METHODOLOGY OF CREATING A THREE-DIMENSIONAL VIEW OF MELIK ADJAR MAUSOLEUM BASED ON GEOMETRIC ANALYSIS

https://doi.org/10.5281/zenodo.10425941

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Annotation: *in this article, based on the geometrical analysis of the Melik Ajdar mausoleum located in Azerbaijan, practical graphic work is done on the methodology of constructing two- and three-dimensional images using modern graphic programs.*

Key words: *Melik Adjar, ellipsoid, Auto CAD, LUMION, 3D project, animation, IX-XV century, Central Asia, mausoleum, arc of a circle, regular octagon.*

In the architecture of Azerbaijan, most of the mausoleums are built with higher vertical views. One of them is the Melik Adjar mausoleum located in the Lachi district of the Republic of Azerbaijan. It is an architectural monument built in the 12th-13th centuries (Fig. 1).

The appearance of this mausoleum was developed in the form of an octagonal vertical prismatic volume. The appearance of the mausoleum has the shape of an octagonal convex pyramid. The overall shape of the mausoleum is like a parabola.

This historical architectural complex was geometrically analyzed by the architect M.S.Bulatov (Fig. 2).

Fig. 1.

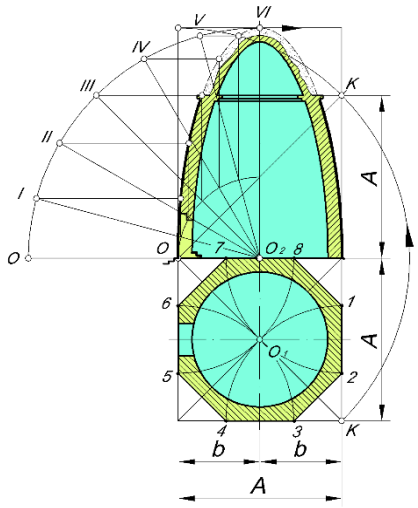

Fig. 2.

Squares of length A are drawn for the base of the mausoleum, diagonals are drawn to the square, and points K are marked. An arc of a circle passing through points K is drawn from point O as the center. The point where a vertical line is drawn from the side of the

square where point O is located and intersects with the arc is determined. From the point of intersection, a horizontal straight line is drawn to determine the height of the mausoleum and center lines are drawn. The minor and major circular arcs of the ellipse are drawn from the the center O2. The arc of a circle is divided into six equal parts (a full circle is divided into twenty-four equal parts) and its points are identified and connected by drawing a straight curve. The interior is done in the same way. As a result, the front view of the mausoleum is formed (performed by frontal cutting). When creating a horizontal view, diagonals are drawn to the square, and circular arcs are drawn from the ends of the square to the intersection point O1 of the diagonals. The intersecting points of the arcs with the square sides are connected by straight lines to form a regular octagon. This will be the base of a regular octagonal mausoleum. (Fig. 2).

The three-dimensional shape of one of the side walls of the mausoleum is made on the base of the mausoleum (Fig. 3), the necessary part of the side wall made on the base is left and the excess part is trimmed (Fig. 4) and removed (Fig. 5). Since the interior of the mausoleum is an ellipsoid groove, based on the geometrical analysis of the mausoleum, the flat surface shown in Figure 6 is converted from its two-dimensional form to the shape of a circular body to show the space inside, for this, Auto Cad software with the “вращать” command, points 1 and 2 of the center line are marked and the shape of an ellipsoid is formed (Fig. 7).

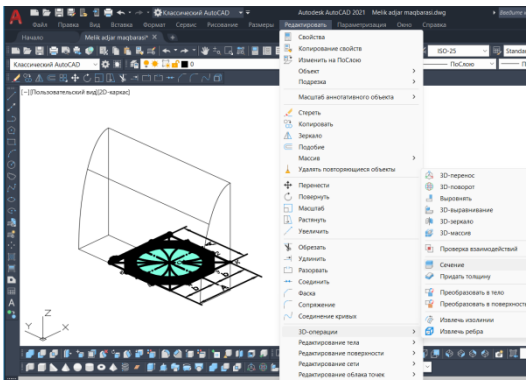

Fig. 3.

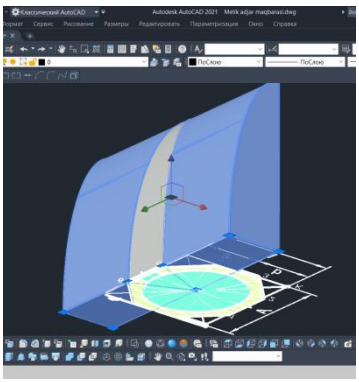

Fig. 4.

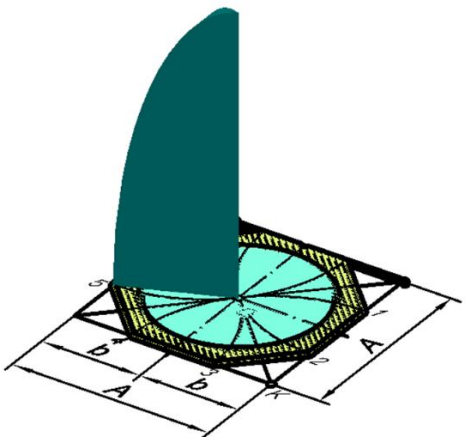

Fig. 5.

Fig. 6.

The ellipsoid is placed at the end of the side wall built on the base of the mausoleum, overlapping with the center of the base (Fig. 8). A part of the wall and an ellipsoid in its center are separated by the “вычитание” command, for which the remaining object (mausoleum wall) is first selected and confirmed, and the exiting object (ellipsoid) is selected and confirmed. As a result, the interior of the mausoleum wall becomes an ellipsoidal void (Fig. 9).

Fig. 7.

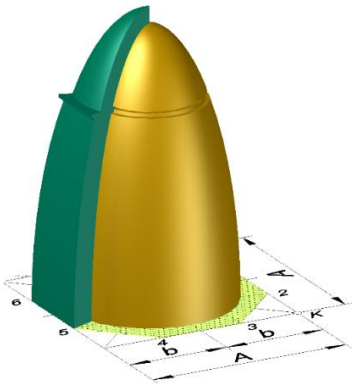

Fig. 8.

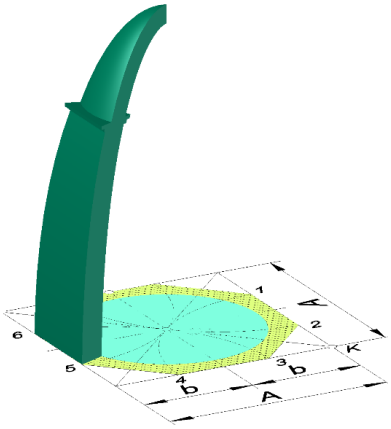

Fig. 9.

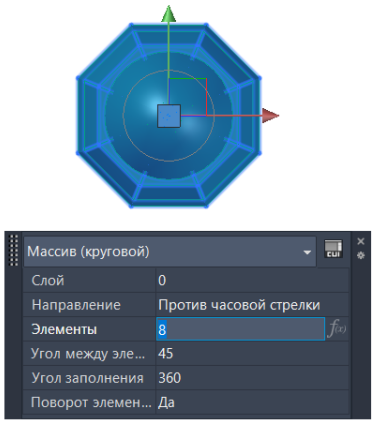

Fig. 10.

The base is regular octagonal with bevered edges and the top is ellipsoidal in shape, one-eight of the mausoleum is brought to a top view and is multiplied by eight with the “Массив” command (Fig. 10). As a result, a complete three-dimensional view of the mausoleum is formed. In accordance with the base of the mausoleum, regular octagonal bases are also made for it (Fig. 11). When showing the interior of its three-dimensional shape has been removed (Fig. 12).

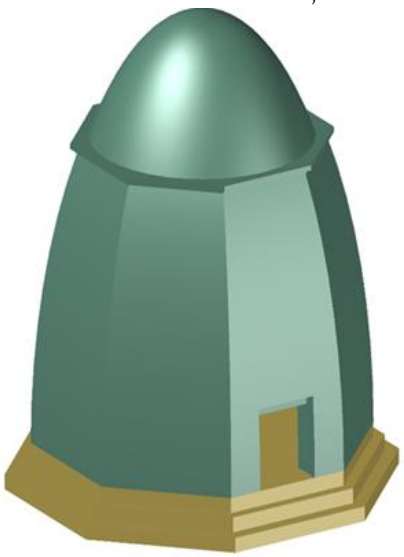

Fig. 11.

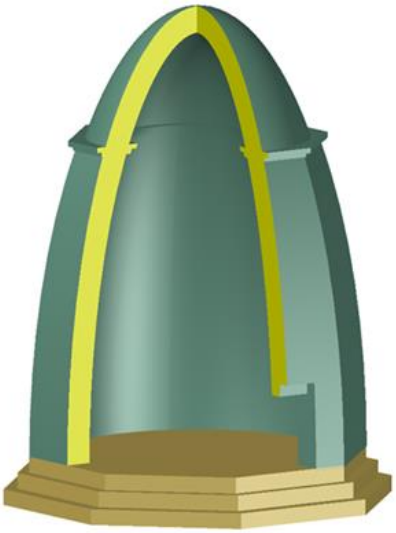

Fig. 12.

To match the three-dimensional view of the mausoleum to the real view, the three-dimensional file made in the Auto CAD graphic program is exported in the LUMION graphic program or imported after launching the LUMION graphic program. Then the three-dimensional shape is given textures and the landscape design is carried out, and it is saved in the photo view by rendering based on poles and time mode in the program itself (Fig. 13).

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By geometrically analyzing the architectural objects built in Central Asia in the 9th - 15th centuries, depicting them in two- and three-dimensional images in visual and animated forms, it becomes important in the development of students` graphic imagination and literacy. 3D designs of all architectural structures can be prepared and used for educational purposes using the above geometric rendering processes. This plays

an important role in appreciating the scientific heritage left to us by our past generations and applying their geometric constructions in today`s modern education system.

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