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STUDY ON THE SOLVING OF SURFACES INTERSECTIONS IN PROJECTIONS WITH ELEVATIONS

Abstract: *This paper presents two examples for the solution of polyhedral surfaces intersection, of elliptical paraboloid respectively, by making use of the representation system of the projections with elevations.*

Key words: *projections with elevations, polyhedral surfaces, elliptical paraboloid, surface intersections*.

1. INTRODUCTION

The projections with elevations representation system is used in engineering, besides the other three representation systems: the Monge projection, axonometry, and perspective. Each and every representation system presents advantages and disadvantages. It is for this reason that choosing the optimal solution for solving various applications requires a good level of knowledge regarding the mentioned systems. Though less often used, projections with elevations can also be applied to the majority of descriptive geometry problems. However, this system is opted for in representations where one of the three dimensions ("z" elevation) is much smaller in size than the other two dimensions.

2. POLYHEDRAL SURFACES INTERSECTION

Figure 1 presents, in projections with elevations, the intersection of an oblique pyramid having a triangular basis situated in the projection plane and an oblique prism whose lower basis is a four-sided figure situated in the projection plane and whose upper basis is placed in a plane of elevation level 7.

The intersection is a "penetration" case, and consequently two intersection polygons were produced. The determination of each side of the (spatial) intersection polygon was made by finding the intersection of two-by-two horizontal lines of the same elevation in the participating faces. This kind of intersection is widely explained in the material below [Drăgan, Nerișanu, Mârza - Descriptive Geometry]. The intersection polygon which resulted is exactly determined and no errors occur.

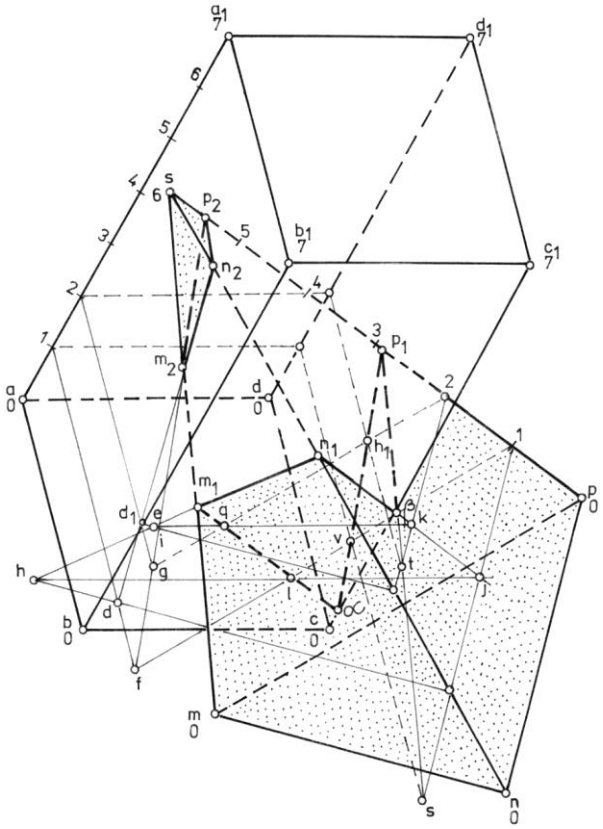

Figure 1 Intersection of an oblique pyramid with an oblique prism. Elevated projection.

3. ELLIPTICAL PARABOLOID SURFACES INTERSECTION

Figure 2 shows the representation in projections with elevations of an elliptical paraboloid surface on a rectangular contour. The ellipses were produced by cutting the surface with equidistant level planes.

As presented in paper [2], once the curves are found, there is no difficulty to intersect such surfaces with various types of planes (Figure 3, Figure 4).

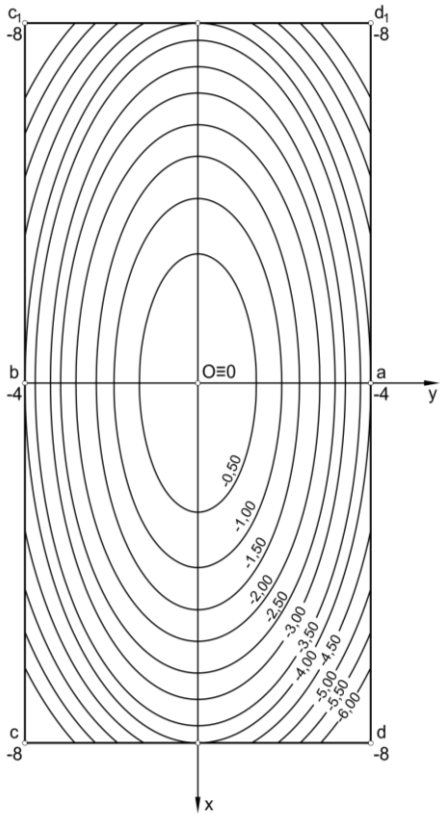

Figure 2 Representation of an elliptical paraboloid with rectangular contour.

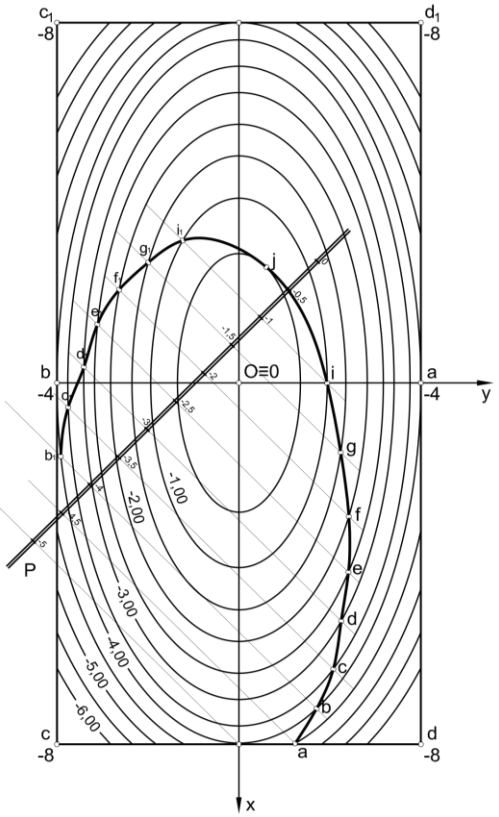

Figure 3 Section in an elliptical paraboloid type surface with an oblique plane.

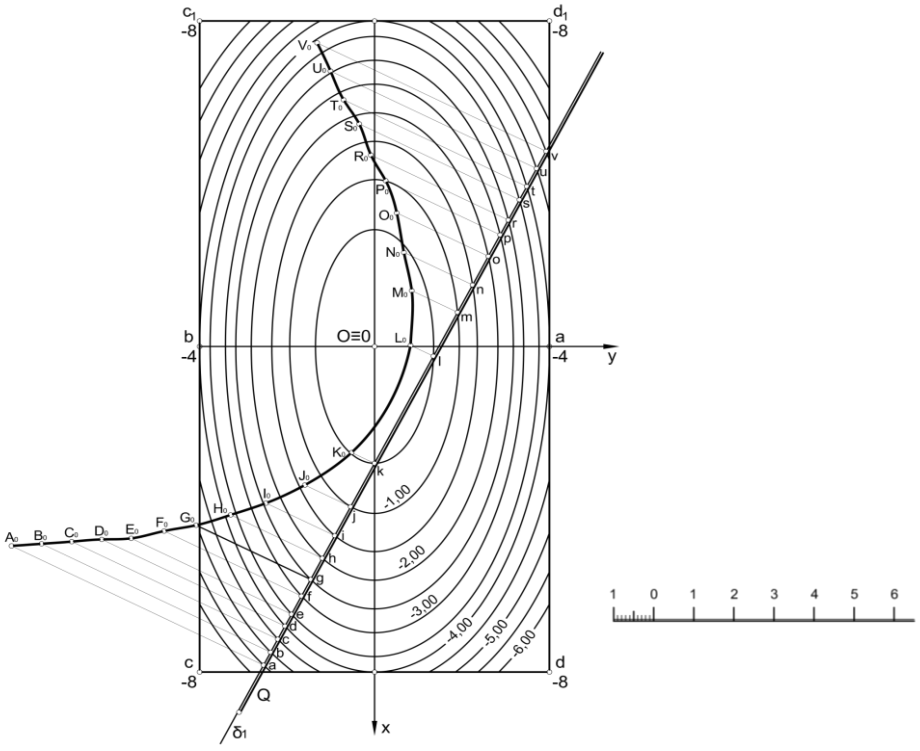

Figure 4 Section with a vertical plane in an elliptical paraboloid type surface.

Mention should be made that there is a certain degree of approximation of the results obtained, function of the number of equidistant level planes initially chosen to represent the surface.

Figure 5 presents the intersection of four surfaces of the type mentioned.

Before positioning and intersecting, the surfaces were cut by vertical planes. The intersection curves present between the various surfaces resulted easily from the cutting of the ellipses of the same level.

Figure 6 is dedicated to the section with a vertical plane through the given structure.

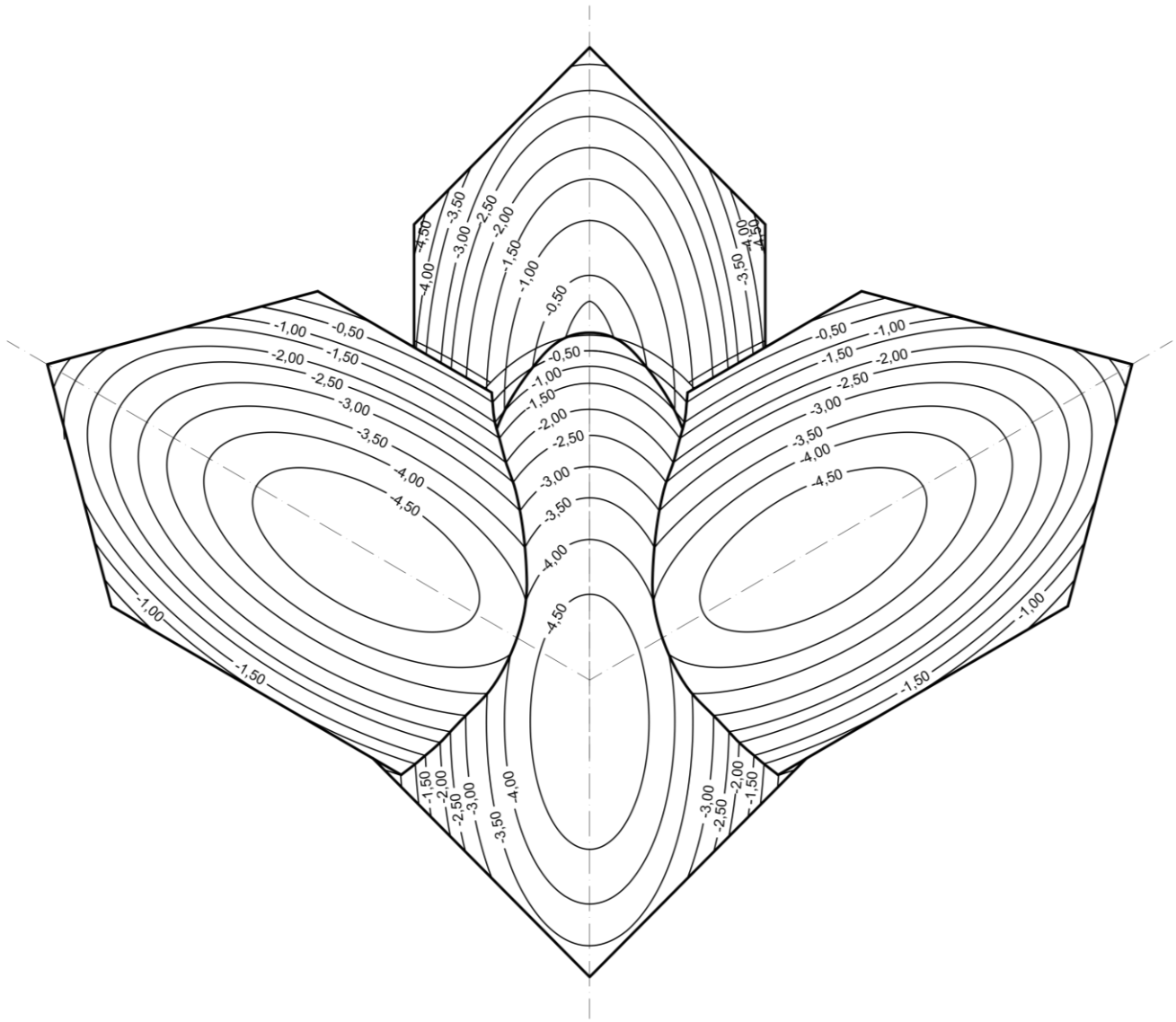

Figure 5 Intersection of an elliptical paraboloid type surfaces.

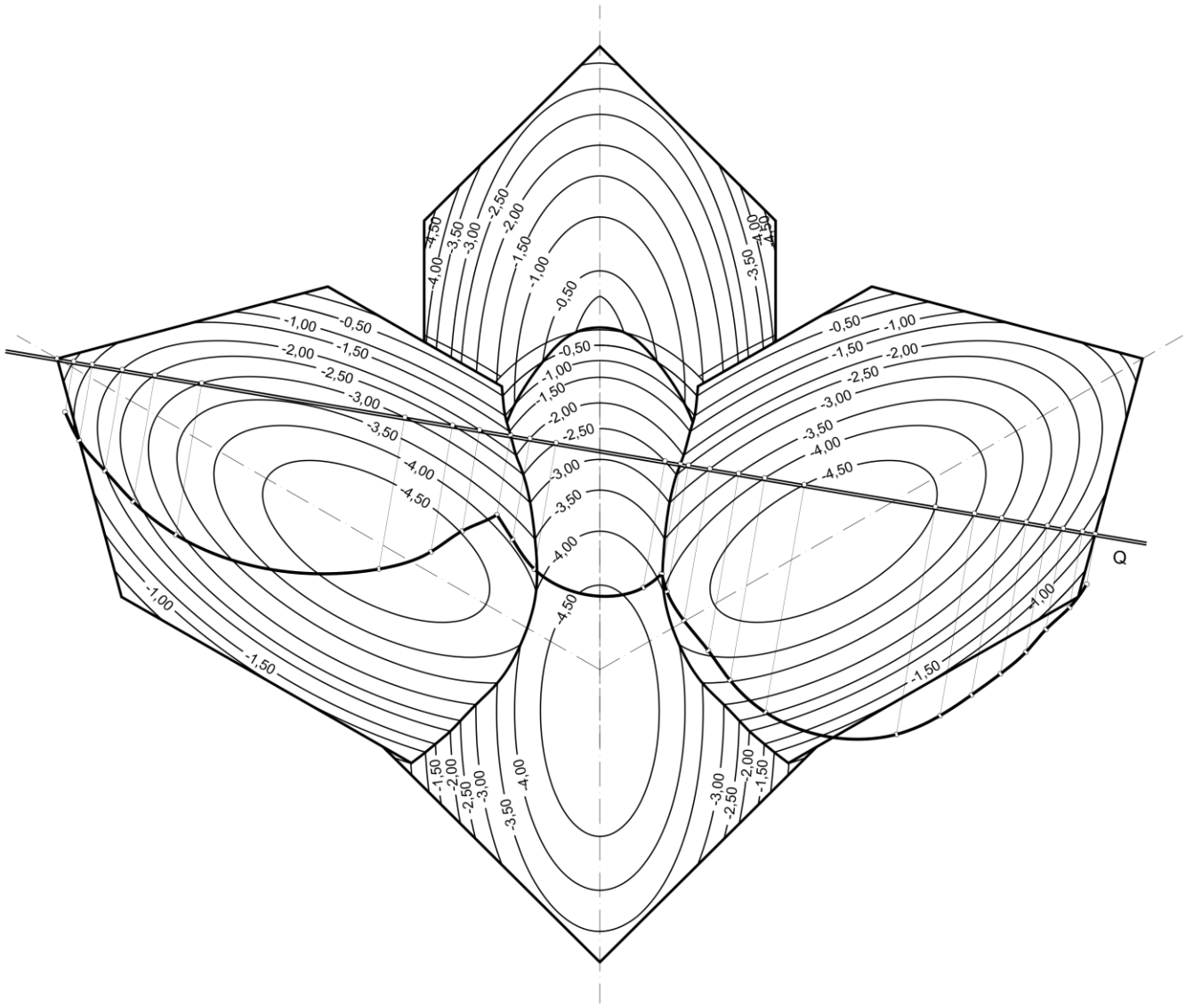

Figure 6 Intersection of an elliptical paraboloid type surface with a vertical plane.

4. CONCLUSIONS

It is noticed that once the projections with elevations is obtained, for however complex surface given, it becomes relatively easy to solve problems related to intersections with planes. In spite of its advantages, the projection with elevation remains a projection performed on only one projection plane, i.e. the elevated plane, and it is not as suggestive as the axonometric representation or as accurate as the Monge projection. Therefore, the elevated projection remains a solution of favour in certain kinds of representations such as: representation of relief in topography, cadaster, communication ways and excavation works.

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