Ana - Maria TOMA, Irina IGNĂTESCU MANEA, Oana NECULAI

AUTOCAD CAN BE FUN!

Abstract: *This article describes a fun way to teach AutoCAD, including some of the commands in creating a fun, animated landscape. In this way, the students are able to pay attention to the presentation because the idea catches their eye, the drawing being fun, easy to fallow and giving them interesting ways to express themselves through AutoCAD 3D. The idea is to teach the students some of the commands, linking them together, by creating a story like animation, which takes the viewer from basics to more advance features of AutoCAD, both 2D and 3D.*

Key words: *AutoCAD 3D, video, animation.*

1. INTRODUCTION

In our university, Technical University of Iasi, in the first or second year of study (depending of the faculty), the students make contact for the first time with the object entitled Computer Assisted Graphics, which teaches Technical Drawing using a graphic software, in this case, AutoCAD. Some of the students, before coming to the University, they've never used a technical drawing software before. Teaching them about computer graphics is a joy and a challenge sometimes, because we have, here the opportunity for the students to really enjoy this part of their formation, as engineers. Learning about a new software and how to properly use it, including for some of the students technical drawing notions, it can be an interesting challenge for the teacher. In some of the faculties, AutoCAD is taught combining technical drawing with the computer assisted graphics, in the same topic of study, for example for the students from the Faculty of Automatic Control and Computer Engineering.

But, is it Auto Cad fun to use? How to teach Auto Cad commands in the most interesting way for students?

The authors thought of designing a tool for teaching Auto Cad commands in the most attractive way possible, because students nowadays are very active, they are used to computers, animations and interactive teaching since they were little children. They are the generation of "computer" kids, touch screen phones, playing computer games and their brain function at a much higher speed. Their attention span is shorter due to this almost constant screen time. Taking all of this into account, there is a need to capture their attention through things different from everyday life, sometimes even trivial, but also out of the ordinary.

2. CONTENT

In introducing Computer Graphics to students, it was used AutoCAD 2018 software and presented the fallowing commands, as intended: SPLINE, OFFSET, HATCH, REVOLVE, COPY, POLYGON, POLYSOLID, CONE, ANIPATH. There was a combination of 2D and 3D work and, in the end, an animation was created. The main objective was to show students how to use the commands listed above by integrating them into execution of a simple drawing, a landscape.

SPLINE (Command) creates a smooth curve that passes through, or near, a set of fit points, or that is defined by the vertices in a control frame (Figure 1). Splines are defined either with fit points, or with control vertices. By default, fit points coincide with the spline, while control vertices define a control frame. Control frames provide a convenient method to shape the spline. Each method has its advantages [1].

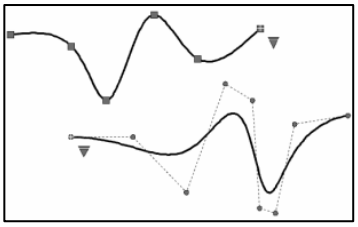

Figure 1 Smooth curve.

POLYGON (Command) creates an equilateral closed polyline (Figure 2). It needs the user to specify the number of sides of the polygon and whether it is inscribed or circumscribed.[1]

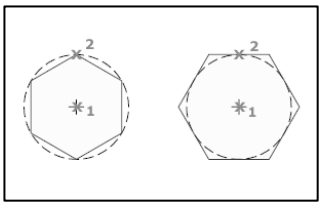

Figure 2 Equilateral closed polyline.

OFFSET (Command) creates a geometric object that is parallel or concentric to the selected object at a specified distance (Figure 3).

For example, if you offset a circle or an arc, a larger or smaller circle or arc is created, depending on which side you specify the offset. If you offset a polyline, the result is a polyline that is parallel to the original [1].

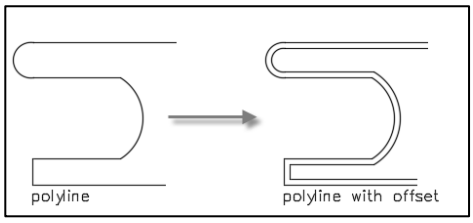

Figure 3 Polyline with offset.

REVOLVE (Command) creates a 3D solid or surface by sweeping an object around an axis (Figure 4). Revolve path and profile curves can be: open or closed; planar or non-planar; solid and surface edges; a single object or a single region [1].

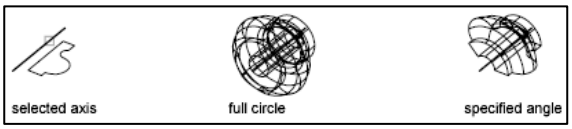

Figure 4 Using the REVOLVE command.

CONE (Command) creates a 3D solid with a circular or elliptical base that tapers symmetrically to a point or to a circular or elliptical planar face. The smoothness of 3D curved solids, such as a cone, in a shaded or hidden visual style can be controlled with the FACETRES system variable. Initially, the default base radius is not set to any value. During a drawing session, the default value for the base radius is always the previously entered base radius value for any solid primitive (Figure 5).

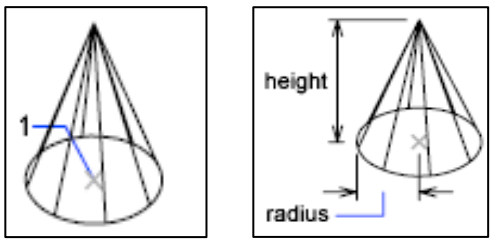

Figure 5 Defining a cone.

POLYSOLID (Command) creates a 3D wall-like polysolid. With the POLYSOLID command, one can convert an existing line, 2D polyline, arc, or circle to a solid with a rectangular profile. A polysolid can have curved segments, but the profile is always rectangular by default (Figure 6) [1].

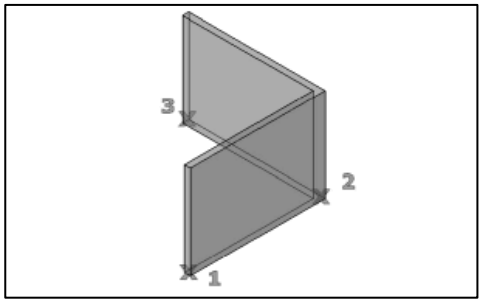

Figure 6 Rectangular profile.

ANIPATH (Command) saves an animation of a camera moving or panning in a 3D model [1].

In a Motion Path animation, one might control the camera motion by linking the camera and its target to a point or a path. To create an animation using motion paths, one needs to link the camera and its target to either a point or a path. If one would want the camera to remain still, it must be linked to a point. If the camera is needed to move along a path, it has to be linked to a path.

In order to link a camera or target to a path, one must create the path object before the motion path animation is created. A path can be a line, arc, elliptical arc, circle, polyline, 3D polyline, or spline.

In order to create the drawing, 5 layers were set (Figure 7):

- Layer, which is preset, has the color brown, line type continuous and thickness 0.30.
- The second layer was named br (trees), has the color green, line type continuous and the thickness 0.30.
- The third layer was called the path (path), has the color red, line type dash dot line and the thickness 0.00.
- The fourth layer was called acop (roof), color is yellow, the line type is continuous and the thickness 0.00.
- The fifth layer was called snow (snow / snow), has the color blue, the line type is continuous line and the thickness 0.35.

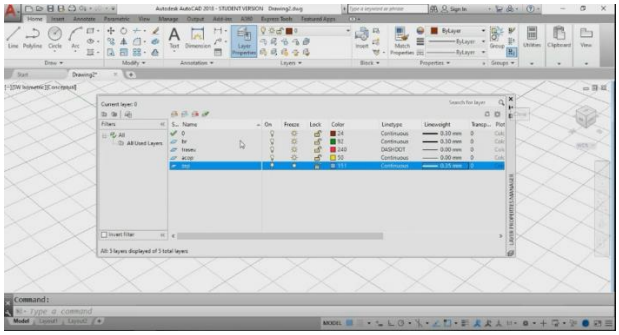

Figure 7 Establishing the 5 layers.

A workspace in the form of a circle with a radius of 20 m was set from the beginning, in order to establish an area for the winter scenario. For the route of the moving camera, a circle with a radius of 30 m at a height of 22 m was drawn (Figure 8).

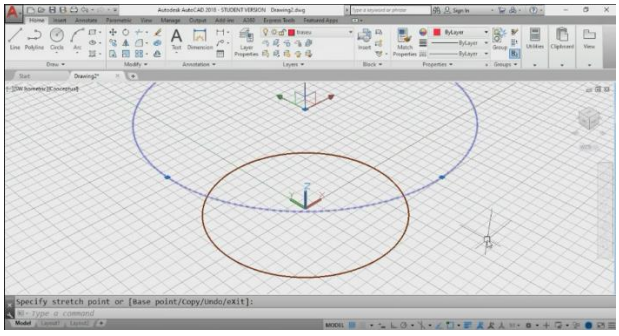

Figure 8 Route of the moving camera.

On the surface of the first circle, on the lower horizontal plane, there were drawn the elements of the winter scenario. First, the alley crossing the little park, was created with the help of SPLINE command. The width of the route is set to be of 2 m and is done with OFFSET command. For the pavement of the alley, HATCH command was used, and *Angle* pattern was chosen, at a scale of 1.00.

The rest of the area was considered to be covered in snow and for hatching pattern *AR-CONC*, at a scale 0.3 was chosen (Figure 9).

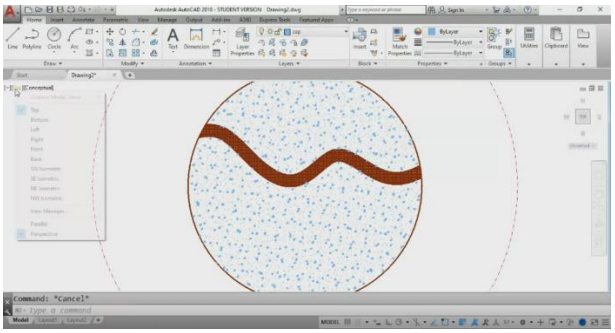

Figure 9 Area covered in snow for winter scenario.

Next step was to create a Christmas tree, which was multiplied in the drawing. For this, The UCS (User Coordinate System) was changed, in order to be able to work in the vertical plane and the GRID MODE was activated. Although one could set quotas for tracing the crown of the tree, that was left to each student to complete the section, free to choose a bigger of smaller section area, depending on their preferences. After creating the cross section of the tree using polyline command, a 360 degrees REVOLVE command was applied, in this way rounding up and completing the 3D trees (Figure 10).

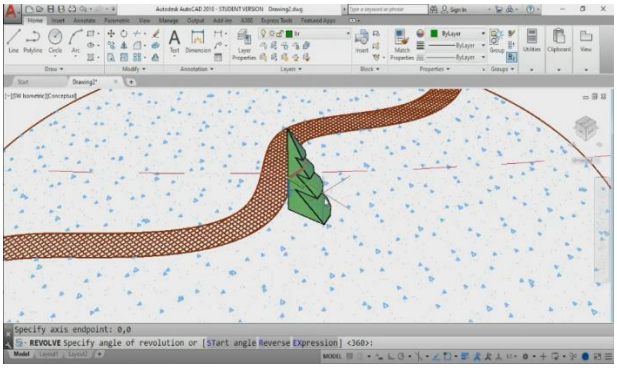

Figure 10 Making the Christmas tree.

After completing the drawing of a single tree, the element was copied several times in the selected area, spreading them all around the park (Figure 11).

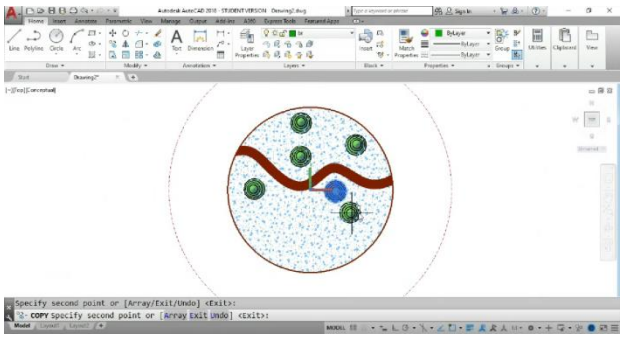

Figure 11

In the area that was left unused, an ice ring was drawn. The POLYGON command was launched and the number of 8 sides was chosen, in the inscribed circle. (Figure 12)

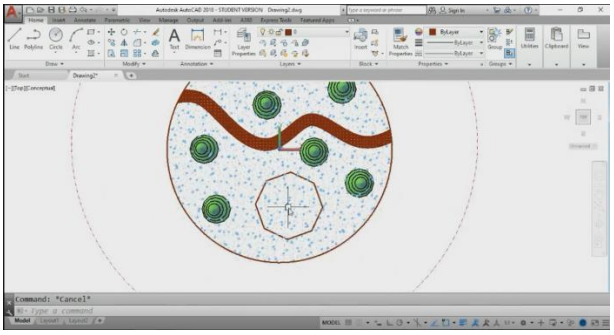

Figure 12 Adding Christmas trees.

POLYSOLID command was used afterwards, in order to complete the fence of the skating area, using the octagon as its base, with the options Heigh = 1.00 m and Width = 0.50 m (Figure 13).

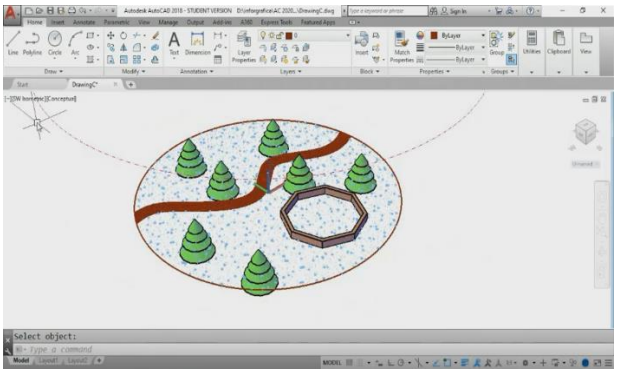

Figure 13 The fence of the skating area.

The ice was created using the command HATCH - *Solid* and color blue. This was overlapped with the type *AR - CONC* hatch in order to create the ice pattern (Figure 14).

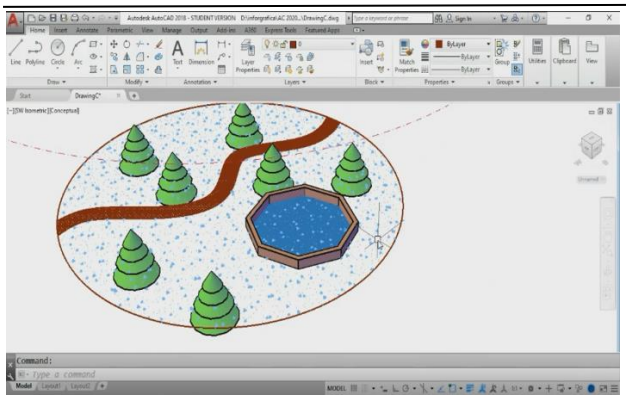

Figure 14 Creating the ice pattern.

CONE command was used to create a roof over the rink. That was done using Layer "roof" and added to the features already introduced, using Hatch Transparency = 60 (Figure 15).

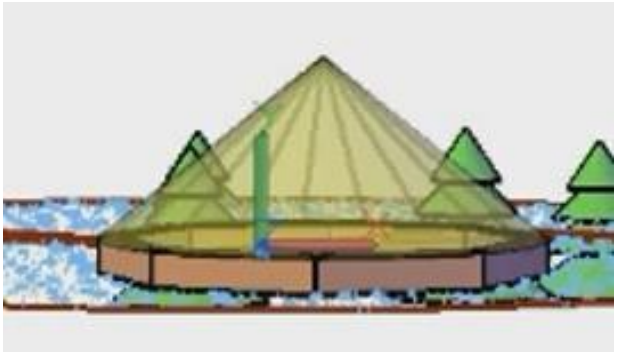

Figure 15 Adding a roof over the rink.

Next step was to create the animation scenario. The position of the camera was set to be on the contour of the circle drawn at a height of 22 and the lens will film the landscape from the top. ANIPATH command was used.

The duration of the animation was set, the number of frames per second, the offset path of the camera and the number of frames per minute (Figure 16).

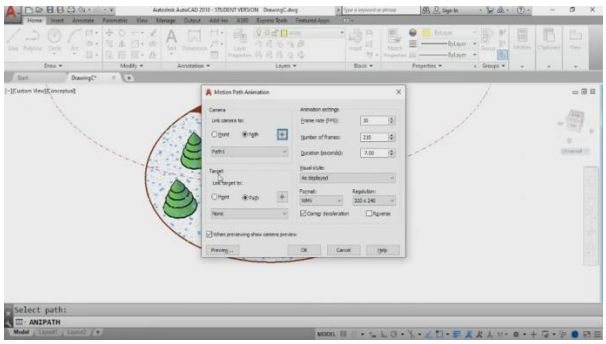

Figure 16 Setting the parameters for the animation scenario.

The Visual Style is set on Conceptual mode (Figure 17). When Preview button was pressed, the camera appeared on the required route and the movie was created.

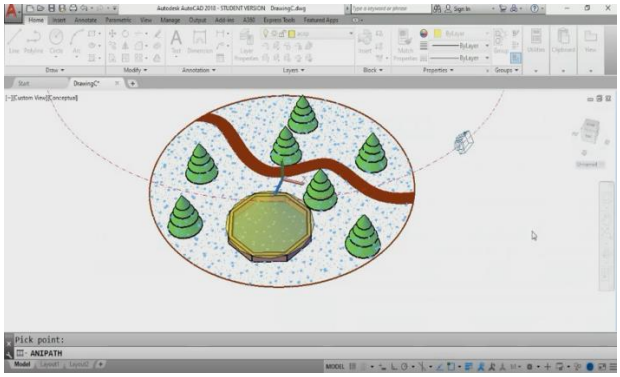

Figure 17 Camera position on the required route.

3. CONCLUSIONS

In the end, it can be concluded that the initial goal was achieved, in an attractive way for the students. Thus, the presented commands had a strong impact on the target group and it was possible to observe the difference in retaining and using the presented commands.

REFERENCES

[1] AutoCAD, Autodesk, at: *https://knowledge.autodesk.com/support/autocad/learn-explore/*. Accessed: 2022.03.12.

Authors:

Senior Lecturer Ana – Maria TOMA, Gheorghe Asachi Technical University of Iasi, Department of Engineering Graphics
E-mail: ana-maria.toma@academic.tuiasi.ro
Assistant professor Irina IGNĂTESCU-MANEA, Gheorghe Asachi Technical University of Iasi, Department of Engineering Graphics
E-mail: irina.ignatescu-manea@academic.tuiasi.ro
Senior Lecturer Oana NECULAI, Gheorghe Asachi Technical University of Iasi, Department of Civil and Industrial Engineering
E-mail: oana.neculai@academic.tuiasi.ro