



APPLICATION OF THE “ARC” TOOL IN THE “AUTO CAD” PROGRAM IN DESIGN AND ARTISTIC ACTIVITIES

Marufov F. O.

Tashkent State Technical University

Acting Associate Professor of the “Industrial Design” Department

(ORCID 0009-0005-7361-9802)

Abstract:

This article discusses the creation of arcs in the AutoCAD program, which is used in industrial design, particularly in artistic activities. As is known, there are many methods for constructing the shape of an arc. This article compares these methods in terms of their efficiency and application in artistic activities.

The study examined existing methods for creating arc shapes using AutoCAD, which are widely used in industrial design within the field of design and artistic activities. Practical experiments were conducted using AutoCAD 2022. The results obtained can be used in the design and artistic activities of specialists and students studying in this field.

Keywords: “AutoCAD”, arc, first point, center point, end point.

Introduction

As we know, one of the advantages of the AutoCAD program is the creation of various complex elements in both two-dimensional and three-dimensional measurements. This program also allows the realization of various creative ideas. In addition, the program enables objects to be assigned colors, textures, and animations can be created using a camera.

Application of Arc Shapes

Arc-shaped lines are mainly used in drafting to create curved lines.



In drawings, arc lines are primarily used to create circles, ellipses, and spirals, where appropriate proportions and measurements must be maintained.

As is known, arc shapes are widely used in many fields. For example, in architecture and construction, arc shapes are used in the creation of door and window arches, which not only improve design but also provide structural strength. In mechanical engineering, arc shapes are mainly used to increase structural strength and reduce load. In industrial design, arc shapes ensure both aesthetic appeal and functionality. For example, arc shapes are widely used in all types of furniture, decorative-stylistic objects, glass and metal structures, and in the design of storefronts and interiors. Additionally, arc shapes are widely applied in household appliances, enhancing both their design and functionality.

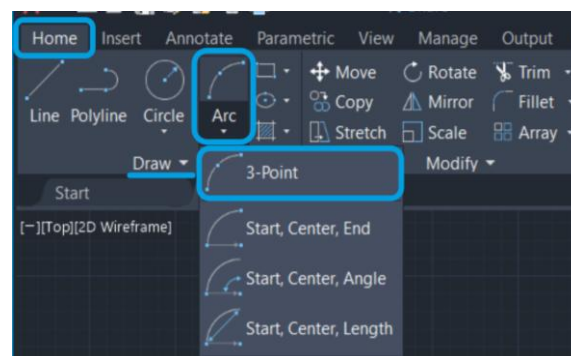
From the above, it can be confidently stated that arc shapes are used in almost all industries.

Creating an Arc Shape Using the “AutoCAD” Program.

An arc is a segment of a circle shape, and its creation involves the properties and parameters of a circle. Arc characteristics include the coordinates of its starting and ending points, chord length, and central angle. The AutoCAD program provides several methods for creating arcs. Let's look at some commonly used methods:

Creating an Arc Using Three Points.

To create an arc using three points, go to the "Home" tab on the "Draw" panel and select the “Arc” tool. From the drop-down list, choose the “3-Point” command (Fig. 1).



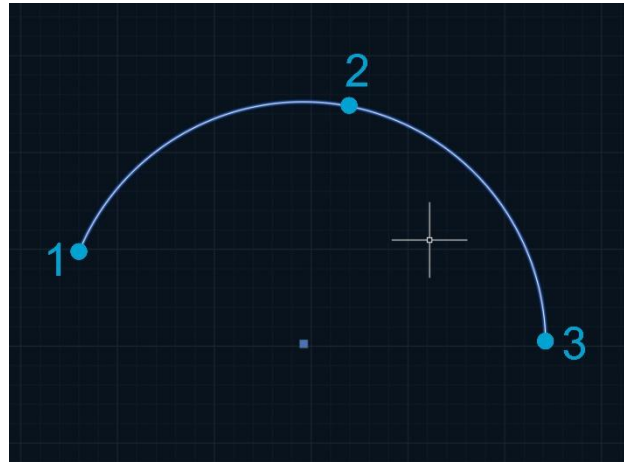


Figure 1. Creating an arc using three points.

Or, in the command line of the program, the "_arc" command can be entered using the keyboard, followed by pressing the "Enter" key. As a result, a prompt appears to specify either the first point or the center of the arc (Fig. 2).

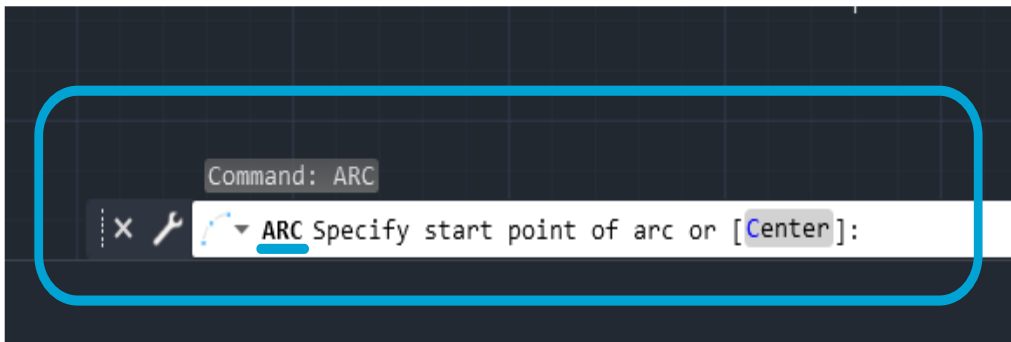


Figure 2. Entering the "_arc" command into the command line.

Using the cursor, the sequence of points is indicated in order by clicking the left mouse button, creating the arc shape (Fig. 3).

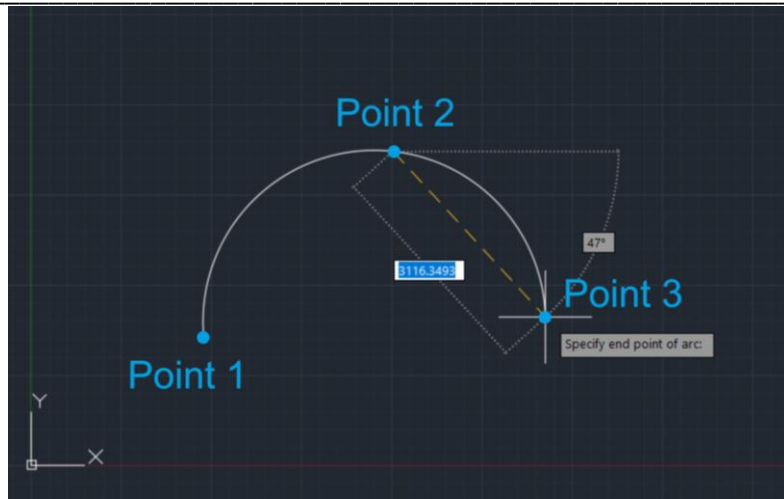


Figure 3. Arc view formed by sequential point selection.

Creating an Arc Using Start, Center, and Included Angle.

To create an arc, go to the "Home" tab on the "Draw" panel and select the "Arc" tool. From the drop-down list, choose the "Start, Center, Angle" command (Fig. 4).

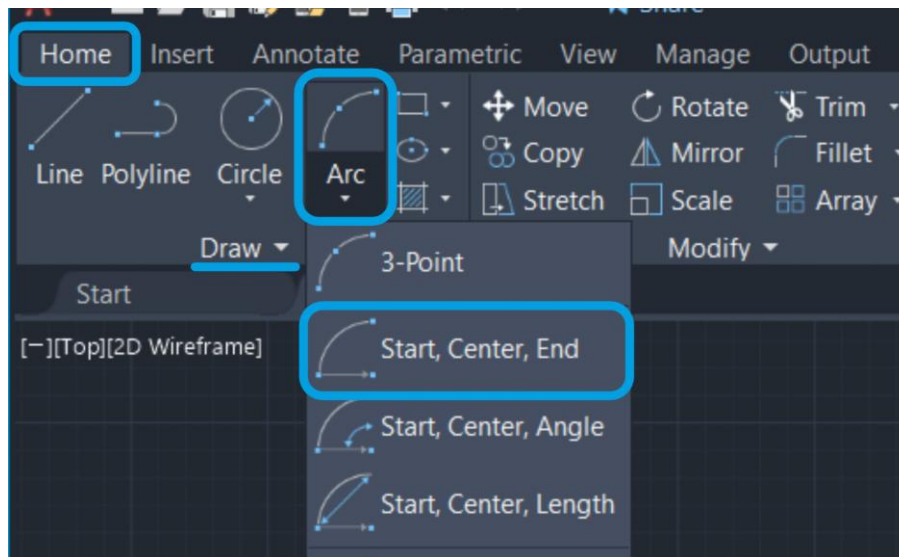


Figure 4. Selecting the "Start, Center, Angle" option from the Arc tool.

Alternatively, in the command line, type "_arc" using the keyboard and press the "Enter" key. Then right-click and from the list, select "Center" (Fig. 5).

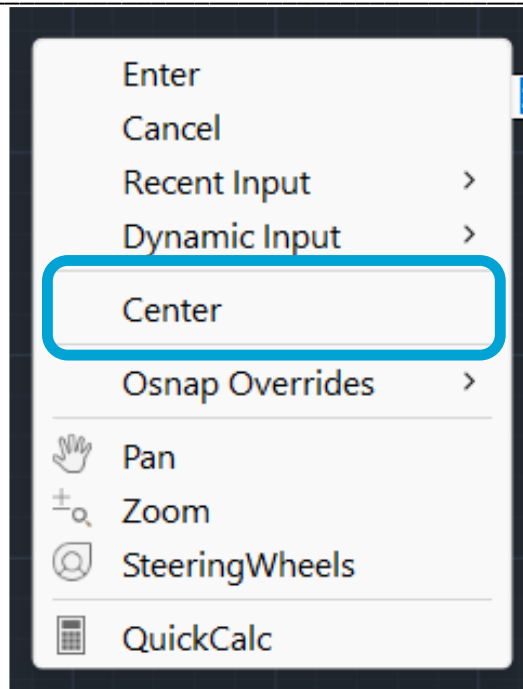


Figure 5. Selecting the “Center” option from the list.

Click the left mouse button to define the center and the starting point of the arc. Then right-click again and from the dropdown list select “Angle” (Fig. 6).

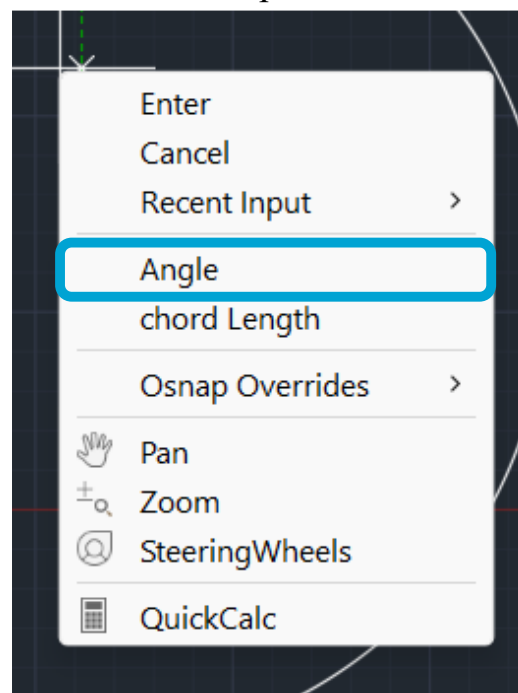


Figure 6. Selecting the “Angle” option from the list.

Next, enter the desired angle value (for example, 130 degrees), press “Enter” on the keyboard, and the arc is created. The arc is drawn counterclockwise (Fig. 7).

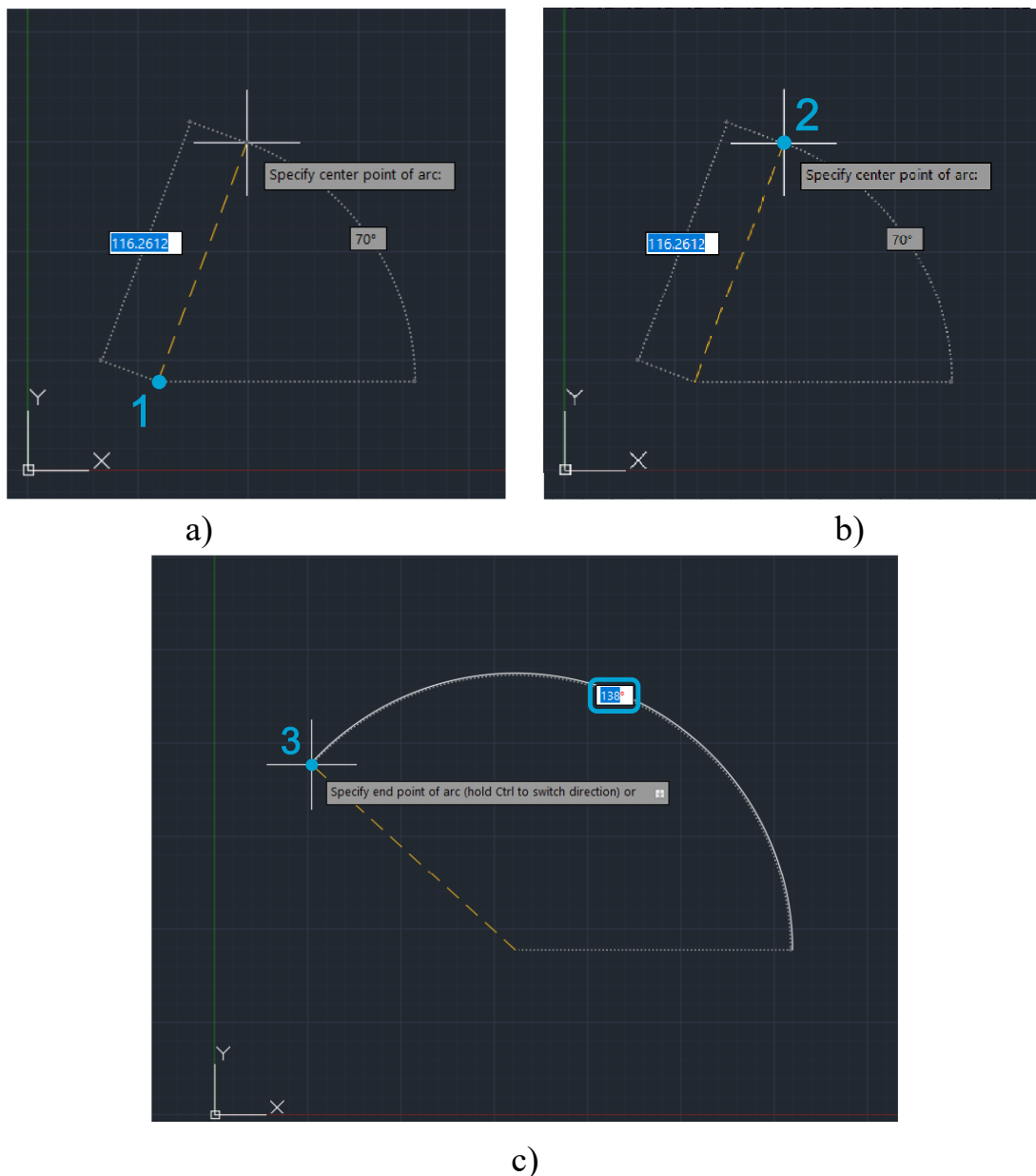


Figure 7. Arc created using start, center points, and included angle:
a – defining the center of the arc; b – defining the starting point of the arc;
c – entering the angle value of the arc.

Creating an Arc Using Start, End Points, and Radius.

To create an arc, go to the “Home” tab on the “Draw” panel and select the “Arc” tool. From the drop-down list, choose the “Start, End, Radius” command (Fig. 8).

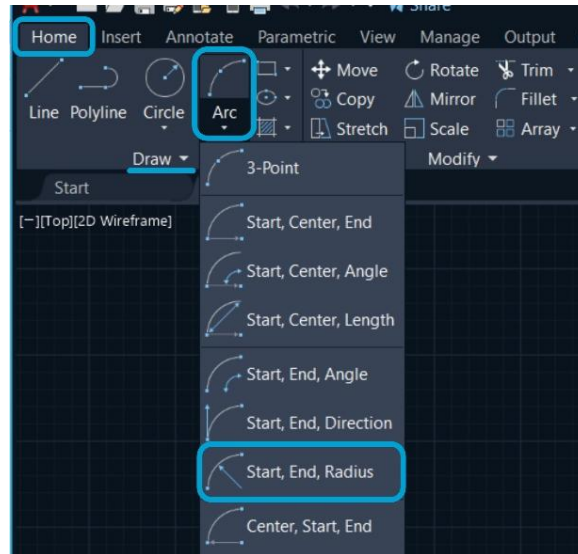
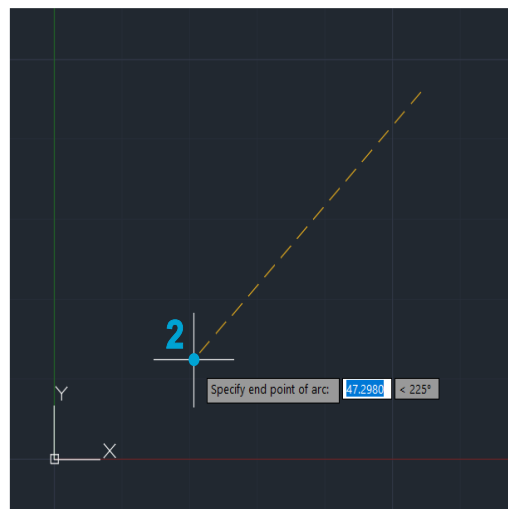
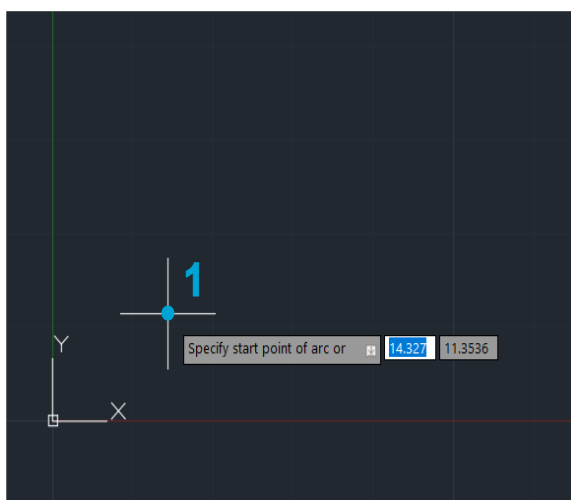


Figure 8. Selecting the “Start, End, Radius” option from the Arc tool.

Click the left mouse button to mark the starting and ending points of the arc. It is important to note that the order of specifying the end point determines the arc's bending direction (Fig. 9).



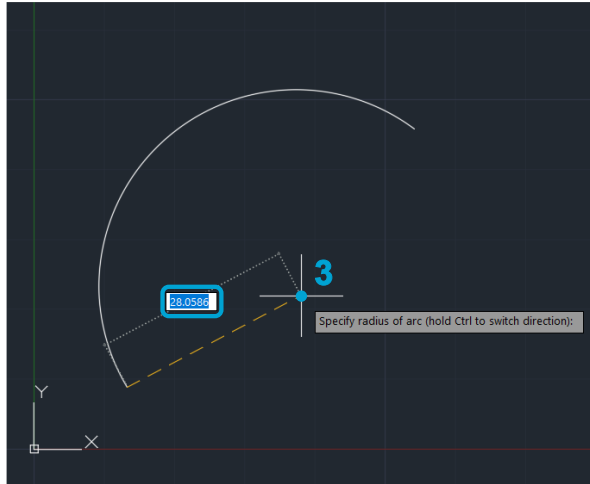


Figure 9. Defining the start and end points of the arc, as well as the radius.

Enter the radius value and press “Enter.” As a result, the arc shape is created (Fig. 10).



Figure 10. Arc created using start and end points and radius.

Let us consider the practical application of arc creation tools using examples of student work completed by 3rd-year students in the discipline “Design and Modeling of Industrial Products” within the Industrial Design program:

The arc-shaped handle of an object created by a student was made using the “3-Point Arc” tool. The known width of the object corresponds to the diameter of a

cylindrical shape. To meet ergonomic requirements, a specific height is set. As a result, three points are formed and an arc is drawn through them (Fig. 11).



Figure 11. Example of a creative project.

Using the “Start, End, Radius” tool, the top part of the object is drawn. The width of the object is known. The starting and ending points of the top part are marked using the tool, corresponding to the width. Then the third input, the radius of the top part, is entered. The large or small size of the top affects the radius value. This is directly related to the sketch and composition of the project (Fig. 12).



Figure 12. Example of a creative project.

The “Start, Center, Angle” arc tool is used to draw the upper and lower parts of the object (a stand element). According to the sketch of the creative work, while drawing the upper part element, the starting point is first defined, followed by its center, which coincides with the center of the upper part. Then the length of the element is created by entering the exact angle value in the angle field of the tool (Fig. 13).

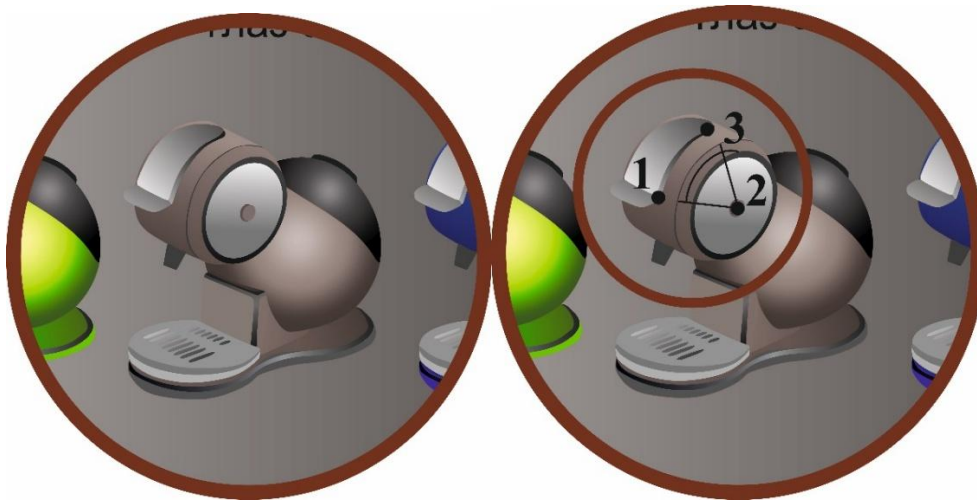


Figure 13. Example of a creative project.

The base part of the object (stand element) is also drawn in the same way as described above. The difference is that the arc length is greater, and the value is entered into the degree field of the arc (Fig. 14).



Figure 14. Example of a creative project.



From the provided information and the students' creative work, it became clear that the successful outcome directly depends on which tools are used to draw the arc. A brief analysis of the arc creation tools is presented in the table below (Table 1).

Table 1. Arc Creation Technology

No.	Tool for Arc Creation	Arc Drawing Sequence	Indicators (Main)	Additional	Number	Features of Arc Creation
1	Arc – “3 Points”	along the sequential axis of three points	distance between points	center, end	3	arbitrary point selection
2	Arc – “Start, Center, Angle”	start, center points and arc angle	Arc angle in degrees	center	3	via angle value
3	Arc – “Start, End, Radius”	start and end points and radius	Arc radius	center	3	via radius

Note: * – when creating an arc, access to additional settings is not taken into account.

Conclusion

The process of creating an arc shape using the AutoCAD program is simple, convenient, and efficient. AutoCAD is widely used in drafting, architecture, technical drawings, and industrial design fields. With the help of AutoCAD, design professionals and students can create arc shapes with high precision and edit them as needed, offering great opportunities for creative work and design processes.

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