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CREATING OF THE PRIMITIVE SHAPES USING AUTOCAD

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ABSTRACT

AutoCAD is one of the most popular graphics programs that was created for the production of technical drawings in the 2d and 3d with a high precision. In this paper we have presented the basic primitives which can be found with 3D command. We have also mentioned some commands that belong to the Modeling bar. From these the following ones can be remarked: Polysolid, Helix and Planar Surface.

KEYWORDS: AutoCAD, Polysolid, Modeling, 3D command, Dish, Dome.

1. Introduction

The AutoCAD software appeared in 1982 and eversince it has undergone different developments until today. We will in the main specify only: some of its main advantages: improving the drawings quality and shortening the projection time; special facilities for objects creating in 2D and 3D space; the possibility of giving objects the properties of being colored, hidden, shaded or rendered; automatic objects extracting from three-dimensional space to bi-dimensional space [1].

In AutoCAD, there are two types of surfaces:
- surfaces whose representation is based on primitive shapes: Box, Cone, Dish, Dome, Mesh, Pyramid, Sphere, Torus and Wedge. These surfaces can be generated by the 3D command or Modeling bar;
- surfaces which consist of rectangular network topology, generated by the command 3DMESH.

In this paper, we will present the primitive shapes that we can use to work with in 3D.

2. The primitive shapes with AutoCAD

The 3D command allows creating of three-dimensional polygon mesh objects in common geometric shapes that can be hidden, shaded, or rendered. This can be accessed from toolbar Modeling (Fig. 1) or from the prompt command.

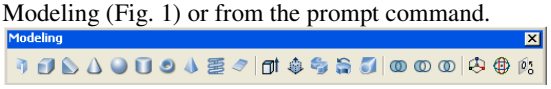

Fig.1 The Modeling toolbar

The POLYSOLID command (Fig.2.a, b) has been available since AutoCAD 2007 being frequently used for creating 3D solid entities. By using this command, we can draw solid entities that are in forms of polylines that have constant width and height [3, 4].

Command: POLYSOLID
Height = 4.0000, Width = 0.2500, Justification = Center
Specify start point or [Object/Height/Width/Justify] <Object>: <Enter> (we will select two entities from figure 2.a);
Select object: <Enter> (the operations of selecting will be closed as shown in figure 2.b).

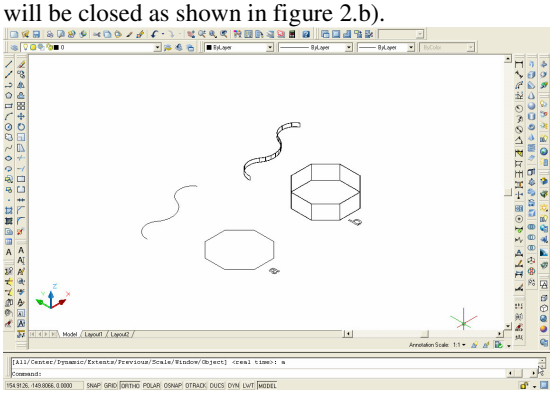

Fig. 2. a, b The POLYSOLID command

The BOX command allows creating a rectangular or cubical solid box (Fig. 3).

Command: BOX
Specify first corner or [Center]: we can specify a point or will enter C for center;
Specify other corner or [Cube/Length]: we will specify the other corner of the wedge or enter an option.

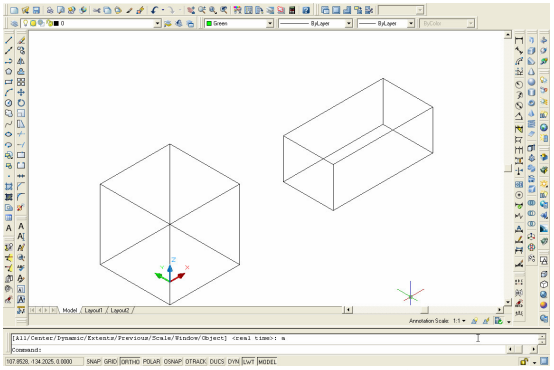

Fig. 3 The BOX command

The WEDGE command creates 3D solid wedge as shown in figure 4. The WEDGE syntax is similar to the BOX command.

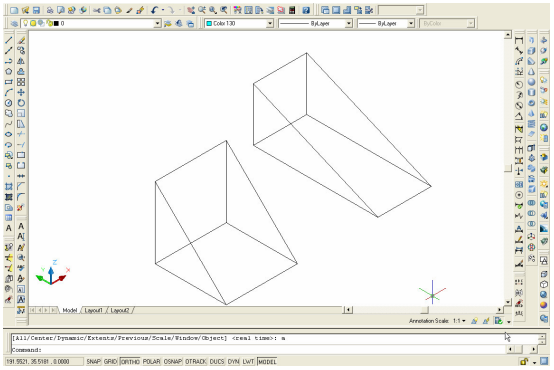

Fig. 4 The WEDGE command

The CONE command allows drawing some cones and trunks, as shown in figure 5.
Command: CONE
Specify center point of base or [3P/2P/Ttr/Elliptical]: we will specify a point or can enter an option;
Specify base radius or [Diameter] <default>: will be specified a base radius, will be enter D to indicate a diameter, or press Enter to specify the default base radius value;
Specify height or [2Point/Axis endpoint/Top radius] <default>: will be specified a height, will be entered an option, or can be pressed Enter to specify the default height value.

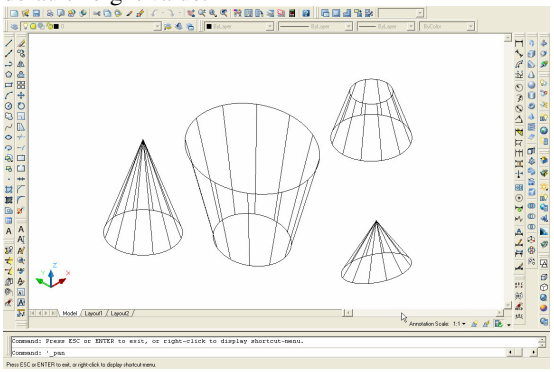

Fig. 5 The CONE command

The CYLINDER command allows drawing cylinders with a circular or elliptical base (see Fig. 6).
Command: CYLINDER
Specify center point of base or [3P/2P/Ttr/Elliptical]: will be indicated a center point or will be entered an option;
Specify base radius or [Diameter] <default>: will be specified a base radius, or will be entered D to specify a diameter, or will be pressed Enter to specify the default base radius value;
Specify height or [2Point/Axis endpoint] <default>: will be specified a height, can be entered an option, or can be pressed Enter to specify the default height value.

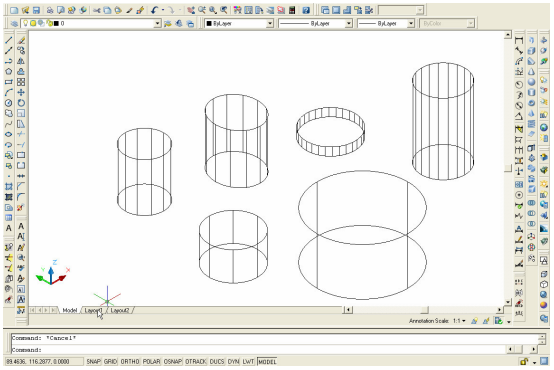

Fig. 6 The CYLINDER command

The TORUS command creates a torus based on center point, radius and tube radius (see Fig. 7).
Command: TORUS
Specify center point or [3P/2P/Ttr]: will be specified a point or can be entered an option;
Specify radius or [Diameter] <default>: will be specified a distance or can be entered D;
Specify tube radius or [2Point/Diameter] <default>:

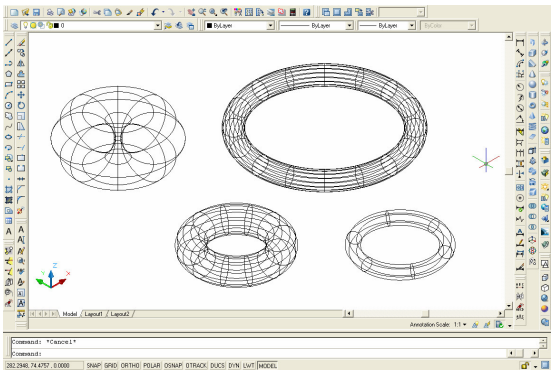

Fig. 7 The TORUS command

The SPHERE command allows creating a solid sphere from a center point and radius (see Fig. 8).
Command: SPHERE
Specify center point or [3P/2P/Ttr]: will be specified a point or can be entered an option;
Specify radius or [Diameter] <default>: will be specified a distance or can be entered D.

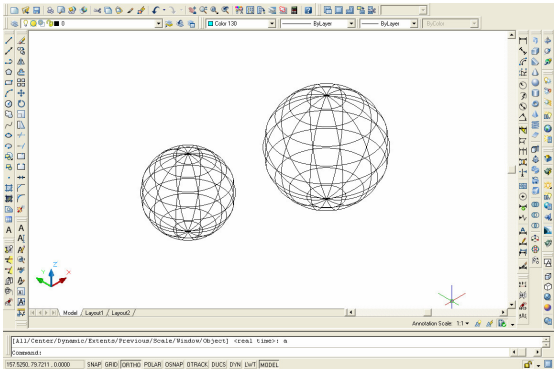

Fig. 8 The SPHERE command

In the 3D command, there are also the Dish, Dome and Mesh options.

The DISH option allows the construction of a hemisphere, positioned with the convex up part like a ship. The DOME option permits the creation, of a hemisphere, positioned with the convex down to give the impression of domes [5].

Command: 3D
Enter an option [Box/Cone/DIsh/DOme/Mesh/Pyramid/Sphere/Torus/Wedge]: DI
Specify center point of dish: will be specified a center point of dish;
Specify radius of dish or [Diameter]: will be indicated a radius of dish or can be entered D to specify a diameter;
Enter number of longitudinal segments for surface of dish <default>:
Enter number of latitudinal segments for surface of dish <default>: will be specified a number of longitudinal/latitudinal segments for surface of dish.

DOME option syntax is similar to DISH option which was presented above.

Figure 9 shows two examples made with the options Dome and Dish.

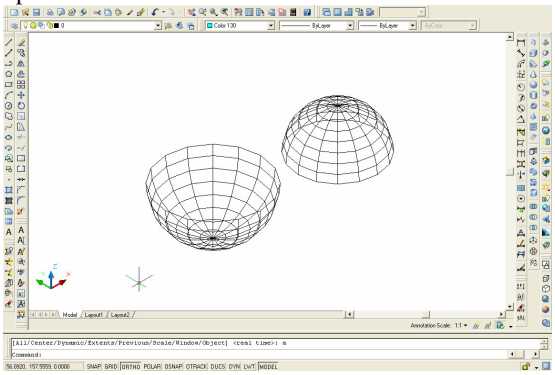

Fig. 9 The Dish and DOme options

We will continue with option mesh from 3D command.

The MESH option can create a planar mesh whose M and N sizes determine the number of lines drawn in each direction along the mesh as shown in examples from figure 10).

Command: 3D
Enter an option [Box/Cone/DIsh/DOme/Mesh/Pyramid/Sphere/Torus/Wedge]: M
Specify first corner point of mesh: will be specified first corner point of mesh;
Specify second corner point of mesh: will be specified second corner point of mesh;
Specify third corner point of mesh: will be specified third corner point of mesh;
Specify fourth corner point of mesh: will be specified fourth corner point of mesh;
Enter mesh size in the M direction: can be entered a value between 2 and 256.
Enter mesh size in the N direction: can be entered a value between 2 and 256.

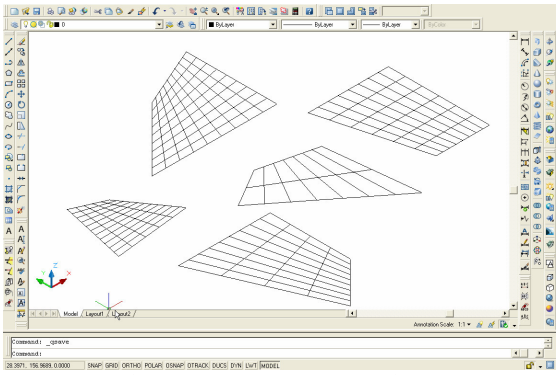

Fig. 10 The PYRAMID options

The PYRAMID option allows creating a pyramid or tetrahedron as illustrated in figure 11.

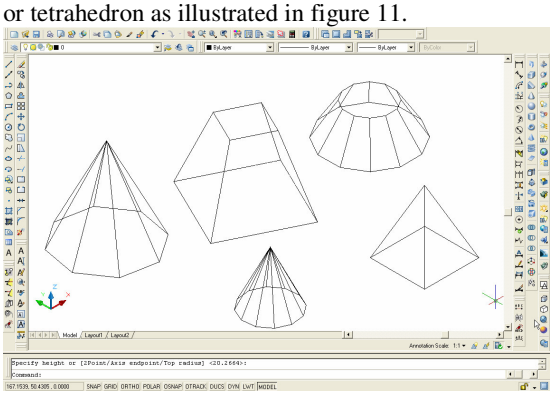

Fig. 11 The PYRAMID command

Command: 3D
Enter an option [Box/Cone/DIsh/DOme/Mesh/Pyramid/Sphere/Torus/Wedge]: P
Specify first corner point for base of pyramid: will be first corner point for base of pyramid;
Specify second corner point for base of pyramid: will be second corner point for base of pyramid;
Specify third corner point for base of pyramid: will be third corner point for base of pyramid;
Specify fourth corner point for base of pyramid or [Tetrahedron]: will be fourth corner point for base of pyramid;

Specify apex point of pyramid or [Ridge/Top]: will be specified the location for the type of pyramid's top: an apex, ridge, or a top.

The HELIX command can be found in Modeling bar and creates a 2D or 3D spiral as shown in examples from figure 12.

Command: HELIX

Number of turns =3 (default) Twist=CCW (default)

Specify center point of base: will be indicated a center point of base;

Specify base radius or [Diameter] <1.000>: will be specified a base radius, can be entered D to specify the diameter, or can be pressed ENTER to specify the default base radius value;

Specify top radius or [Diameter] <1.000>: will be specified a top radius, can be entered D to specify the diameter, or can be pressed ENTER to specify the default top radius value;

Specify helix height or [Axis endpoint/Turns/turn Height/tWist] <1.0000>: will be specified a helix height or can be entered an option.

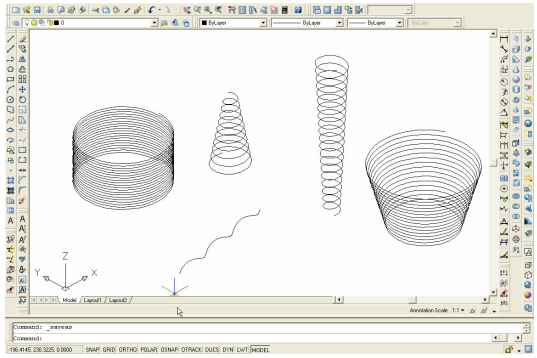

Fig. 12 The HELIX command

The PLANAR SURFACE command can be found in Modeling bar and creates a planar surface as shown in examples from figure 13.

Command: PLANESURF

Specify first corner or [Object] <Object>: will be specified the first point for the planar surface;

Specify other corner: will be specified other corner for the planar surface.

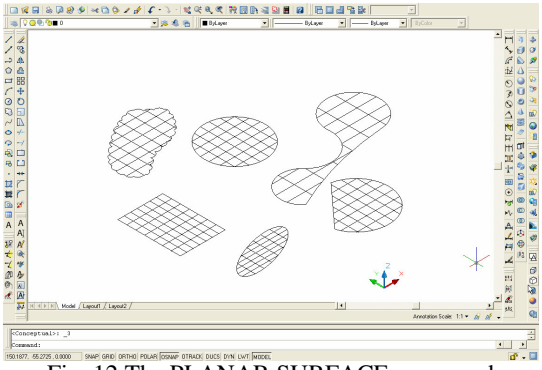

Fig. 12 The PLANAR SURFACE command

The SURFU and SURFV system variables control the number of lines displayed on the surface.

The ISOLINES variable specifies the number of contour lines on objects surface. This number can be valid only when there are whole numbers from 0 to 2047.

In figure 13 are presented some primitive shapes mentioned in this paper. In this case, we wanted to realize a more realistic image, applying the REALISTIC VISUAL STYLE command that is found in the Visual Styles toolbar.

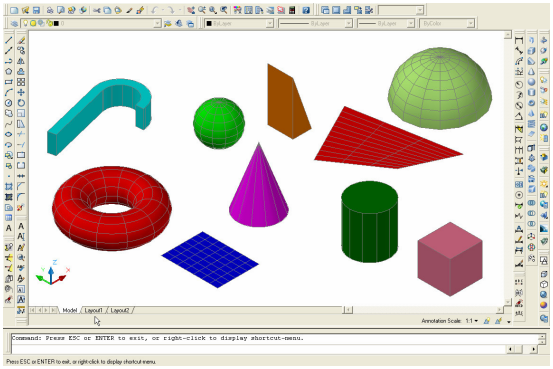

Fig. 13 The primitive shapes with the REALISTIC VISUAL STYLE command

4. Conclusions

The AutoCAD is a power also graphics program that helps users to create simple or complex shapes in bi-dimensional or three-dimensional space [2].

This paper presents some examples concerning basic primitives using 3D command in AutoCAD software. Of these we mentioned: Box, Cone, Cylinder, Sphere, Dish, Dome, Torus, Pyramid, Wedge and Mesh [2, 4]. This paper was also concerned with three commands that we can find in the Modeling toolbar called: Polysolid, Helix and Planar Surface. So, a solid object is easier to construct and will be the entire volume of an object.

References

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