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Projections of a Straight Line, the Actual Size of the Segment and the Angles of its Inclination to the Planes of Projections

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Annotation: A drawing is a certain set of points and lines on a plane. Descriptive geometry deals with the construction of drawings of spatial forms and relationships. What kind of two-dimensional drawings can be models that would display the properties of space, spatial forms and relationships.

Keywords: orthogonal, projection, point, horizontal, frontal, profile, line.

The method of descriptive geometry is a graphical method based on the projection operation - a binary constructive model of space, spatial forms and relations, i.e. the method of planar (binary, two-dimensional) models of spaces.

We need to build planar models of spaces and be able to solve various spatial problems using them. If three-dimensional spatial forms are formed on a two-dimensional plane, this is a drawing. A drawing is a certain set of points and lines on a plane. Descriptive geometry deals with the construction of drawings of spatial forms and relationships. What kind of two-dimensional drawings can be models that would display the properties of space, spatial forms and relationships?

There are two types of projection: central and parallel.

Central projection. Central projection is the most common case of obtaining projections of geometric shapes. Its essence is as follows:

Let be given a plane (theta) and a point S. Let's take an arbitrary point A in space, and A S A S. We need to build a central projection of point A. To do this, through the given points S and A

The central projection apparatus is set if the position of the projection plane and the projection center S is set. If the projection apparatus is specified, it is always possible to determine the position of the central projection of any point in space on the projection plane.

For example: Given point B. Let's draw a projecting ray [SB) and determine its meeting point with the plane. This is the central projection B of point B with a given projection apparatus (,S).

If point C is positioned so that the projecting ray [SS] , then it will intersect the projection plane at the wrong point C .

With a given projection apparatus (,S), each point in space will have one and only one central projection (because one and only one straight line can be drawn through two different points). The converse statement does not make sense, since point A can be the central projection of any point belonging to a straight line (A S) (For example, the central projections of points A and D coincide).

It follows that one central projection of a point does not determine the position of a point in space.

A point is the basic, indefinable concept of geometry. It cannot be defined by more elementary concepts. The point has no dimensions.

Let be given a point A and three mutually perpendicular planes of projections. Let's construct projections of a point in the first octant.

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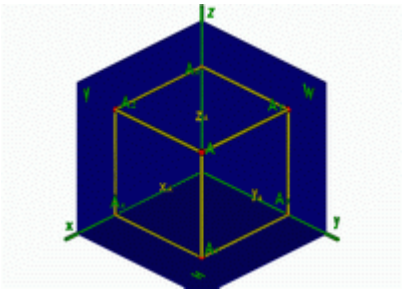

From point A, we omit the perpendiculars on the projection plane. The position of point A in space is determined by three coordinates (xA, yA, zA), showing the values of the distances by which the point is removed from the projection plane.

Projecting a point onto three projection planes.

To get a point plot, you need to transform the spatial layout. The frontal projection of point A - A2 remains in place as belonging to the plane V, which does not change its position. The horizontal projection A1, together with the horizontal projection plane H, combined with the drawing plane, will descend and be located on the same perpendicular to the x axis with the frontal projection A2.

The profile projection A3 will rotate to the right along with the profile plane of projections W until aligned with the drawing plane. In this case, A3 will belong to the perpendicular to the z axis drawn through A2, and is removed from the z axis by the same distance that the horizontal projection A1 is removed from the x axis.

Thus, a PLOT (a complex drawing of a point) is a flat image obtained as a result of orthogonal projection onto two or more mutually perpendicular planes by subsequently combining these planes with one projection plane.

The bisector of the angle between the y axes is called the constant line to the Monge plot.

The resulting model (plot) carries the same information that is contained in the spatial layout. It follows, in particular, that:

The position of a point in space is completely determined by the position of its two orthogonal projections (because from any two given orthogonal projections of a point, it is always possible to construct its missing third orthogonal projection)

- The horizontal and frontal projections of any point belong to the same perpendicular (one line of communication) to the x-axis.
- horizontal and profile projections of any point belong to the same perpendicular (one line of communication) to the y axis
- frontal and profile projections of any point belong to the same perpendicular (one line of communication) to the z axis

Construction of an axial plot of a point. In cases where there is no need to determine the position of a point (or any other geometric figure) relative to the coordinate system of the projection planes, you can not indicate the coordinate axes on the plot, i.e. for an axial drawing, the projection planes are assumed to be indeterminate until parallel transfer (they can move parallel to themselves), which means they are not drawn and are not indicated on the plot.Литература

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