Fig. 4

2.2.4. Located projections of the basic points in the horizontal projection plane in ordinala and mean index 2. Located projections and other points in $\pi 2$.

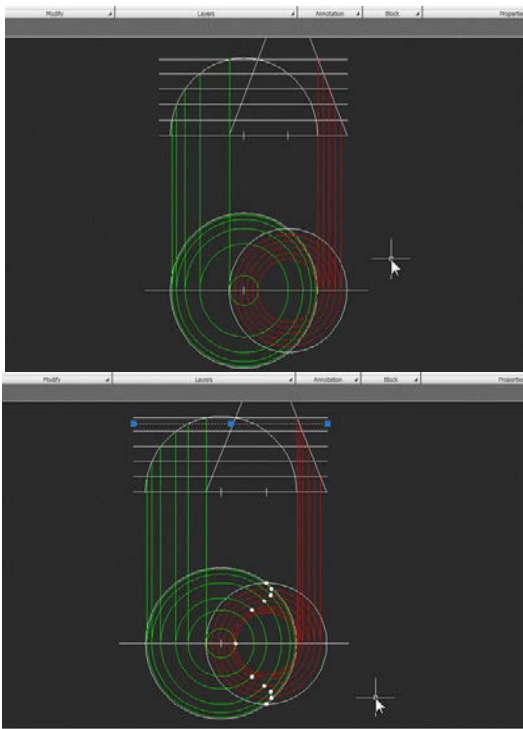


Fig. 5

2.2.5. Connecting the points obtained by using the command Spline, obtain approximate line of intersection of two surfaces in top view Figure 6.

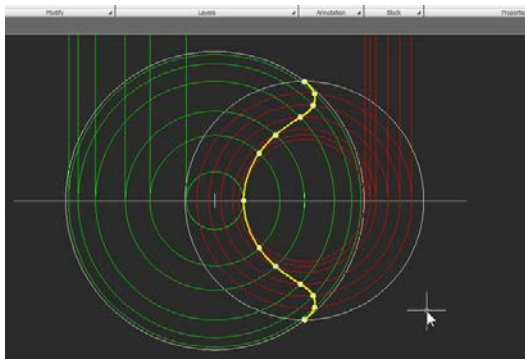


Fig. 6

2.2.6. To get the intersection in the frontal projection plane raise the points ordinala respective planes and receive the projections of points in $\pi 1$. Construction of the points shown in yellow in Fig. 7.

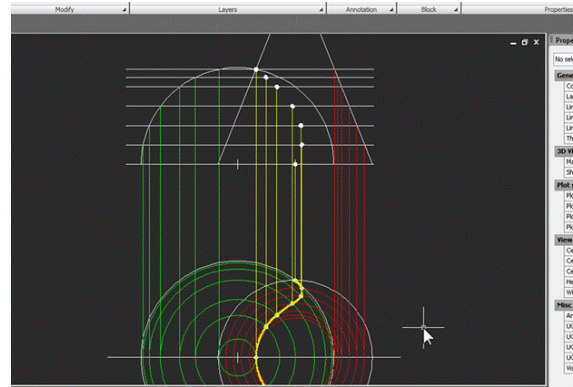


Fig. 7

2.2.7. Connecting the Dots and receiving line in $\pi 1$ (figure 8).

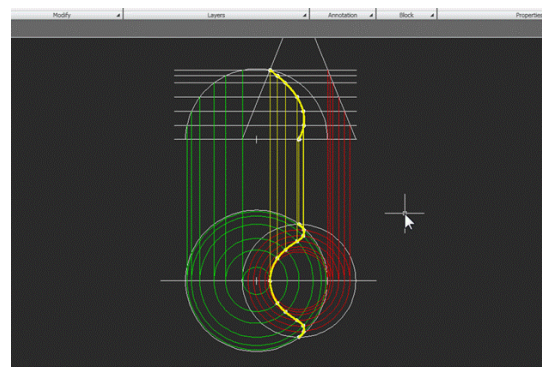


Fig. 8

2.2.8. Option in the software 3D Modeling allows to check the correctness in the construction of the intersection of the geometries shown in Figure 9 in front view and top.

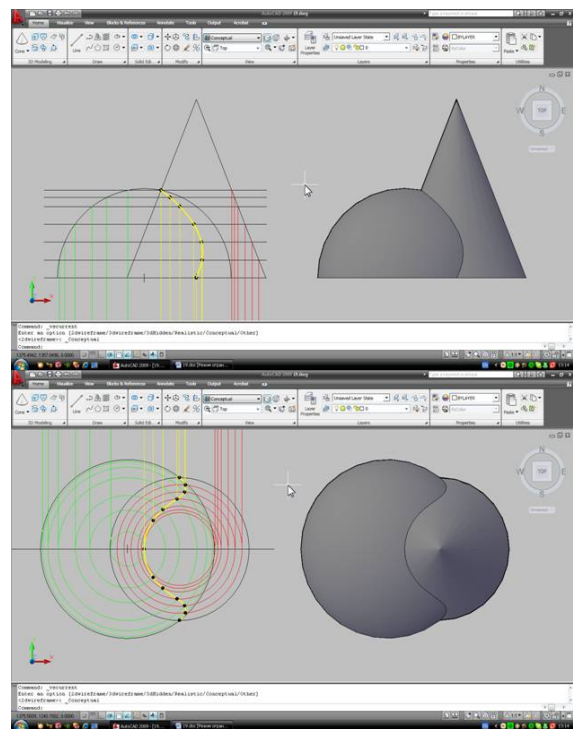


Fig. 9

3. Conclusion

Based on the application of CAD / CAM system for finding the points and the intersection of two geometric objects in the learning process can draw the following conclusions:

1. The tasks of mutual crossing of geometric objects belong to the position tasks. In their search for an item is a line belonging to both of the two geometric objects.
2. By AutoCAD graphics system creates three-dimensional geometric models, which contributes to a better absorption of the tasks of this kind through their visualization.
3. 3D modeling of geometric objects helps to accurate and clear visualization of search sections.

4. References

[1]. Nikolov N. Trimino presentation using a computer task to find the points and the intersection of geometric objects in the

- drawings. Scientific University of Rouse, 2010, Vol. 49 Series 4
- [2]. Sandalski B. Goranov P. and others. Applied geometry and engineering graphics. Sofia, 2006.
 - [3]. autocad-lessons.ru
 - [4]. Sandalski B. Goranov P. and others. Applied geometry and engineering graphics. Sofia, 2006.
 - [5]. Reshetov AL, Karmanova VN etc .. Inzhenernaya graphics. Kontrolnyble assignments nachertatelnoy geometries and chercheniyu. Chelyabinsk. 2012.

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